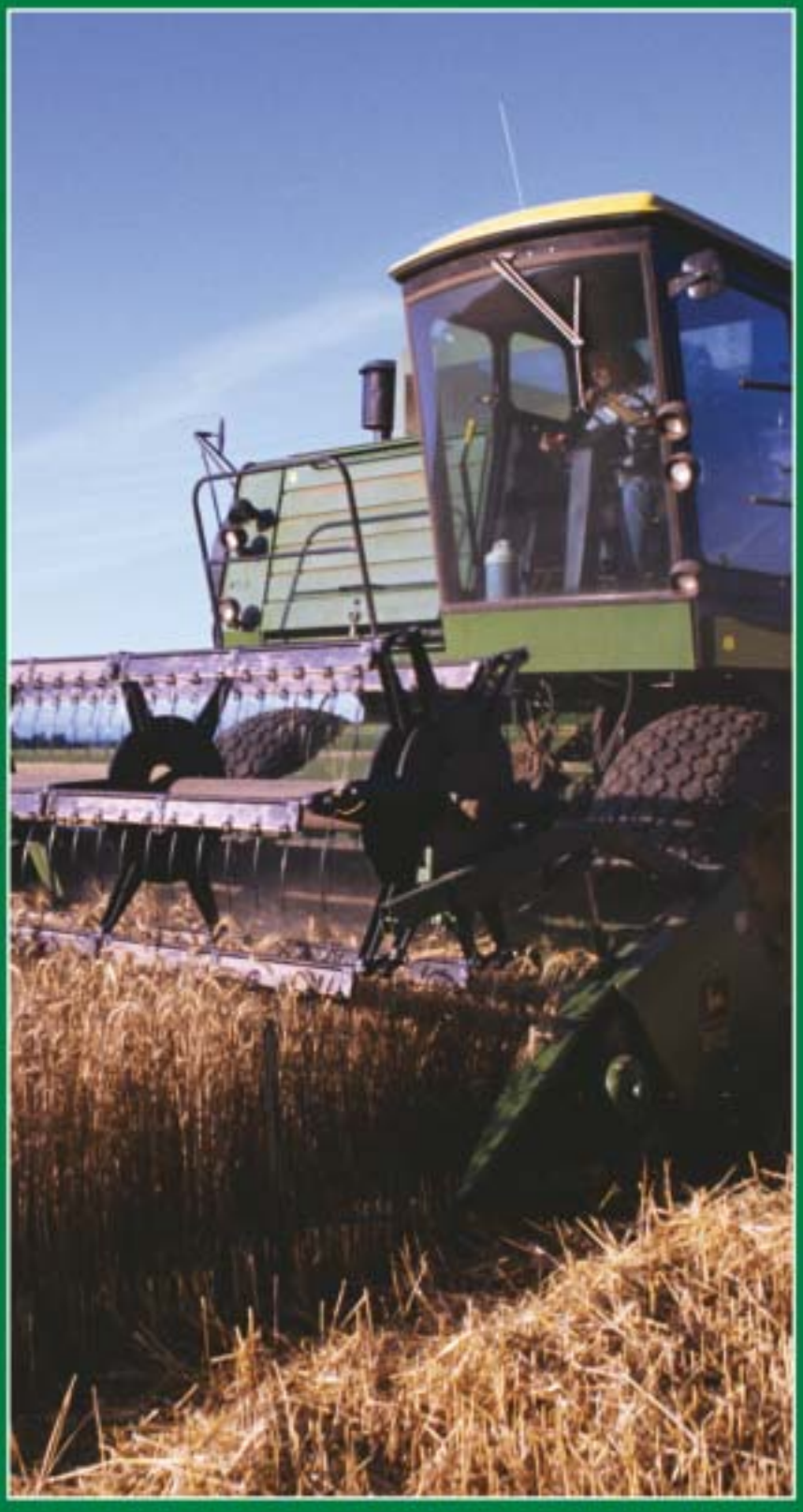

REPORT ON THE TEN YEAR HUMAN RESOURCE DEVELOPMENT ON AGRICULTURAL GRADUATE OUTPUTS IN SAQA ACCREDITED HIGHER EDUCATION INSTITUTIONS

agriculture

Department:
Agriculture
REPUBLIC OF SOUTH AFRICA

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Publish by:
Department of Agriculture
2006

Design and layout by:
Department of Agriculture

Obtainable from:
Resource Centre
Private Bag X250
Pretoria
0001

Printed in the Republic of South Africa

ISBN 1-8687-185-4

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ACKNOWLEDGEMENTS

The project team would like to thank all the contact persons of the various institutions who provided information in support of this research as requested. The project team would also like to thank all the respondents from the various enterprises, organisations, associations and instituions who participated in the telephonic interview undertaken during this research, for giving both of their time and their expertise. Finally, personal thanks are due to Professor Leopoldt van Huysteen of the University of Stellenbosch for his interest in the project and for giving of his time and his own documentation in support.

Foreword by the Director General

It is my pleasure to present to you the Ten Year Human Resource Development (HRD) Review on Agriculture. It is a fact that human capital development is one of the cornerstones of a democratic South Africa.

The Department of Agriculture has made strides towards enhancing human capital development for the entire agricultural sector by the development of the Agricultural Education and Training (AET) strategy of 2005. The strategy indicates a need to match the supply of agricultural graduates with the market demands in the sector. A study on throughput rates of agricultural students in the various agricultural fields is necessary to address the concern on supply and demand. One of the tools to address this concern and towards implementing the AET Strategy is the Ten Year HRD Review on Agriculture.

The shortage of skills has long been a feature of the South African economy. The Agriculture sector is faced with a challenge of oversupply of certain skills in one hand and a shortage of certain critical and scarce skills in another. The principal, but not the only cause of the persistent shortage of skills in some agricultural categories, has been the dual systems and skewed provision of agricultural education and training by the apartheid government.

An informed understanding and knowledge of the demand and supply of agricultural skills for the sector is therefore essential for future planning and the Review is intended to provide this information. We can no longer afford to ignore the disparities in skills provisioning in the sector, hence the review is aimed at assisting all the stakeholders involved in agricultural education and training provisioning at intermediate and high levels to start engaging on the possible long term interventions on the supply of skills which will contribute to higher growth in the sector.

The State of Skills in South Africa Report of 2003 indicates that the demand for unskilled and low skilled people in the agriculture sector has declined, while the demand for skilled and highly skilled workforce has been increasing significantly. This Review therefore serves as an important tool for us to design viable and sustainable intervention strategies to balance the supply and demand of skills that will bring about social change and economic empowerment for the agriculture sector.

The Ten Year Review is intended to examine various factors relating to agricultural graduate outputs in the Further and Higher Education and Training institutions and the employment of these graduates in the labour market. It also provides the link between the supply of graduates with intermediate to high-level agricultural qualifications and demand conditions. The Ten Year HRD Review on Agriculture incorporates the following:

- An analysis of the shape and distribution of graduate outputs in all higher Education and Further Education institutions offering agricultural programmes
- Analysis of demand and supply of agricultural graduates
- Analysis of the factors affecting enrollments and throughput rates of agricultural students in the Further and Higher Education institutions
- Trends in the interaction between demand and supply of agricultural graduates.

We believe that the findings of this review will initiate a dialogue between various stakeholders in agriculture to build the skills base in the Further and Higher Education sector towards the realization of the vision of a united and prosperous agriculture sector.

I wish to thank the Human Science Research Council for the review and hope that the Ten Year HRD Review on Agriculture will prove valuable in sharing the information.

DIRECTOR-GENERAL
Masiphula Mbongwa

Executive Summary

1 Objectives of the project

Agricultural education is an important tool that development planners can use to bring about social change and economic empowerment. There is concern about the co-existence of shortages of skilled agricultural workers with unemployed agricultural graduates. The Department required a service provider to conduct research and write a report on agricultural graduate outputs that can assist in accelerating human capital development in agriculture.

The project was intended to examine various factors relating to the output of graduates in the agricultural field from higher and further education and training institutions and their employment in the labour market. More specifically, the objectives were:

- To analyse the shape and distribution of these graduate outputs in the targeted institutions,
- To develop an analysis of demand and supply of agricultural graduates, and
- To investigate factors affecting the enrolment and graduation of students in agricultural fields with reference to: admissions policy, bursaries available, and costs of study.

Each of these objectives is addressed in the same order below. This is followed by a set of recommendations for consideration.

2. Shape and distribution of agricultural graduate output

The educational institutions that contribute to skilling in agriculture in further and higher education are: ordinary high schools, Agricultural High Schools, Further Education and Training Colleges, Agricultural Colleges and higher education institutions.

High Schools

A large cohort of high school learners - 60 112 in 2003 - pass the subject Agricultural Science in the Senior Certificate Examination anually but the number who qualify to study further and accumulate higher agricultural skills is unknown. Also, the character of the Senior Certificate qualification is generalist and formative rather than vocational. Therefore, this group of graduates is noted but not drawn further into the analysis.

Agricultural High Schools

There are forty-two Agricultural High Schools which offer a learning programme up to Senior Certificate level which includes the same Agricultural Science (HG)/ (SG) subject offered in ordinary high schools as well as five other Agricultural subjects from which students may select. An estimated number of 548 learners enrolled with at least one agricultural subject in these schools in 2003. However, not all Agricultural High schools offer the full range of Agricultural subjects and some students may take only one or no agricultural subjects. These schools therefore do not necessarily offer a standardized vocationally focused agricultural qualification. The graduates from these schools is noted but not incorporated into the supply side analysis.

Further Education and Training (FET) Colleges

Ten Further Education and Training (FET) Colleges provide a vocationally oriented curriculum ranging from N1 to N6 in agriculture. In 2004, 161 people graduated across the different levels from N1 to N6, with the majority completing qualifications in the N4 to N6 range. This study takes into account graduates of complete qualifications. However, the semester-based structure provided by the FET Colleges allows learners to enroll for a once-off instructional offering because this meets a particular need they have for specific skills. Therefore, to assess the

flow of qualified personnel from the FET Colleges only through completed qualifications will lead to underestimation of the full contribution of the Colleges to skilling agricultural workers. The data on the FET Colleges obtained from the National Department of Education was not provided with race breakdowns. However, in terms of gender, females constitute less than 20% of the graduate population.

Colleges of Agriculture

There are eleven Colleges of Agriculture entitled to offer qualifications in the HET band up to the BTech degree level. In 2004, 1000 students passed the examinations in the Colleges, but the total number of graduates completing the Higher Certificate (2 years) and the Diploma (3 years) from the Colleges for Agriculture who are considered as labour market entrants numbered 624. Overall, between 1999 and 2004, African students were the largest group of graduates (59%) followed by White students (39%). Male graduates consistently outnumber female graduates on a ratio of about 5 to 2.

Technikons and Universities

(NOTE: This analysis refers to data from the higher education system before the phase of mergers) In 2003, nineteen technikons and universities offered qualifications in agriculture and the graduation 'output' from these programmes, for universities and technikons combined, rose from 967 in 1994 to 1765 graduates in 2003. The agriculture share of total enrolment in higher education rose from 1.32% in 1994 to 1.56% in 2003. In real terms, 1 721 more students enrolled in 2003 than in 1994. Agriculture programme graduation numbers as a share of total graduations in higher education increased from 1.30% to 1.61% between 1994 and 2003. This suggests that relatively, the efficiency of agriculture programmes increased slightly against the national average.

Consistently more students enrolled for agriculture programmes in technikons than universities, the share of enrolments in the favour of the former on a 3:2 basis. The main feature of changing enrolment patterns in both universities and Technikons was a significant increase in African enrolments from 42% in 1996 to 62% in 2003. In the period under review, agriculture enrolments were consistently higher for men who accounted for 58% and 63% of enrolments at universities and Technikons respectively in 2003.

In universities, the fields with the largest share of enrolment in 2003 were: Agricultural Economics (25%), Animal Sciences (18%), Plant Sciences (14%) and Soil Sciences (7%). In Technikons, the fields with the largest share of enrolment in 2003 were: Animal Sciences (29%), Horticulture (14%), and Plant Sciences (12%). Across higher education four key fields shared the bulk of registration in 2003: Animal Sciences (25%), Agricultural Economics (14%), Plant Sciences (13%), and Horticulture (10%).

In universities, post-graduate enrolment comprised 38% of all Agriculture enrolment, with a particularly large proportion of enrolment at the Masters Degree level. There was relatively low enrolment of students at post-graduate levels within Technikons at only 2% of agriculture enrolment.

In the universities, there was a wide range in the distribution of Africans by study field across the agriculture study fields from 100% to 14% of enrolments. In other words, in some fields only Africans were enrolled while in other fields, Africans constituted only 14% of enrolments. In the technikons, the proportions of African enrolment across the study fields ranged from 75% to 5% for enrolments. This suggests that the distribution of African students across different fields of study was more uneven in the universities than in the Technikons. Practically, this meant that Africans were enrolled in greater numbers in fields such as Renewable Natural Resources, and Agricultural Extension and in smaller numbers in courses like Agricultural Technology, Horticulture and Wildlife.

The low African enrolment in a technological subject such as Agricultural Food Technology can be partly understood in relation to small numbers of African learners completing Senior Certificate with Mathematics and Science. Yet, at the same time, African student enrolment in Agricultural Economics is relatively high which suggests that the

gateway subjects of Mathematics and Science cannot be the only reason for low enrolment in particular study fields. Easier admission criteria for Agricultural Extension programmes – which generally do not specify high levels of mathematics skills – can partially explain why enrolment of African students in that field is so high. In some instances there is a particular pattern of enrolment in subjects by race and gender. For example, low numbers of Africans are enrolled for Agricultural Food Technology, and this is coupled with high female representation of 72%, which implies that the majority group enrolled is white females.

When the pattern of enrolments is compared with graduations in the universities, there are certain fields in which the graduation figures of Africans are markedly lower than their enrolment figures: Agricultural Food Technology (16% lower), Plant Sciences (13% lower) and Agricultural Economics (11% lower).

It should also be noted that the representation of persons classified as 'Coloured' and 'Indian' is very low across all agricultural fields which raises the question as to why this is the case.

3 Analysis of demand and supply of agricultural graduates

Summary of supply of intermediate to high-level skills in agriculture

The table below summarises the total number of graduates with vocational or professionally specific agricultural training in intermediate to high slevel kills who were in a position to enter the labour market.

In 2003/2004, the number of people who were eligible to be absorbed in the labour market was 2 550. Not all of this group would seek work (eg: some would elect to study further).

Output of intermediate to high-level skills graduates from agricultural education institutions in 2003/04					
	Curriculum type	**Institution**	**Year data was collected**	**Graduates**	**Employment**
E	**Professional and vocational**	**Technikons and Universities**	**2003**	1 765	**High skills**
D		**Agricultural Colleges**	**2004**	624	**2550**
C	**Vocational Education**	**FET Colleges**	**2004**	161	**Intermediate skills**
B	**General & vocational**	**Agricultural High Schools**	**2003**	548	
A	**Subject choice in General education**	**Ordinary High Schools offering Agricultural Science**	**2003**	60 112	

Analysis of the Labour Force Survey of 2004 suggests that there were between 33 000 and 42 000 workers in the labour force who held degrees, diplomas and certificates in agriculture and who worked in the sector. If the 2550 graduate output is calculated as a percentage of the number of workers in agriculture who have intermediate and high-level skills in agriculture, we arrive at a figure of between 6.1% and 7.7% (2 550/42 000 = 6.1% or 2 550/33 000 = 7.7%). In other words, this estimate suggests that the graduate output of 2003/2004 could compensate for annual losses – or replacement demand - of skilled individuals in the sector to the magnitude of between 6.1% and 7.7%.

Changes in rate of employment among workers with intermediate to high-level agriculture skills

Analysis of the South African Labour Force Survey of 2004 suggests that there were between 33 000 and 42 000 workers in the labour force who held degrees, diplomas and certificates in agriculture and who worked in the sector. This data provides the best estimate of the total size of the agricultural workforce with intermediate to high skills but because it is a 'snapshot' it cannot tell us whether gross employment is increasing or decreasing.

Agriculture share of total employment

Employment data reveals that the agricultural labour force is in long-term decline, a trend that is attributed to general shifts in economic activity away from primary activities towards manufacturing and services. Counter to this long-term trend, recent evidence suggests that there has been a slight increase in agriculture's share of total employment, from 12% in 1995 to 13% in 2002. In real terms, employment within the sector grew by a substantial 24.7% over the same period (Bhorat, 2003, 6). Simultaneously, there are strong signs of growth in certain agricultural sub-sectors, especially those which are servicing export markets (eg: wine & rooibos tea).

Skilled workers share of agricultural employment

Apart from size, the skills composition of the agricultural labour force is of importance. Data on the 'agriculture hunting, forestry and fishing' sector shows how unskilled workers' share of employment declined while the share of semi-skilled workers increased by almost the same margin between 1995 and 2002. In addition, the proportion of skilled workers doubled – although from a very small base (Bhorat, 2003, 6). This suggests that, regardless of whether agricultural employment is increasing or decreasing, the demand for high-level skills is likely to be higher than for intermediate and low-level skills.

Success in finding employment

It is not unusual to find unemployment coexisting with skills shortages in a particular economic sector on account of disequilibrium of demand and supply. Apart from the size of the unemployed group and their skills levels, a key issue is whether unemployment is episodic or structural. Data from the Labour Force Survey of 2004 reveals that even under the expanded definition of unemployment, unemployed persons with degrees, diplomas and certificates from within the agricultural field of study is less than 10 000. Further empirical evidence from Moleke (2005) is reassuring in showing that 61.6% of agricultural graduates obtained employment immediately and a further 31.% obtained employment within one to six months. Thus only 7% of agricultural graduates did not obtain employment within the first six months after graduation. In contrast, around 20% of graduates in 'humanities and arts' and 'law' did not find employment within six months. Those responsible for supporting employment in the South African agricultural economy will no doubt argue that evidence of a relatively small proportion of unemployed in agriculture is no reason for self-congratulation. Indeed, it is crucial to establish more clearly the skills profile of this unemployed group.

Specific observations on changing skills demands in agriculture

While estimating the overall size of the supply and demand of intermediate to high-level skilled workforce is useful, it is important to obtain insight into the current skills demand in fields of agriculture related economic activity.

To address this information need, telephonic interviews were conducted with a purposive sample of industry players and stakeholders according to a framework that distinguished between different types of agriculture related activities (eg: primary and secondary agriculture; supply of inputs such as seed and fertilizer; vehicles, machinery and equipment supply; governance and support; consulting etc.).

For the purposes of discussion, we must distinguish between general demand characteristics of the labour market and the specific identification of scarce skills. The observations made below refer mainly to where and how demand for skilled workers, and for workers with even higher skills, are surfacing.

The basis of the interview methodology was not robust enough to make empirically grounded observations about the exact size of skills shortages or even to identify all occupations that are suffering shortages. Where shortages are indicated, these must be read responsibly in relation only to the institution that the respondent is representing.

General trends in the requirement for agricultural skills are as follows:

- Managers of farms owned by corporations and commercial farmers (owner-managers) are finding themselves under increasing pressure to obtain formal qualifications, which equip them with a range of skills and knowledge to succeed in a somewhat volatile sector. Where corporate farms are linked to secondary agricultural activities, the demand for agricultural qualifications is almost exclusively for the primary agricultural aspects of their business.

- There were low levels of demand for general agricultural qualifications within secondary agriculture. Two subsectors will suffice as examples. Demand in the food and beverage, and fibre processing portions of the secondary agricultural sector is small - with the single exception of the production of wine. Skills that are required are predominantly in food technology and process/industrial engineering.

  Likewise among the suppliers of inputs into secondary agricultural activities (eg: chemical preservatives, supplements and detergents) there was virtually no requirement for agricultural qualifications. Qualifications required include organic-, inorganic- and bio-chemistry, chemical engineering, bio-technology and food technology.

  This means that the agricultural sector contributes to demand for skills and occupational competencies that are normally considered outside of the range of agricultural occupations.

- For sales positions related to agricultural products (whether locally manufactured or imported), enterprise recruitment policies are increasingly oriented to consider mainly graduates. This is evidence that skills requirements are going to increase over time in sales and marketing positions. (Eg: large fertiliser companies intend to “only recruit people in future who have the minimum N. Dip. Agric”.)

- Demand for agricultural skills arises out of the vertical integration of product value chains. The skills of agricultural graduates and diplomates are required by the large retail organisations. These corporations establish preferred or sole-provider agreements with their suppliers of fresh produce as a means of improving and standardising product quality. Agricultural qualifications are required within the retail organisations to provide farmer support around issues of crop production, the use of fertilizers and international best-practice benchmarking, as well as for general fresh produce procurement.

- There are a large number of industry organisations, associations and societies that bring together stakeholders within the agricultural sector in pursuit of improved sustainability of the industry or activity. These organisations work in specific interest groups such as: professional (Soil Science Society of South Africa), producer (South African Avocado Growers Association), service (Field Guides Association) or consumer bodies (South African Meat Industry Company). This research reveals that these organisations are growing in importance both as platforms for spreading information about skills and for offering specific skills training. In short, these organisations are contributing to rising demand for skills and increasing consciousness about the value of skills to business. In the future, industry associations may become critical players in gathering and communicating information about skills needs and skills supply, as well as becoming training providers in their own right.

- There is growing interest among private enterprises in supporting more R&D activities in order to raise the quality of processes and products. At the same time, within the parastatal Agricultural Research Council

there are concerns that capabilities within the institution are being eroded. Certain of the twelve research institutes within the organisation are struggling to the source high level of skills required within their areas of speciality.

More specific skills needs at the occupational level or level of field of study are as follows:

- Respondents in a number of large animal feed production companies observed that they struggle to fill posts in which Animal Nutrition is a requirement – such as for the post of 'Feed Formulator'.
- In the group of enterprises providing inputs to primary agriculture, there are strong demands among seed manufacturers for 'Seed Scientists'
- The specialised field of veterinary services is suffering a serious shortage of skills. This shortage is particularly acute in government, although it is difficult to assess shortages among private veterinary practices. For example, of all the government veterinary posts (at National, Provincial and Laboratory Level) only 59% are currently filled (185 out of 314). Similarly only 74% of government posts for Animal Health Technicians (1,055 out of 1,423) are currently filled.
- Government as an employer experiences shortages of key knowledge specialists, especially at the high-level qualifications requirements. Scarcity is noted for the following qualification types: agricultural economics; agricultural engineering; hydrology; aqua-culture; horticulture; soil science; agronomy; animal science; veterinarians; and crop protection.
- Agricultural Science is offered as a subject in Grade 12 in 2 645 high schools but it is known that not all teachers of the subject hold these qualifications.

Respondents made the following observations regarding generic skills requirements:

- Enterprises complained that apart from the qualification itself, skilled agricultural workers required additional competencies defined as the *combination* of qualification, life-skills and the ability to get the job done, that were alleged to be in short supply.
- Respondents complained that many people apply for advertised vacancies, but lack of working experience (especially among EE candidates) limits the employability of applicants.
- Respondents alleged that there is a 'poor standard' of graduates emerging from certain institutions that limits the pool of possible candidates.
- It was generally argued, that the poor image of Agriculture as a career option is compounding the issue of skills shortages. This is seen to be deterring really bright, ambitious and determined young people from entering agriculture-based professions.

Key findings on the nature of demand for agricultural skills

The key findings are given below:

- Relative demand for agricultural qualifications is higher in the primary agriculture sector than in the secondary agriculture sector
- Demand for agricultural qualifications is not restricted to primary and secondary agricultural activities, but is also evident among firms that provide various inputs to the agricultural producers
- There is strong demand for agricultural qualifications among the organisations and institutions that provide governance and support to agricultural activities
- Demand for agricultural qualifications within government remains critically important

There were also cross-cutting observations:

- Demand in the sector applies to highly specialised agricultural qualifications as well as to general agricultural qualifications
- Demand for specific agricultural qualifications displays geographical variability due to the impact of climate on the sector

Trends in the interaction between demand and supply

This study has also identified a number of key trends which assist our understanding of how demand and supply factors mutually interact to produce employment and unemployment trends in the agriculture sector. These trends are given below:

- The agricultural sector is characterised by intra-sector mobility of skilled workers
- The extent of labour market demand is hidden by qualification substitution
- Demand for skills in the marketplace is mediated by employers who provide forms of focused but informal in-service training
- Not all individuals with the same agricultural qualifications are perceived to be equally desirable candidates for employment
- BEE and Employment Equity (EE) requirements compound the problem of scarce skills
- The pattern of supply of agricultural qualifications shows rural-urban and socio-economic bias
- The presence of regional 'clusters' of agricultural activity impact on the supply and demand of specific agricultural qualifications
- Higher private sector wages draw skills away from the public sector
- The poor image of the sector is discouraging young and motivated individuals from pursuing a career in agriculture
- Lack of adequate labour-market information contributes to sector skills imbalances
- Increasing formalisation of the relationships between role-players within the agricultural sector appears to be driving demand for formal training

This Executive Summary has discussed the key findings of this research on the link between the supply of graduates with intermediate to high-level agricultural qualifications and demand conditions. It now turns to examine the factors, such as admissions policy, costs of study and availability of funding which influence student access to agricultural programmes.

4 Factors affecting the enrolment and graduation of students in agricultural fields: admissions policy, bursaries available, and costs of study

The influence of admissions policy and costs on access

Admission requirements are set by an education institution in accordance with the level of difficulty of a programme of learning in order to ensure that candidates possess the required skills and capacity to complete the prospective course of study.

Admission requirements for FET colleges are specified for each year from N1 to N6, and are uniformly applied in all of these institutions. In the Agricultural Colleges, uniform minimum entrance requirements are stated, but there are several Colleges that apply additional criteria (eg: senior certificate subjects relevant to agriculture). In general, admissions policy at the institutions:

- is more stringent as qualifications rise up the NQF levels and increasingly extends beyond common standard requirements
- is more complex for entry at higher qualifications levels (eg: where institutions apply many different criteria that become difficult to compare)

Only at the university level was the subject 'Agricultural Science' specified explicitly as a part requirement for admission to programmes. In the Colleges, it was a recommendation rather than a requirement to have Agricultural Science in Matric. Clearly there is no explicit advantage in getting entry to a programme for an applicant holding a

Matric with the subject 'Agricultural Science'. Therefore a student who took Agricultural Science instead of Mathematics or Science or even Biology at Matric level could well be disadvantaged in her attempts to access agricultural study opportunities in higher education.

The analysis of admission requirements across the institutions revealed that for programmes which are presented in almost exactly the same way across institutions, where each programme contains a limited number of courses, and where students have a limited number of options, it should be feasible to compare the effects of admissions policy on outcomes (eg: FET Colleges programmes). However, in the case of higher education and especially universities, investigating the impact of admissions criteria across institutions and across programmes is not possible. This is because in the universities the following conditions apply: each programme (eg: BSc Animal Science) will involve a different set of courses in each institution, and because there will be a variety of options, students can select individualised combinations of courses. This means that degree programmes differ across institutions and even students taking the same degree will have different emphases. For these reasons, student achievement is not strictly comparable unless at a highly aggregated level (eg: type of degree such as BSc or broad field of study such as animal health).

In addition we must take into account admissions criteria that are not comparable. The different institutions each set different criteria for admission to studies leading to a degree. For example, requirements for admission to BScAgric programmes in the universities show quite wide variation beyond the basic Matriculation exemption. The problem is that the variations between admission requirements stipulated by the institutions are difficult to equate (eg: is a rule stating that a student must have a E symbol in Biology (HG) more – or less - restrictive than a rule stating that a student must have a D symbol in English (SG)?).

Some institutions use a so-called M-Score to equate school leaver eligibility. Essentially the simple M-Score measures overall performance of Matriculants across all Senior Certificate subjects. If the institutions involved translated their specifications into an M-Score format, this would enable a more standardized and reliable approach to comparing admissions policy between different degree programmes and comparing admissions policy between universities offering the same degree programme. Nevertheless, this score in any case does not replace the specification of other criteria. Many institutions refer to their prerogative to subject students to an 'evaluation process' which involves particular tests the nature of which are unstated. The main point here is that if these processes – which are vaguely stated - are applied, then the outcome of admissions cannot be the product only of the stated criteria. Interpretation of the admission requirements is therefore not an exact process.

Ultimately, analyzing the impact of admission requirements must be undertaken within specific programmes and within specific student groups. For example, the degree with the lowest admission requirement among the Bachelor level programmes reviewed is the BInstAgric offered at the University of Pretoria. Noteably, there are no requirements with respect to science-related subjects. Also the requirement is restricted only to a language, English, where the cut-off off mark is Higher Grade 40%. This particular requirement could be interpreted as a strategy to attract second language English speakers and to accommodate students from formerly disadvantaged population groups. Even though this degree is accredited with the HEQC and is offered by a credible university, the first question is: what prospects for employment does the degree provide? The second question is about the quality of instruction and support within the programme: to what extent does the programme and its structure enable access (eg: through bridging), provide support and build students in the process of their studies? Therefore, we must consider examining particular programmes and the prospects for employment and contribution in the market place that they generate. This is analytically feasible whereas a survey approach across general admission criteria will not provide answers.

Costs of study

Cost of studying is an important factor that affects access to study opportunities. Unless costs of studying are very low, they constitute a serious barrier to students who wish to enroll and who qualify academically for admission but do not have access to sufficient financial resources to meet fee requirements and other financial needs. The cost of study is the barrier below which students who cannot raise this amount, are excluded.

Any comparative analysis of this barrier is problematic because institutions do not levy fees in a consistent way. There is a range of categories of fees that are charged separately by some and not other institutions. Some institutions will not explicitly charge particular costs separately, but will bundle these costs together with other charges. Where an institution levies these various costs separately, the amount charged for academic fees may appear lower than the fees charged by an institution which bundles these costs together. Consequently high degrees of accuracy in this level of detail are difficult to obtain, since institutions provide their costs in different forms and in different documents. In addition, there is no official requirement for standard reporting of costs.

Another complication is that institutions build costs on the basis of courses that a student chooses rather than on a whole programme. The actual fees payable by a student will depend on the specific modules taken during the year, and what is compulsory and what is elective will affect the full fee debt. Annual fees will also differ according to whether a student is part time or full time. Finally, tuition fees will differ according to the year for which the student is registered. At many universities, first degrees in particular - but also many post graduate diplomas, and BEd degrees - are charged per course. This means that the undergraduate degree costs are dependent on the student's choice of curriculum and course options.

For these reasons, it was necessary to obtain data from a source that used a consistent method of capturing cost information. The data – for 2005 - used below was sourced from the NSFAS, which monitors study costs in higher education as the basis for allocating financial aid.

Around the average of R12 191 for all South African higher education institutions, academic fees ranged in price from R5 900 at Border Technikon to R20 787 at the University of Cape Town. Registration fees ranged from nil to R1 380 at University of Venda (registration at MEDUNSA is R4 400 but this is an outlier). The average registration fee across all institutions was R770. The lowest average residence fees of R11 437 are levied at Cape Technikon and the highest are R23 726 at University of Pretoria. The average residence fee across all higher education institutions is R18 227.

In those institutions that offer agriculture, the institution with the lowest average academic fees was Fort Hare University (R7 124) and the institution with the highest average academic fees was the University of Stellenbosch (R17 238). Overall, the Technikons/Universities of Technology that offer agriculture programmes generally set much lower academic and registration fees than do the universities that offer similar programmes. There is however a much smaller difference in residence fees between the institutional types.

Cost information provided by the Colleges is difficult to bring into comparison because the Colleges independently structure their fees and bundle their costs in different ways. The average costs of study for one year across the different qualifications offered in the Colleges could be R 15 000 consisting of R1 000 registration, R7 000 Tuition fees, and R7 000 residence fees. In the FET Colleges, the costs of the more popular N4 and N5 (one year) and N6 (1 year) are R3 150, R3 000 and R6 650 respectively. Variations in the scale of costs between FET Colleges do exist.

As can be seen, there is a wide range of study costs across the three institutional types. Over and above these institutional cost parameters, the cost of access (in respect to travel and transport) is another financial barrier that could not be taken into account.

Funding for students studying in agricultural fields

Funding availability for study in agriculture is discussed under three headings: public funds available, private funding, and R&D funding.

Public funds

In 2004, 1 372 students in Agricultural fields were awarded R12 348 million rands by the National Student Financial Aid Scheme. Between 1998 and 2002, the percentage of agriculture students who received financial aid was greater than their share of enrolment. However, in 2003 agriculture students comprised 1.56% of all students enrolled in higher education and only 1.5% of those who received NSFAS funding which is a slight decline that should be monitored. In 2003, the average amount received by agriculture students was R7 946, which was 14% less than the national average.

Within the group of students registered to study agriculture, the proportions who are recipients of NSFAS financial assistance provides some sense of the extent of the financial 'safety-net' that is extended to Agriculture students. The proportions of agriculture students who were recipients of NSFAS assistance was at its highest in 2000 at 15.7% and then declined to 13.1% in 2003 - which means that in 2003, 13 in every 100 agriculture students received NSFAS assistance. This raise the important question as to what other sources of financial aid is available to agriculture students.

Data for all students receiving NSFAS support suggests that the overwhelming majority of recipients - 85% to 90% between 1996 and 2001 - were African. Financial support in the Colleges of Agriculture is set to improve as the NSFAS begins to offer support for students enrolled in these institutions. The qualification breakdown of NSFAS grants within agriculture shows that the proportion of diplomates has increased from 36% in 2000 to 48% in 2004, while recipients registered for degrees declined from 64% to 51.3% in the same period.

The Department of Agriculture provided funds to the NSFAS to the value of R5.3 million and R5.7 million in 2004 and 2005 respectively. It is a matter of concern that the full amount of funds made available by the Department of Agriculture and ring-fenced for agricultural study was not spent in the 2004 year. The reason for this was the difficulty in finding sufficient numbers of young people to enroll in the study fields for which there was funding available. The Department of Agriculture has also put in place its Agricultural Bursary Scheme in order to "increase the number of agricultural scientists in designated groups" and "to increase the number of farmers from designated groups at commercial level".

Private funding

A survey of sixty privately provided bursaries (eg: business, community, international donor organisations etc.), which included agriculture as a field of study eligible for support, was conducted. Of the bursaries obtained in this sample, 56% were dedicated specifically to agriculture or a sub-field within agriculture. In the balance of cases, students from one or more fields other than agriculture were also eligible to compete for the bursary on offer. The value of the bursaries ranged from R400 to R25 000 with an average value of R6 928. Private bursaries tend to be offered in Universities and Technikons, with Colleges being specified in only 23.4% of the cases.

R & D

Support of research and higher degrees in agriculture is of critical importance in all fields to replenish the stock of R&D personnel so that this country can maximize innovation for agricultural development. Respondents from several different agricultural sectors expressed rising interest in R&D. Given that funding for higher degree study is specialized and that these studies are frequently more expensive than undergraduate study in the natural sciences, the sources of financial support are critical. The National Research Foundation supplies a range of funding opportunities. It is necessary to establish the extent to which such funds are available to agriculture graduates through these sources and through the Agricultural Research Council.

5 Recommendations

Improve dissemination and use of HRD information in the private and public sector labour markets

- Improve dissemination of both supply and demand data to all role-players within the agricultural sector.
- Improve collection and use of information on mission critical agricultural skills needs in national and provincial departments of agriculture.
- Generate knowledge of and opportunities to pursue agricultural careers
- Market the agricultural sector's broad range of agricultural career possibilities not only in schools, but also to the general public.
- The Department of Agriculture should discuss with the Department of Education how to make it possible for students who take agriculture as a subject at school to also take the key gateway subjects of mathematics and science.
- Sustain the quality and focus of agricultural study programmes
- There are clear gender and race differentials in the extent to which enrolment, graduations and throughput are distributed. In collaboration with the educational institutions, investigate such patterns and plan support interventions to ameliorate the causes.
- Graduates from rurally based and previously disadvantaged institutions are currently being negatively impacted by perceived differences between their education and those graduates from urban-based and historically white institutions. Research can be undetaken to establish what factors these perceptions are being based upon.
- Investigate the possibility of supporting rural-based agricultural training institutions, such as Colleges and universities to obtain staff with the appropriate qualifications.
- Provision needs to be made for alternative paths of entry for individuals who do not meet direct requirements in targeted study fields (eg: alternative admissions and bridging courses).
- In co-operation with the Department of Education, reinforce the importance of general life and workplace skills (eg: communication and language skills, teamwork skills; ability to work independently; ability to use computers) and integrate opportunities to learn these skills as part of the curriculum.
- Encourage education institutions offering qualifications in agriculture to integrate 'Agriculture as Business' skills (eg:. finance, business skills and project management skills) in curricula.
- The Department of Agriculture should focus on facilitating particular career and study pathways. Particular plans of action can be undertaken in collaboration with relevant education institutions and employer role-players to facilitate the flow of cohorts of students towards the goal of obtaining employment in occupations that have scarce skills needs.
- Support the capability of public education institutions to respond to industry needs in respect of particular programmes, subject to quality requirements.

Strategically targeting scarce skills

- Target a set of key occupations that are known to be in short supply and conduct an analysis of the likely future demand for these occupations over a five to ten year period (eg: seed scientists etc.).

- Encourage an increase in the number of graduates obtaining higher level agricultural and research qualifications at the M.Sc and PhD levels to support national agricultural R&D.

- Set aside funding for 'bursaries' to international institutions for particular specialised qualifications, which are not offered locally.

- Investigate the possibility of implementing a scarce skills allowance and rural allowance that applies to particular scarce skills (eg: such as veterinarians) in the public service.

Support for stronger cooperation between training providers and employers

- Consider ways of supporting industry organisations (eg: sub-sectoral bodies such as in the sugar industry or professional associations) which through their activities improve the training and skills development culture, act as networking hubs for skills related information, and sometimes themselves engage in training.

- Contracting a research agency to conduct skills needs analysis for particular targeted agricultural sub-sectors. If a trustworthy empirical analysis were undertaken of the value system of a particular industry to show skills needs, employers would be more likely to invest in training.

- Seek ways of supporting higher education-industry linkages that involve the development of curricula and programmes to meet niche industry needs in either the public or the private sector.

- Foster a strong relationship with the new AGRISETA to support the accreditation of intermediate to high-level skills that are developed in the form of Learnerships at the appropriate NQF levels.

- Conduct case studies of agriculture industry organisations that have established relationships with education providers (eg: higher education institutions, agricultural colleges etc.) to identify best practise models of curriculum development in key fields of agriculture.

Foster intergovernmental collaboration

- The Department of Agriculture should pursue discussion with the Department of Education with the aim of assisting to shape the future of the Agricultural High Schools. Data from the research suggests that Agricultural High Schools are becoming more strongly generalist and losing their original mission focus.

- The Department of Agriculture may wish to engage with the Minister of Education and provincial Departments of Agriculture in defining the mission of the Agricultural Colleges. There is evidence that certain provinces aim to shift the higher education mandate of Colleges towards farmer support (e.g.: Mpumalanga province). Plans to shift the mission of these institutions towards local needs may produce a gap in the national production of high skilled human resources.

Understand how young people make education and career path choices

- Conduct tracer studies to follow the career choices of young people: in the year of their first major career oriented subject choice in Grade 9, and in the critical periods when they make decisions regarding higher education studies and occupational choice.

- Monitor the distribution of bursaries from NASFAS, and recipients of 'scarce skills bursaries' to assess the extent to which these schemes are contributing to building the human resource base of the agriculture sector, and to career advancement of 'scarce skills' bursary recipients.

Introduction

i. Background

In South Africa's democratic era, government is faced with many challenges, among which are the issues of generating equity and social and economic development. Agricultural education is an important tool that development planners can use to bring about social change and economic empowerment.

There is pressure on agricultural education and training in South Africa, not only in terms of aggregate demand but also in terms of its nature and focus. It has to respond to the Key Result Area given in the DoAs 2003 Strategic plan: "Optimising growth, remunerative job opportunities and income in agriculture "and "To increase remunerative opportunities in the agricultural supply chain" (Department of Agriculture, 2003, 19).

The Department of Agriculture developed the "Agricultural Education and Training Strategy" to address human capital in agriculture. There is concern about the co-existence of shortages of skilled agricultural workers with unemployed agricultural graduates.

The Department required a service provider to conduct research and write a report on agricultural graduate outputs that can assist in "accelerating human capital development in agriculture in the right direction and ensuring a sustainable agriculture".

ii. Objectives of the project

The project was intended to examine various factors relating to the output of graduates in the agricultural field from higher and further education and training institutions and their employment in the labour market.

More specifically, the objectives were:

- to obtain data on graduate outputs and analyse the shape and distribution of these outputs in the targeted institutions. The research was to take into account graduates in SAQA accredited programmes of agricultural study in the higher and further education fields
- to investigate factors affecting the enrolment and graduation of students in agricultural fields with reference to: admissions policy, bursaries available, and costs of study
- to develop an analysis of demand and supply of agricultural graduates

iii. Structure of this report

Following after a description of the methodology used in this study, the report will have the following chapters:

- Chapter 1:
  The macro context
- Chapter 2:
  The structure of agricultural education programmes in higher and further education institutions in South Africa
- Chapter 3:
  Agricultural graduate enrolments and outputs from higher and further education institutions

- Chapter 4:
  Enrolment, graduation and throughput of agriculture graduates in higher education according to race, gender and field of strudy from 2000 to 2003

- Chapter 5:
  The influence of admissions policy and costs on access to agricultural education programmes in higher and further education

- Chapter 6:
  Financing higher and further education students in the study field of agriculture

- Chapter 7:
  Demand for intermediate to high-level skills within the South Africa agricultural sector

- Chapter 8:
  Interaction of demand and supply of agricultural graduates with intermediate to high-level skills

- Chapter 9:
  Recommendations

- Appendices
  Appendix 1: Definitions used in this project
  Appendix 2: Chapter 2
  Appendix 3: Chapter 3
  Appendix 4: Chapter 5
  Appendix 5: Chapter 7

iv. Mergers of higher education institutions

It should be noted that institutional mergers have been undertaken in the higher education sector. This means that the former universities and technikons have been reconfigured in a process of creating: universities, comprehensive universities, and universities of technology. Where data is reported on before 2004, the data refers to the former universities and technikons.

v. References

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Methodology

i. Introduction

This chapter provides an overview of the methodology utilised in this study. The first section provides an overview of how data gathering feeds into analysis through the project process. The second section considers the four main data sourcing methods and activities. The last section of this chapter, unpacks some challenges that were confronted in the access, generation and analyis of the data used in this study.

The methodologies chosen were considered to be the most appropriate to the objectives of the study, as outlined below:

- To analyse the shape and distribution of agricultural graduate outputs in the targeted institutions
- To develop an analysis of demand and supply of agricultural graduates, and
- To investigate factors affecting the enrolment and graduation of students in agricultural fields with reference to: admissions policy; bursaries available; and costs of study

Accordingly, the activities required to meet each of the above objectives is briefly sketched.

A Achieving A above required:

a) Obtaining data on enrolments and graduates with intermediate to high-level agricultural skills from intermediate and higher education instituions which fall into the categories: FET Colleges; Agricultural Colleges; Technikons; and Universities. The student graduates of high schools offering agricultural subjects were not analysed in depth as they do not provide whole programmes leading to specific agricultural qualifications.

b) From this data, throughput rates were calculated.

B Achieving B above required

c) Obtaining data on the size, employment status and other characteristics of persons holding intermediate and high-level agriculture qualifications in the labour market

d) Comparing the findings from (a) above with (c) to assess what replacement need in the labour market could be accounted for by the graduate output of the institutions

e) Conducting a number of targeted telephonic interviews with academic leaders from HET and FET Agriculture Faculties involved with graduate supply, as well as with key employers in the agricultural sector.

f) Integrating the findings from (v) with data from (iii) to obtain an overview of the relationship between supply and demand of skills in the agricultural sector

C Achieving C required:

g) Obtaining data about: admission requirements and fee requirements from the institutions themselves; National Student Financial Aid Scheme financing of higher education students from the NSFAS itself; and various bursary and other scholarship opportunities from private and NGO information sources

h) Analysing this data to develop an understanding of the factors that impact on the number and demography of those students who successfully register for agricultural programs and those who eventually graduate

ii. Main data sourcing activities

From the overview presented above of the procedures followed to address each objective, the main data sourcing activities (which related directly to the numbered activities above) were:

a Obtaining data on enrolments and graduations

c Obtaining data on the size, employment status and other characteristics of persons holding intermediate and high-level agriculture qualifications in the labour market.

e Conducting a number of targeted telephonic interviews with role players in the sector to establish key skills needs and training initiatives, and

g Obtaining data: about admission requirements, fee requirements, financing and bursaries

These are outlined in detail below.

a. Obtaining data on enrolments and graduations

Contributions to intermediate and high-level agricultural skills within the labour market are made by tertiatary education insitituions which fall into the categories: FET Colleges, Agricultural Colleges, Technikons and Universities. The student graduates of high schools offering agricultural subjects were not analysed in depth as they do not provide whole programmes leading to specific agricultural qualifications.

The number of enrolments and graduates produced by each of these insitituitons was calculated. In the case of Technikons and Universities this was done for the period 1994 to 2003. In the case of FET Colleges and Agricultural Colleges, this scale of historical data was not available. Data for these institutions was analysed for the period 2000 to 2004 where data was available.

Throughput

Throughput is a key indicator of efficiency of educational institutions and reveals the extent to which students complete the programmes for which they enrolled in the optimal allocated time. The graduation rate remains the best proxy for measuring throughput in South Africa. Throughput is defined as the number of years students take to complete the learning programme for the qualification for which they registered. Unfortunately, there is currently no available accurate means of calculating throughput rate in South Africa. This would require cohort studies which trace a group of students from first-year to graduation and is thus not possible to calculate from the data that can be obtained from the two relevant data sources: the South African Post Secondary Education (SAPSE) database or the Higher Education Management Information Systems (HEMIS) database. The graduation rate, which is used as a proxy, is officially defined as the number of graduations divided by the total number of enrolments within the entire programme in the same year (Subotzky, 2003). The graduation rate is therefore a measure of the rate at which students graduate from these institutions and suffers large fluctuations on an annual basis depending upon fluctuations in headcount enrolments in a particular year, as well as numbers of repeaters, drop-outs, conversions to other courses etc.

Throughput, in the form of graduation rates, was calculated only for the Technikons and Universities.

CESM categories

National data on student enrolments and graduations is organised according to Classification of Education Subject Matter or CESM classification. This system provides a single, standardised scheme that facilitates the recording, reporting and comparing of data about subject matter. The development of this standard classification of subject matter facilitated compliance with the statutory reporting requirements for various educational agencies and institutions and expedited communication and information exchange about subject matter regardless of the type of the organisation providing instruction.

The CESM classification enables inter-institutional data comparisons, as institutions' data systems involve the use of CESM for a number of purposes. While institutions have their own internal management units such as faculties and Departments, for funding purposes as well as monitoring performance, CESM and its current categories will need to be retained.

The following links exist in the HEMIS database:

- CESM categories are directly linked to Courses in the "COURSE FILE" table.
- Courses are directly linked to Qualifications in a separate table, "COURSE REGISTRATION FILE".
- The field 'Course' in both tables mentioned above, creates an indirect link between CESM categories and Qualifications.

CESM categories include information on students enrolled in other programmes/qualifications who chose an Agricultural subject as an elective. This information is included within the 2nd order Agricultural CESM categories, which all fall under the 1st order CESM category of 'Agriculture and Renewable Natural Resources'. In other words, 2nd order Agricultural CESM categories do not distinguish between students enrolled in Agricultural programmes and those students enrolled in other degree/diploma programmes with an Agricultural elective.

HEMIS only provides information at the highest level and does not have information on the curriculum of institutions. The qualification codes, course names and course codes in the HEMIS database are unique to the institution; however, the CESM categories are standard across the system.

The institutions are supposed to confer generic qualifications. Only Technikons use generic qualifications, which are standardised across the system, while individual universities structure their own qualifications, which differ among institutions. Notably, from 2005 Technikons will also be able to structure their own qualifications.

While it was possible to extract information from HEMIS according to CESM categories, an attempt was made to independently obtain data from the institutions at the qualification level. The following was observed:

- The information that the HE institutions were able to provide by qualification level was drawn from the same data source supplied to the HEMIS directorate
- Some institutions kept their data in different formats before uploading into the required HEMIS format. However, this information could not be used since it varied from institution to institution in how it was coded, captured and formatted, as this was designed to suit their own purposes
- It could not be established whether information obtained directly from the faculties was more or less accurate than the data contained in the HEMIS CESM categories. In the end, the HEMIS data on the basis, of itd being standardized and quality assured, was considered the best option

b. Obtaining data on the size, employment status and other characteristics of persons holding intermediate and high-level agriculture qualifications in the labour market.

Data indicating the size, employment status and other characteristics of persons holding intermediate and high-level agriculture qualifications was obtained using the Labour Force Survey (LFS) for March 2004. From the LFS data the overall size of the agricultural labour force, and the proportions thereof with intermediate to highlevel skills, was extracted. Analysis entailed reference to the distribution of agricultural workers, and the distribution of workers with intermediate and high-level agriculture qualifications, by occupation (SOC), sector (SIC), and income levels.

c. Conducting targeted telephonic interviews with role players in the sector to establish key skills needs and training initiatives

Once the researchers had explored the labour force data, contact was also made with a number of organisations involved directly in economic activities in the agricultural sector. Information was obtained regarding the nature of these employers' requirements for agricultrual qualifications among their employees. Outside of the request for micro-level – at level of organisation or enterprise - quantitative information, disucssions regarding the availability of such agricultural skills, as well any indications of changing skills demands within the sector, were also undertaken.

The process of preparation for the interviews was:
Phase I: Internet based and general documentary research into the structure and skills demands of the South African agricultural sector was undertaken to identify the various skill-absorbing role-players within the industry as well as the relationship between these. From this information, the schematic representation of the sector outlined in Table 5 in Chapter 7 was developed.

Phase II: Using Table 5 as a basis for selection, a cross-section of larger individual firms, organisations, institutions and government departments operating within the various areas of the sector (A-E in Table 5) were contacted telephonically in order to obtain information regarding their demand for agricultural qualifications.

Individual firms and organisations were approached with a particular focus intended to minimise the effort to these respondents. 'Agricultural qualifications' were explained as inclusive of all agriculture-focussed qualifications from the Diploma level upwards (including Agricultural Economics but excluding Veterinary and related fields) without reference to any other specific subject specialisation.

Contact with firms and organisations were intended to fulfil two purposes. Firstly, information on the numbers of current employees with agricultural qualifications as well as the vacancies for such employees was requested, although this latter aspect was not always available. Secondly, discussions around recruitment issues i.e. trends in internal skill requirements versus external availability, succession planning and internal training, were initiated with respondents where possible.

Based on this data gathering it was planned to integrate the findings with the quantitative data in order to provide an overview of the key trends in demand and supply of agricultural qualifications.

d. Obtaining data about admission requirements, fee requirements, financing and bursaries

Information on bursaries

Apart from government co-ordinated financial support for students, there is a range of agencies that provide financial support on their own initiative. The grouping of sources of student financial assistance can be described as follows:

- National Student Financial Aid Scheme (NSFAS)
- Institutions of education at the Further and Higher Education levels
- Other sources:
    - Trust funds (eg: various small to large philanthropic trusts)
    - Industry bodies (eg: South African Sugar Industry)
    - Enterprises (eg: as part of their corporate social responsibility commitment)

Data on financial assistance for students in South Africa at the Further Education and Higher Education and Training levels is not available from a central information resource. This is to be expected since, apart from the NSFAS, the various bodies elect to provide this support and to advertise its availability in their own right.

A complete view of all financial aid provided by the NFSAS was available from the NFSAS offices and is analysed separately. While there is no central source of information on other providers, there are two third party organisations that bring together information on financial assistance for students. The two main organisations operating in this field are as follows:

- The Bursary Register publishes a hard copy resource that provides information on bursaries available from various agencies in South Africa.
- Careers.co.za publishes "Career Mentor" which is a computer based Career Guidance and Information System available on CD. It consists of a database of careers, bursaries and study information for South Africa.

Both of the above resources were obtained for the purposes of this research. However, even though these sources make claims to providing fairly exhaustive information, these claims could not be verified without undertaking a special purpose survey to actually uncover all sources of student financial aid. Such a task was not within the time or budget bounds of this project.

The data from each source was analysed separately, since the precise methodology adopted by each of the data providers differed eg: in terms of what information was collected and how it was collected.

In addition to the above sources, the project team also searched the Internet for possible sources of bursaries. Bearing in mind that the aim was to investigate bursary availability in the field of agriculture only, there was hardly any information on the Internet beyond what was provided in the two publications given above.

Bursary information for the 2004 and 2005 years only were used, as this information changes annually.

Information on entrance requirements, and fees and fee structures

Information on entrance requirements was obtained from the following resources:

- The relevant institutions themselves
- The Bursary Register, which publishes a hard copy resource
- Careers.co.za, which publishes “Career Mentor” - computer based Career Guidance and Information System available on CD

These three sources were used in order to obtain a standard report of entrance requirements for all institutions in the higher education band that offer agriculture related courses. This information was verified through spot-checking data with a sample of institutions.

This information on entrance requirments, and fee and fee structures is based on the rules applying in the 2003/2004 academic year.

iii. Conditions affecting data gathering

A number of conditions affected the data gathering process. These are outlined below:

Mergers

The mergers in progress physically disrupted access to data. This was due to a couple of key compounding factors: Firstly, older datasets were not easily accessible from the merged institutions; and secondly, people who were in management and in contral of data prior to the merger are currently no longer in charge. Complicating the process of data analysis is the actual mergers themselves, as well as the fact that some progress has been made with the rationalization of courses for the 2004 and 2005 academic years. As this latter is sill ongong, data relating to reformulated programme is difficult to finalise.

Recency of data

The latest data available on enrolment and graduations in the universities and technikons is for 2003, because the HEMIS system is still in the process of validating the 2004 data. This means that the enrolment and graduation figures reports on the last year when the technikons and universities were separate – i.e. before the mergers. It is thus difficult to match this data with reference to the current programme-based data.

Data for the Agricultural Colleges was difficult to obtain

There was a problem obtaining standardized validated data on the Agricultural Colleges. When the proposal was submitted, the HSRC was in contact with Dr Alvin van Niekerk of AvN CONSULTING who indicated that he could provide the relevant college student records for 1999-2002. However, Mr Van Niekerk emigrated and the database was not passed on to the Association of Principles of Agriculture Colleges (APAC). This data had to be sourced directly from the institutions and from APAC. The Department of Education was approached to ascertain whether data on the Colleges was available via the FETMIS. The FETMIS system is currently under development in that Department, and this was thus not possible.

Data on the FET Colleges

The Examination data for the FET Colleges was obtained from the DoE's website. However, it was discovered that exam results would be insufficient to obtain a picture of graduations and the records of FET College certification was requested from the DoE. Institutions frequently did not have the data readily available. In very few instances was data going back into the early nineties available.

Additional data requested

The HSRC was requested to obtain data on scarce skills categories of personnel, such as veterinary surgeons and agricultural engineers. Specific contact was made with the Veterinary Science Faculty of the University of Pretoria at Onderstepoort in order to obtain information on veterinarians. Addtionally, the management of HEMIS were requested specially to provide the datasets to enable extraction of the agricultural engineers' data as this CESM does not fall under agriculture.

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CHAPTER 1

The macro context

1.1 The context of this analysis

The Department of Agriculture is concerned about the flows of people with agricultural skills into the labour market. This is because of the co-existence of numbers of unemployed agricultural graduates, with shortages of agricultural graduates in particular occupational categories (eg: agricultural engineers, agricultural economists and veterinarians) in the labour market. Furthermore, the Department is aware that globalization and associated technological advances are producing changes in national and international markets for agricultural products. As part of the process of strategically positioning the South African agricultural sector to address national developmental goals as well as global pressures, the Department of Agriculture wants to obtain a picture of what the future skills needs of the sector are likely to be.

1.2 Future skills needs in the agricultural sector

In analysing the relationship between agricultural growth and development, on the one hand, and human resource needs on the other, Barry (1995,133) observes that we need to understand the "*integrated nature* of the effects of industrialization and their relationships to social goals for consumers, agriculture, natural resources and rural areas".

Nevertheless, it is necessary for the purpose of analysis to separate out the range of influences on the future skills needs of the agricultural sector, which has been done as follows. Each of the themes below will be treated in turn:

- Macro-economic factors
- South Africa's participation in national and international agricultural markets
- International trade implications for government regulation
- National government policies
- Technology in the agriculture value chain
- High-level management and strategic skills needs in the agricultural sector

1.2.1 Macro-economic factors

Currently, the South African government has created a favourable economic environment in which the macro-economic fundamentals such as low interest rates, strong currency, limited inflation pressure, and above inflation wage growth (DoA, 2005,5) have been achieved. Naturally, this favourable environment cannot be viewed in isolation and is also subject to external changes and shocks such as: changes in the oil price; relative strength of major currencies such as the dollar; and the general shape of the world economy, and also regional economic blocs such as Europe, emerging Asian countries, China, India, the USA and Sub-Saharan Africa in terms of real GDP growth.

The impact of these external factors is complex, as they can create contradictory pressures on the agricultural sector. For example, the strong Rand makes it possible for agricultural producers to replace capital equipment, but drives down prices and reduces the competitiveness of agricultural exports (DoA, 2005, 8).

Furthermore these factors will, in combination, have general and specific effects on the intensity of growth or decline across different agricultural subsectors which will have human resources implications. The actual dimensions of changing human resources needs cannot be clearly identified at such a high level.

1.2.2 South African enterprise participation in national and international agricultural markets

The evolution of global and national markets for primary agricultural and agro-processed products is obviously

conditioned by the broader economic climate. However, growth in the size and output of the agricultural sector of a particular country is not determined entirely by the macro-economic environment. Also vital is the extent to which enterprises, entrepreneurs and industry bodies (eg: Grain SA, Capespan Group, National Wool Grower's Association, SA Flower Growers Association) in agriculture are pro-active in developing and improving products and in targeting markets both internal and external.

Government is a key player in respect to the opening of markets through securing trade agreements. For example, growth in agricultural exports from developing countries is dependent on WTO agreements on agricultural export subsidies and reductions in trade distorting domestic support in agriculture (AgriNews, 2004, 6). Then there are specific multilateral agreements that can encourage trade such as the Trade, Development and Cooperation Agreement (TDCA) with the European Community entered into in 2000, which provides incentives for all agro-processing industries, but which South African SMEs have not fully capitalised on (Groenewald, 2005a, 4-9). More targeted bi-lateral trade agreements are negotiated between countries such as between South Africa and China which is a major new market for SA (AgriNews, 2004, 3). Hardy (2004a, 4) quotes Mbongwa on the potential role of government in marketing as follows: "Another important issue is the role of government in agricultural marketing and the appropriate institutional structure to achieve this role".

There are various dimensions of trade that must be identified at the industry and the value-chain level to make it possible to isolate the particular skills and human resources dimensions at stake. In South Africa, further research and analysis needs to be undertaken that links shifts in international trade and their underlying human resources requirements.

1.2.3 International trade implications for government functioning

Enhancements in trade especially internationally will produce requirements on government to regulate various aspects of trade interactions, which will in turn produce increased human resources requirements. These include:

- Personnel in the South African Food and Quarantine Inspection Services (Department of Agriculture, 2004,25) and directorates under national regulatory services
- Veterinary services to deal with transboundary (animal to human) diseases and to control disease outbreaks in the animal population (Hardy,2004b,3)
- International imposition of regulations also requires local personnel to implement them. One reason for this is that, international trade is increasingly subject to greater controls against risks of importing exotic pests into a domestic biosphere. For example the International Standard for Phytosanitary Measures No.15 "Guidelines for regulating wood packaging material in international trade", which aims to reduce risk and spread of quarantine pests associated with wood packaging, has just been promulgated and will need personnel to implement (Groenewald,2005b,5).

1.2.4 National policy

In the process of policy development, the South African Department of Agriculture may generate human resources needs. New policies or amended policies, which indicate new strategic directions or changes in direction of the governance of the domain of agriculture, can generate new skills needs. The following are examples of this possibility:

- The launch of the Agricultural BEE policy refers to 'skills and knowledge' needs (Swanepoel et al 2004) of beneficiaries in various fields of agriculture especially at technical and management levels
- The policy to push for biodiversity as a key to food security (Groenewald,2004,1-2) produces needs for scientists to explore ways of sustaining biodiverse agricultural practices
- The commitment through SADC and NEPAD to support research to assist with the revitalisation of African Agriculture (Mulaudsi,2005,8) has high-level research skills implications
- Bi-lateral and multi-lateral trade agreements directed by government can facilitate growth in particular sectors of agriculture

As can be seen, government policy can create the conditions within which particular human resource needs arise.

New policy can create skills needs within the Department which must implement the policy. New policy also can create opportunities for the private sector, but the private sector will have to obtain skills in order to capitalise on the opportunities.

1.2.5 Technology and the agricultural value chain

It is important to view the contribution of agriculture to the national economy not just with reference to the value of primary products that it generates in their 'raw' form. Value chain analysis enables us to understand the full range of activities that contribute to the delivery of value in the form of a product to the consumer. It accounts for the fact that agricultural products are linked in a chain of processing and other value-adding activities before the product is ultimately purchased by the consumer. This means that increasingly, the agricultural producer must contribute as an active participant in the process of value-adding to the final product according to consumer requirements whether the consumer is local or global.

This means that even though the contribution of Agriculture to South Africa's Gross Domestic Product (GDP) is in the region of 4% - 5% and it directly provides for about 10% of the country's jobs, in reality the sector make a far larger contribution. Taking upstream processing and related activities and linkages into account, agriculture creates employment for an estimated 16% of the workforce across other sectors such as manufacture and food and beverages. Sub-sectors of manufacture and food and beverages contribute one quarter of manufacturing's 37% share of the South African GDP (Agriculture and Agro-processing Working Group, 1998, 4-5).

If it is assumed that primary agricultural producers do not merely supply raw materials into agro-processing, then we understand that the activities associated with primary production are integrally part of the entire agro-processing chain. As such we must look imaginatively both downstream and upstream at ways in which technology and improved producer practices can yield efficiencies and better quality of product and service in the local and global marketplaces. Possibilities for technology applications include (Agriculture and Agro-processing Working Group, 1998, 5-7):

- Breeding technologies: Extended production systems that link with on-farm production lifecycles which can impact positively on industrial processing quality
- Biotechnologies: Applied to augment or supplant traditional breeding techniques thereby improving crops and animals, or to diversify the product base through developing new genetic materials
- Natural resource management and resource utilisation knowledge: Applied to support sustainable utilisation of natural resources (eg: water saving technologies) and waste management
- Processing technologies: Lead to improved product packaging, handling and preservation which provide for higher quality and extended 'shelf-life' that in turn make products more competitive locally and globally
- Integration and adaptation of information and communication technologies (ICT): As a general purpose technology this can contribute to various technical processes associated with each of the points above, thereby enhancing competitiveness. The importance of ICT is that currently technologies can exist without any awareness of their potential application inside agro-processing (eg: odour sensors or 'electronic noses' may be used in beer manufacturing but not in dog food manufacturing)

Any of the above potential areas may be identified as an opportunity for future development. This may be decided at the level of an enterprise or an industry, or government can decide that it wants to apply subsidies or other measures to encourage growth in an area of agro-technology. However, this means that government and industry players must be aware of the implications of such decisions for the supply of appropriately trained personnel from higher education.

1.2.6 Management and strategic skills needs

In addition to the kinds of interventions noted above that impact specifically on agricultural value chains, there is a set of important managerial capacities that must be fostered in South African agriculture so that an enabling environment is created for sustainable growth and market development to take place in as many agricultural sub-

sectors and markets as possible:

- Appropriate economic and socio-economic research and analysis undertaken
- Information delivery to participants at all levels (eg: workers, employers, entrepreneurs, government planners and legislators)
- Systems modelling and risk management capability to assist in macro-strategic decision making
- Technology transfer which is considered to be extremely important in assisting less developed agricultural sectors. The key issue here will be in the prior identification and selection of technologies appropriate to do the job
- Climate and early warning systems for decision making

These kinds of high-level skills are essential in the private and public sector to ensure sustainable growth in agriculture. However, they may not be available in the right numbers for deployment in the national economy.

1.3 Current and future skills needs

The discussion above showed how the drivers of skills demand in the agricultural sector are extremely varied. Knowledge of policy and industry trends can assist us to some extent in identifying current and future areas of skills need.

This report will explore the possible links between agricultural economic activity and skills needs on the one hand, and skills supply on the other. The following chapters will set out the supply side through a review of the public institutions engaged in agricultural education and training in South Africa. This will be followed by a review of demand side factors and the policy recommendations which flow directly from the researach findings.

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Chapter 2

The structure of agricultural education programmes in higher and further education institutions in South Africa

2.1 Introduction

Most education systems produce a variety of qualifications that are relevant to existing agricultural occupations and to the broad shape of the agricultural sector. These qualifications are associated with a range of programmes dealing with agriculture related forms of knowledge - and difficulty levels - such as those identified in Table 1 below

Table 1: Typical range of qualifications offered across an education system	
• Post-doctoral research degrees	
• Doctorates	
• Masters degrees	- Masters Certificates & Masters Diplomas
• Professional Qualifications	
• Honours degrees	- Postgraduate Certificates & Postgraduate Diplomas
• National first degrees	
• Higher diplomas	
• National diplomas	
• National certificates	

Typically, in different countries such qualifications are offered by different institutions, from schools to higher education institutions. Such qualifications envisage different skill and knowledge outcomes that may range from the vocational to the purely theoretical. Curriculum intentions may include certain attitudinal and motivational attributes regarding agriculture. Also, the various qualification are sometimes linked to each other suggesting that a student can progress through various steps in building her knowledge and skills in the field (eg: from certificate to degree to post-graduate qualification). Understanding these characteristics helps us to understand the overall structure of agricultural qualifications in a particular country. The aim of this chapter is to understand the shape of South Africa's qualifications structure.

2.2 Curriculum policy in South Africa

In order to understand how the South African qualifications structure in the field of agriculture works, we need to refer to the general policy framework established for the curriculum in South Africa.

Policy change in the South African education system has far reaching effects on the provision of agricultural education and training. The generation of policy has touched on virtually all aspects of educational activity but has given particular attention to: curriculum development, generating equitable access to education, and to integrating education and training (Department of Education, 1995a, 1995b, 1996a, 1996b, 1996c, 1997a, 1997b, 1998a, 1998b, 1998c).

Central to these aims is the South African National Qualifications Framework (NQF) which is intended to facilitate linkages between multiple qualifications that are located in various Education and Training pathways in order to facilitate learning as a lifelong process (Table 2). The NQF is still very much an evolving system, where the linkages between qualifications and pathways in some fields are well developed while in others, pathways must still be 'opened' or 'created'. The basic structure of the NQF consists of the General Education and Training (GET), Further Education and Training (FET) and Higher Education and Training (HET) bands. With ten years of free and compulsory education for all, the end of the GET becomes the first possible exit point from the formal education system. The FET is designed: to provide intermediate to higher level skills and competencies, to promote the integration of education and training, and to enhance learner mobility and progression at the critical point between GET, entry to HET and the workplace.

Table 2: National Qualifications Framework

NQF Level	Band	Types of Qualification and Certificates		
8	Higher Education and Training Band	Doctorate / Further Research Degree		
7		Higher Degree / Professional Qualifications		
6		First Degree / Higher Diplomas		
5		Diplomas / Occupational Certificates		
4	Further Education and Training Band	Gr.12	School / College / Training Certificate	
3		Gr.11		
2		Gr.10		
1	General Education And Training Band	Gr.9	Senior Phase	ABET Level 4
		Gr.8 to Gr.1	Intermediate Phase	ABET Level 3
			Foundation Phase	ABET Level 2
			Pre-school	ABET Level 1

The post 1994 period of policy development produced Outcomes Based Education and Training (OBET) which seeks to emphasise a learner centered rather than teacher centered approach, and problem solving and transfer of skills rather than memorisation of content in the classroom. In developing these curriculum goals, OBET seeks to recast the social relationships of the classroom. This has important implications for all curriculum areas. These innovations are congruent with international changes in perceptions of learning in agricultural education which involve adopting a more learner centered, experiential learning and interdisciplinary approach. Critically, the policy on OBET brings to our attention the importance of considering the quality of learning – the 'how' of learning and not just the 'what' - that takes place inside of particular qualifications and inside particular institutions. Although this research cannot address the issue of quality of learning as may be reflected by the graduation of qualified and competent individuals from the various institutions, it is important to bear this dimension in mind when considering the absorption of graduates into the labour market.

2.3 Institutions offering agricultural qualifications

Even though this chapter focuses on the agricultural curriculum at intermediate to high skills levels – which is largely based in post school institutions - we must recognise that it is through earlier school experiences that young people are equipped with the foundations of knowledge, skills and interest sufficient to pursue agriculture at a higher qualification level. In the primary school already, learners are exposed to concepts that have relevance to agriculture, although at this level there is a cross-curriculum rather than subject-based approach to learning. It is in the high schools and Colleges in the Further Education and Training (FET) band (Grade 10 to Grade 12/NQF Levels 2, 3 & 4) that Agriculture as a subject/learning area is introduced.

Therefore we briefly describe the flows between all the main institutions providing agricultural education in South Africa from FET through to the Higher Education and Training (HET) band.

Agricultural Science as a subject

A large number of high schools provide "Agricultural Science" **as a subject choice only** up to the school leaving Senior Certificate Examination at Grade 12. In 2003, 60 112 (Table 3) students passed Agricultural Science. Nearly one in five - 19.1% - of all students who passed the Senior Certificate did so with Agricultural Science as one of their six subjects.

Table 3: Senior Certificate Agricultural Science Candidates (HG & SG), 2003

	Total Entered	Total Wrote	Total Passed	Subject Pass Percentage
Total	83 888	80 811	60 112	74.4

In Grade 12, Agricultural Science is a stand-alone subject, and can be studied without taking Mathematics or Science which are the critical gateway subjects for would-be entrants to higher education. This means that even if a student passes Agricultural Science she/he will have limited choice of study options in higher education without Mathematics or Science. Furthermore, the majority of students who pass Agricultural Science do so on the Standard Grade syllabus. The more subjects a student elects to take on the Standard Grade, the lower her/his chances are of qualifying to enter higher education.

Possession of a Matric pass in Agricultural Science is therefore not a strong indicator of whether a student will qualify to study further in higher education or even whether the student will be able to pursue her/his Agricultural studies further. In particular, Maths and Science are necessary for students to be admitted to science-based agriculture programmes (eg: BScAgriculture).

We know very little about how learners select their courses of study. Recently, Cosser and Du Toit (2002) undertook research into what learners in Gr12 said they wanted to study when they entered higher education (Table 4). It is instructive to note that 5.4% of Grade 12 learners indicated their intention to study 'Agriculture and nature conservation'.

Table 4: Learner choice of HE field of study.

Field	Total
Agriculture & Nature Conservation	5.4
Culture and Arts	4.0
Business, Commerce & Management Studies	25.6
Communication Studies & Language	2.1
Education, Training & Development	1.4
Manufacturing, Engineering & Technology	15.6
Human & Social Studies	5.9
Law, Military Science & Security	5.4
Health Sciences & Social Services	14.1
Physical, Mathematical, Computer & Life Sciences	10.2
Services	5.5
Physical Planning & Construction	1.2
I don't know	3.6
Total	100.0

Cosser & du Toit (2002) Table 6.50

In terms of gender, 6.2% of male learners and 4.6% of female learners respectively noted 'Agriculture and Nature Conservation' as their choice of field of study. The field with the highest choice rating was 'Business, commerce & management studies with 24.2% and 27.0% for males and females respectively indicated. More African students than White, Coloured or Indian students indicated Agriculture as their choice field of study (Table 5). Whether students arrived in agriculture programmes in higher education in these proportions is unknown. Naturally, learners would not all have gone into the courses of study that they wanted to when at school. Some would have changed their minds and others would have been forced to select different options because their school academic results precluded them from registration.

Table 5: Learner choice of field of study, by population group.

Field of study	African	Coloured	Indian	White	Total
Business, Commerce & Management Studies	26.2	24.9	24.9	24.1	25.9
Manufacturing, Engineering & Technology	16.4	14.3	13.4	10.0	15.7
Health Sciences & Social Services	13.9	16.4	21.2	11.3	14.1
Physical, Mathematical, Computer & Life Sciences	9.8	10.0	13.7	12.1	10.2
Human & Social Studies	6.5	3.8	2.8	2.0	5.9
Services	5.4	5.6	3.5	7.6	5.5
Law, Military Science & Security	5.3	8.5	4.1	5.9	5.4
Agriculture & Nature Conservation	**5.8**	**2.1**	**1.9**	**3.7**	**5.3**
Culture & Arts	3.7	4.2	2.8	6.8	3.9
I don't know	2.7	5.1	7.5	8.9	3.5
Communication Studies & Language	2.1	2.0	1.1	2.0	2.1
Education, Training & Development	1.0	1.5	2.0	4.3	1.3
Physical Planning & Construction	1.1	1.7	1.1	1.5	1.2
Total	100.0	100.0	100.0	100.0	100.0

Cosser & du Toit (2002) Table 6.55.

Even though large numbers of students take Agricultural Science to the Grade 12 school leaving level, the character of the Senior Certificate qualification is generalist and formative rather than vocational. It must be stressed that this is a subject choice for learners out of a minimum of six subjects in total. None of the other subjects need necessarily be related to agriculture and this subject alone therefore does not constitute an agricultural qualification in its own right.

Cohorts of school leavers who complete Agricultural Science can be assumed to contribute in as yet unknown ways to the subsequent accumulation of higher agricultural skills levels, but in the short term they do not directly feed into the supply of intermediate skills in the agricultural labour market because their academic background is still too general.

Agricultural High Schools

There are forty two Agricultural High Schools that offer a learning programme up to Grade 12 or Senior Certificate level which includes the same Agricultural Science (HG)/ (SG) subject offered in ordinary high schools as well as five other Agricultural subjects from which students may select (See Table 6). However, not all of the schools offer the full range of Agricultural subjects. In addition, students may choose to enroll for other non-agricultural subjects that are also offered in these schools. In the end, some students may take only one or no agricultural subjects. The Agricultural High Schools therefore do not offer a standardized agricultural curriculum. For these reasons, the graduates of these schools cannot be said to have completed a vocationally focused agricultural qualification. The estimated number of 548 learners enrolled with at least one agricultural subject in these schools, in 2003 will be noted but will not be taken into account in the analysis of direct flows of graduates into the labour market.

Table 6: Subjects passed by candidates at the South African Senior Certificate Examination in Agricultural High Schools, 2003

	Agricultural Science HG	Agricultural Science SG	Animal Husbandry HG	Animal Husbandry SG	Applied Agricultural Science SG	Farm Mechanics SG	Field Husbandry HG	Field Husbandry SG	Practical Agricultural Science SG
Entered	318	321	202	125	443	233	75	106	266
Passed	267	281	181	122	429	229	57	105	258
	548		This number is based on the assumption that every student takes at least Agricultural Science HG or SG and then opts for a selection from the other subjects available						

There are fifty Further Education and Training (FET) Colleges which provide a curriculum ranging from N1 to N6 which extends from the FET band and into the HET band. These curricula are explicitly vocational and will therefore be included in this analysis of the potential contribution of agricultural education institutions to the intermediate and high-level skills needs of the agriculture sector.

The numbers of graduates with N1-N3 and with N4-N6 entering the labour market in 2004 was 161 (Table 7).

Table 7: Candidates who completed N-levels at the FET Colleges Examinations in Agriculture N3 and N6 in 2004

	Number
Completed N1	5
Completed N2	16
Completed N3	15
Completed N4	33
Completed N5	32
Completed N6	50
Completed N Diploma	10
Total	161

It must be made clear that the semester based structure of instructional offerings provided by the FET Colleges lends itself to learners enrolling not for a whole qualification at one time, but on an intermittent basis as instructional offerings are needed or as finance becomes available. In some instances, learners will enroll for a one semester instructional offering from within the N4 to the N6 level on a once-off basis because this meets a particular need they have for specific skills (eg: employees in the wine industry may take a single course in viticulture in the N4 to N6 level). In other instances, learners who are full time or part time employed will enroll for courses on a regular or irregular basis over a period of several years before they complete all the requirements for a particular qualification. This means that there is no direct link between enrolments and graduates in the FET College sector. To measure the flow of qualified personnel into the labour market from the FET Colleges through using information on completed qualifications will underestimate the full contribution of the Colleges to skilling intermediate to high-level agricultural workers who complete instructional offerings but not the full requirements for a whole qualification.

Colleges of Agriculture

There are eleven Colleges of Agriculture entitled to offer qualifications that are located in the HET band up to the BTech degree level.

The Colleges have responded to the needs of their environments in at least two main directions. First, some have adapted their curriculum offerings, and some have begun to work in partnership with other institutions. For example, Colleges have attempted to design their programmes to suit the skills requirements of the particular agricultural industry in their locality (eg: wine farming in the Western Cape or forestry in the Lowveld).

Others have begun to work in collaboration with other local education institutions. For example, Elsenberg College is linked with the University of Stellenbosch in providing a degree programme related to local industrial needs in the Western Cape. The Taung College of Agriculture is in a form of partnership with the North West Province's Vuselela FET College, specifically its branch in Pudimoe, Taung. Under their agreement, the College is teaching the FET College N1-N6 programme having started with the first N1 group in 2003. The concept is for students to begin with the N1 to N3 programmes and then feed into the traditional Agricultural College programmes based on the Certificate, Higher Certificate and Diploma levels. All students at Taung who are doing FET courses are counted in the FET dataset operated by the National Department of Education.

Second, some Colleges are working hard to provide support for small and emerging farmers in the province in which they are located. These two factors have brought about marked differentiation between the Colleges in their programme mix.

In 2004, 899 students passed the examinations in the Colleges (Table 8). For the purposes of analysis, the output of qualified people who have begun job seeking will be based on those completing the Higher Certificate and the Diploma only (572), because the first year leads directly onto the Higher Certificate year

Table 8: Candidates who passed in the Agricultural Colleges Examinations in 2004

		Enrolled
Year 1	**Certificate**	327
Year 2	**Higher Certificate**	370
Year 3	**Diploma**	202
		899

Higher Education

In 2003, there were nineteen **Technikons** and **Universities** offering qualifications ranging through the HET band from undergraduate degrees and certificates to Doctoral degrees. Cumulatively, graduates from these institutions in 2003 numbered 1765 (Table 9). Technikons were entitled to offer qualifications ranging throughout the post FET band from undergraduate degrees and certificates to Doctoral degrees. Universities were entitled to offer qualifications ranging throughout the post FET band from undergraduate degrees and certificates to Doctoral degrees.

To capture the discussion above the various qualifications on offer by these institutions are represented in Table 9 below.

Table 9: Qualifications structure in educational institutions offering education in the field of agriculture							
Band	**NQF Level**	**Ordinary high schools**	**Agricultural High Schools**	**FET Colleges**	**Colleges of Agriculture**	**Technikons**	**Universities**
Higher Education and Training Band	**8**						
	7						
	6						
	5						
Further Education and Training Band	**4**						
	3						
	2						
General Education and Training Band	**1**	**Primary and Middle schools**					

2.4 Curriculum orientation of the institutions

Various agricultural curricula are offered by the six institutional types, aimed at addressing a range of social and economic needs, as well as meeting the learning propensity and inclinations of individuals at different ages and life-phases. For the purposes of this study these curricula are considered as having the following main characteristics (Table 10):

- General
- Vocational
- Professional/Specialist
- Academic/Research

The Senior Secondary schools offer "Agricultural Science" as an optional subject to Grade 12 within a *general educational curriculum*. Therefore, this subject as a part of a curriculum is not necessarily intended to direct learners into the agricultural labour market.
At some special Agricultural High Schools, it is possible for a student to choose agriculture related subjects leading up to the Grade 12 school leaving examination. This is the exception rather than the rule as some of these schools only offer some of the subjects.

The FET Colleges have undergone a radical transformation in the past decade which included drastic rationalization from 150 to about 50 institutions. Currently, there is a considerable interest in how the FET Colleges can become more responsive to the students and also to the labour market needs of the local economy. The agricultural curriculum in the FET Colleges is strongly vocational in orientation.

The curriculum in the Agricultural Colleges is framed mainly for a student population that has completed the Grade 12 school leaving examination. Agricultural Colleges provide pre-graduate and graduate qualifications, some of which are vocational and some professional. Pre-graduate certificates and degree programmes available provide 'intermediate' skills, which are between low skills and high skills.

In the Technikons, agricultural education in the last decade focused more strongly on professional and specialist training, and de-emphasised intermediate level programmes. This change can be ascribed to a growing trend for students to choose more professional and specialist courses, but it may also be reflective of policy on the part of the Technikons to move in this direction. Significantly, the Technikons have begun to develop their capacity to provide research training in the field of agriculture.

Universities have provided the bulk of academic and research training in the period under study. They have also provided access to professional and specialist training across a range of agriculture fields.[1]

Table 10: The curriculum orientation of institutions included in this study

Type of curriculum offered	High Schools	FET Colleges	Agricultural Colleges	Technikon	
General					
Vocational		Strong	Strong		
Professional/Specialist			To some degree	Strong	Strong
Academic/ Research				Improving	Strong

The synopsis given above is aimed at providing a broad understanding of the different curriculum emphases across the institutions involved. To some extent this analysis does mask variation in academic and research capacity within the university and Technikon categories. However, a discussion of these issues is not within the scope of this project.

2.5 Curriculum continuity in institutions offering agricultural curricula leading to qualifications

It is important to identify what forms of agricultural knowledge are contained in the curriculum programmes on offer in the various institutions. This is because we need to know if the respective institutions are purveying knowledge that is relevant to the needs of the agriculture industry. In addition, we need to establish whether there are common core themes across curricula offered in the different institutions. There needs to be continuity between the forms of knowledge offered in the different institutions. By the same token, lack of shared focus on core fields would create disjuncture between programmes and prevent progression. In the latter case, students seeking to improve their qualifications would encounter lack of continuity in the required knowledge and skills between particular fields at the different kinds of institution. For example, a student who studies Vine Production at N3 level in a FET College should be able to progress further to advanced programmes in Viticulture that are available in at least one higher education institution.

The analysis that will follow does not constitute an in-depth audit of all agricultural curriculum programmes. The main aim of this analysis is to establish whether there is some broad continuity between the curricula offered at the institutions that have been referred to.

2.6 The agricultural programme in the FET Colleges

This analysis will begin by referring to the curriculum structure of the agriculture programmes offered in the FET Colleges. Table 11 below shows that in the FET Colleges, the four main streams in the curriculum for N1 to N3 (NQF levels 2, 3 and 4) are:

- Courses related to farming as a form of business practice
- Courses dealing with farming mechanics
- Courses focused on crop production

The Council on Higher Education recognises that it is important for higher education institutions to offer academic/research and professional/specialist streams of training (Appendix 1).

- **Courses focused on animal production**

In the phase N4 to N6, the focus is more strongly on management issues with courses offered in the following:

- Farming management
- Financial management
- Data management
- Maintenance management
- Human resources management

Capturing the knowledge fields in this discussion is important as it reflects what is considered as relevant knowledge at the FET level - notably human resources management (given the centrality of labour relations and training issues in the post-1994 agricultural workforce) and data management (given the increased application of information technology solutions to agricultural challenges).

The curriculum offered in the FET Colleges is nationally specified and the same programme can therefore be found in all FET Colleges. This makes it possible to recognise and understand the shape and focus of the curriculum in the full knowledge that the same – or very similar – approach will be followed across institutions.

Table 11: Instructional offerings at FET Colleges

N1	N2	N3	N4	N5	N6
Farming Communication N (OR)					
Farming Business Practice N1	Farming Business Practice N2	Farming Business Management N3	Management: Farming N4	Management: Farming N5	Management: Farming N6
			Financial Management: Farming N4	Financial Management: Farming N5	Financial Management: Farming N6
			Data Management: Farming N4	Data Management: Farming N5	Data Management: Farming N6
					Human Resource Management: Farming N6
Farming Mechanics N1	Farming Mechanics N2	Farming Mechanics N3	Maintenance Management: Farming N4	Maintenance Management:Farming N5	
Crop Production N1	Crop Production N2	Crop Production N3			
Animal Production N1	Animal Production N2	Animal Production N3			
	Dairy Production N2	Dairy Production N3 Beef Cattle Production			
	Beef Cattle Production N2	N3			
	Cereal Production N2	Fruit Production N3			
	Vegetable Production N2	Vine Production N3			
	Poultry N2	Mutton Production N3			
		Pig Production N3			

The grey shading highlights the fundamental curse components at the N1 to N3 levels.

2.7 Learning programmes in the Colleges of Agriculture

Unlike the FET Colleges, the Colleges of Agriculture do not provide highly standardized programmes. There is flexibility because the Colleges of Agriculture orient their courses towards supporting the agricultural activities that are practiced in their region. For example: Cedara focuses on forestry and horticulture; Lowveld focuses on sugar cane, tobacco and horticulture (while offering cotton to attract students from other regions); Potchefstroom focuses on mixed farming as carried out in the Highveld and adjacent regions; and Elsenberg has set itself the aim of specializing in agribusiness.

Even though the curriculum in the Colleges of Agriculture is not highly standardized as in the FET Colleges, a survey of courses reveals that the Agricultural Colleges present programmes that cover the same broad fields of knowledge present in the FET College curriculum: plant production, animal production, agricultural management and agricultural engineering (Table 12).

General Courses	Courses covering specific sub-fields	More specialized courses within sub-fields	Specific product courses include:
	Agronomy (Grain crops)	Crop protection	Eg: Vegetable, fruit production, viticulture, sugar cane etc. Also: green house management,Forestry
	Crop production	Pasture Management	
Plant	Horticulture		
Production	Soil science		
Animal production	Animal breeding	Artificial insemination	Eg: Beef cattle, dairy cattle, fish, mutton, pig, poultry, wool etc.
	Animal nutrition	Animal husbandry	
		Feedlot management	
	Animal production	Small stock production	
		Large stock production	
	Animal health		
Agricultural Engineering	Hydraulics/Hydraulic systems	Irrigation and drainage	
	Agricultural implements	systems	
	Mechanisation planning		
	Electrical apparatus/motors		
	Surveying		
	Marketing		
Agricultural Management	Farm management	Office administration	
		Land use planning	
	Community development		
	Financial management	Farm accounting	
	Economics	Production factors	
		IT applications	
		Entrepreneurial skills	
Environmental management	Game ranching		
	Veld management	Problem animal control	
Other		Farm safety	

Agricultural Colleges offer courses to a more advanced level than in the FET Colleges, as would be expected for programmes in the post FET NQF Levels 5 and 6. For example, within the knowledge field of animal production, more advanced courses such 'Artificial Insemination' are offered. Likewise, in crop production more advanced courses like 'Greenhouse Management' are available. Furthermore, what is called the "Farm Mechanics" of the FET College Curriculum is taken to a more advanced level in the form of "Agricultural Engineering" at the Agricultural Colleges. Also, agricultural management at Colleges includes higher-level courses in agricultural economics that are not presented in the FET Colleges. Finally, a knowledge domain not found in the FET College curriculum deals with Environmental Management, conservation and game farming.

The balance of theoretical to practical in the College programmes is considered important. Broadly across the curriculum there is a 55-60% theoretical component with the rest given to practical application. Is this not necessarily the case for higher education?

Some Colleges also offer non-formal training programmes; typically short courses for the further education and training (FET) sector (APAC, 2004, 6). But these do not constitute whole qualifications and therefore do not form part of this study.

2.8 Differences between agriculture programmes offered in Further Education and Higher Education

As may be expected, agriculture programmes in universities and Technikons are different to those of FET Colleges and Colleges of Agriculture in a number of dimensions. Some of these differences have to do with institutional and or curriculum boundaries which limit the choice of students as to what they can study.

The Agricultural College is the only institutional type that exclusively offers agricultural programmes. This means that student choice of courses is strictly bounded by what is offered inside the institution.

Although the FET Colleges provide programmes across a wide range of fields from business to technology to services and of course agriculture, the agriculture programme in the FET Colleges is strictly defined and students may only choose from within the stipulated agriculture curriculum. The fact that other types of knowledge are presented in the FET Colleges is immaterial to the student registered in an FET agriculture programme. Therefore, FET Colleges and Colleges of Agriculture are similar because student choice is defined by the boundaries of the institution or by the limits of the programme.

There is further similarity between FET Colleges and Colleges of Agriculture because their agriculture programmes are based on a relatively straightforward progression of students between curriculum levels. In the case of the FET Colleges, a student enters at N1 and progresses over three years to N3, and in the Agricultural Colleges, a student progresses from the two year National Higher Certificate to the one year National Diploma. In each case the completion of a strictly defined three year programme leads to a single qualification.

In contrast, universities and Technikons offer many varieties of programmes within a single qualification (See Appendix 2). This does not mean that each programme is unique. The different programmes will frequently require students to register for common fundamental courses. But there will be flexibility for students to select from a wide range of options even outside of the Faculty or Department of Agriculture (which the FET College curriculum does not allow and which the College of Agriculture does not offer).

From this we can see that the programmes in the FET Colleges and Colleges of Agriculture offer relatively 'closed' programmes, whereas the universities and increasingly the Technikons offer more open programmes which admit greater variety. This means that it is possible for university and Technikon programmes to support higher levels of specialisation than in the FET Colleges and the Colleges of Agriculture. This is a necessary form of programme diversification within a national system of knowledge delivery in the field of agriculture.

Because of the clearly defined shape of the agricultural programmes offered at FET Colleges and at Colleges of Education, and because these programmes differ only slightly within each institutional type, it was possible to describe the actual curriculum within each programme. Furthermore, because FET College and Agricultural College programmes are each relatively standardized, it was not necessary to describe programmes on an institution to institution basis.
This approach is not applicable in the case of universities and Technikons because there are so many programmes that lead to many different diploma and degree specialties (Appendix 2).

2.9 Agriculture programmes offered in Universities of Technology

The institutional merger process that is currently under way requires the reconfiguration of hitherto independent higher education entities. This means that the location, size, capacity, curriculum and enrolment of agricultural departments and faculties across the country are likely to change in the ensuing period. The effects of these changes on agricultural programmes in higher education will have to be closely monitored.

In contrast to the Colleges of Agriculture and the FET Colleges, the various universities provide a wide range of programmes that present multiple ways of acquiring a similar qualification level. Logically, it would be impossible for each university to offer all of these courses at the same time, as this would create an unsustainable staff to student ratio. Therefore it is important to consider which institutions concentrate on which programmes.

Analysis makes it possible to assess the relative emphasis on particular programmes within the broad agriculture field and also to see which institutions offer a wider range of programmes to students. First, the programmes offered at the Universities of Technology will be described – although the overview given in Table 13 is indicative only because these institutions are engaged in the process of mergers.

At the NDip and HDip level, the two programmes offered across the largest number of institutions were the NDip in Agricultural Management (in three sites) and the NDip in Nature Conservation (in three sites).

At the BTech programme level, the emphasis on management and nature conservation is repeated with BTech Agricultural Management and BTech Nature Conservation being offered by five and four institutions each. The institution offering the widest range of programmes is Tswane University of Technology (TUT). It is notable that TUT does not seem to offer Diploma programmes (Table 13).

The number of institutions offering a particular programme does not tell us how many students are actually enrolled and graduating. However, the number and location of institutions offering particular programmes will limit the opportunities for entry into the field especially where students need funding for travel, accommodation and living expenses. This question is equally relevant in the universities which are considered next.

Table 13: Agriculture Programmes offered in Universities of Technology						
	Cape Peninsular University of Technology	Central University of Technology	Nelson Mandela Metropolitan University	Mangosuthu Technikon	Tshwane University of Technology	UNISA (Former Technikon SA)
Introductory and Bridging						
Foundation Programme: Agriculture		x				
NHDip programmes						
NHDip Agriculture Pig Production Management					x	
NHDip Poultry Production Management					x	
NDip programmes						
NDip Agriculture				x		
NDip Agricultural Animal Production	x			x		
NDip Agricultural Crop Production	x			x		
NDip Agricultural Management	x	x	x			
NDip Community Extension						
NDip Fisheries Resource Management	x			x		
NDip Forestry						
NDip Game Ranch Management			x			
NDip Nature Conservation			x			
BTech programmes	x		x	x		
BTech Agriculture						
BTech Agricultural Management					x	
BTech Agriculture Animal Production	x	x	x		x	x
BTech Agriculture Crop Production					x	
BTech Agriculture Equine Science					x	
BTech Agriculture Mixed Farming					x	
BTech Agriculture Rural Development & Extension					x	
B Tech Ecotourism Management					x	
BTech Forestry			x			
BTech Game Ranch Management					x	
BTech Nature Conservation	x		x		x	
MTech programmes						
MTech Agriculture	x	x				
MTech Agricultural Management			x			
MTech Ecotourism Management					x	
MTech Forestry			x			
MTech Game Ranch Management					x	
MTech Nature Conservation	x		x			
DTech						
DTech Agriculture						
DTech Agricultural Management			x			
DTech Forestry			x			
DTech Nature Conservation			x		x	

2.10 Agriculture programmes offered in Universities

There is a range of programmes offered in universities at the Bachelor's level (Table 14). Some of these are presented as general programmes (eg: BAgric [General]), while others provide a relatively high degree of specialisation (eg: BSc Agric [Economics]). The degree programmes are offered from different disciplinary bases (BAgric, BInst, BSc, BCom) although most programmes are located within the domain of Science. This distinction is important because the different degree programmes have different admission criteria which include the core gateway subjects of Mathematics and Science. It is these subjects which deflect the flow of enrolments into 'softer' administration and social science related agriculture programmes and restrict the access of students to 'harder' science-based programmes.

Between them, the universities of Fort Hare, Pretoria, Free State and Venda offer general Bachelors degrees in agriculture via a BA or a BSc programme. Furthermore, it appears that the institutions that offer general undergraduate programmes tend to offer less specialisation. In contrast, the other five universities tend not to offer general programmes, and prefer to offer particular specializations.

Apart from the general bachelors' degrees that are offered in four universities, very few of the more than twenty different bachelors' programmes are offered in more than one university. Only agricultural economics, agronomy and animal science specializations are offered in two or more institutions. This means that there is some degree of specialisation among the nine universities that offer one or more programmes in agriculture.

Table 14: Bachelors programmes offered in universities in 2003/4

Degree	Programme	Potchefstroom University	University of Fort Hare	University of Kwa Zulu Natal	University of North West	University of Port Elizabeth	University of Pretoria	University of Stellenbosch	University of the Free State	University of the North	University of Venda	University of Zululand
BAgric	General		X						X		X	
	Management			X								
	Agricultural Education											
	Administration							X				
Binst Agrar							X					
BSc Agric	General		X				X		X		X	
	Agricultural Administration									X		
	Agricultural and Economic Analysis							X				
	Agricultural Economics				X					X		
	Agriculture and Rural Development											X
	Agronomy									X		X
	Animal Health				X							
	Animal Science				X							X
	Crop Science				X							
	Horticulture									X		
	Land Management				X							
	Pasture Science									X		
	Plant Production									X		
	Science and Agribusiness			X								
	Soil Science									X		
	Wine Production Systems							X				
BCom	Agricultural Economics							X	X			

Note: This analysis is based on data obtained about programmes before the mergers. It should be viewed as indicative

It is important to observe that the universities provide for a relatively wide range of choice in their degree programmes - more so even than the Universities of Technology until recently. This means that students in agriculture programmes have the opportunity within the rules of their programme to do optional or elective courses in cognate fields or in underlying academic fields that support agriculture. These include (as examples only):

- Biology
- Botany
- Business subjects (eg: marketing)
- Chemistry
- Ecology
- Economics
- Environmental management
- Genetics
- Human Resources Management
- Information Technology
- Microbiology
- Oenology
- Personnel Management
- Rural Sociology

Students at university have greater latitude to construct their own degree programmes. Upon graduation two students who graduate with the same qualification (eg: BSc Animal Health) may have obtained different sub-specialisations dependent on the mix of courses they have chosen to make up the programme leading to their degree. Naturally, not all students elect to move outside of a standard type of programme, and their choice is restricted to the extent that options are available. The point here is that it is difficult to analytically categorise degree programmes offered in the universities where variation in the internal structure of such programmes can differ substantially.

Lastly, the graduate output of programmes in higher education is complex. If all courses in a programme were compulsory and students had no options, outputs would be easy to analyse. However, this is seldom the case, since there is often a wide choice of options for students. Because of this, the full range of courses that a faculty can offer is usually larger than what courses are actually in operation at a given time. The difficulty is to track courses that are not compulsory, those that are offered on a regular basis on a cycle (such as every alternate year), and those that are offered only when the number of students willing to register rises above the critical threshold which makes a course viable to run. These factors make a programme by programme analysis of student enrolment and graduation on an annual basis, a very cumbersome task to perform – a task beyond the brief of this project.

2.11 Other forms of qualification offered at the FET and HET levels

This research project was intended to investigate graduate outputs in SAQA accredited higher and further education institutions. However, it is important to point out that outside of these higher education and public FET institutions, there are additional opportunities for obtaining agricultural qualifications in South Africa, through the SETA system. In 2001 the Primary Agriculture Education and Training Authority (PAETA) expressed the intention to launch the following Learnerships for which business plans were developed:

- Farm Operator: Horticulture, NQF level 1
- Farm Operator: Agronomy, NQF level 1
- Farm Operator: Animal Husbandry, NQF level 1
- Farm Owner: Horticulture, NQF level 1
- Farm Owner: Agronomy, NQF level 1
- Farm Owner: Animal Husbandry, NQF level 1
- Junior Farm Manager: NQF level 4
- Senior Farm Manager: NQF level 5
- Farm management for Farm owners: NQF level 5
- Land Care Expert: NQF level 5

In 2004, SETASA registered the following Learnerships (SETASA, 2004):

- National Certificate in Sugar Technology NQF level 5
- Learnership in Grain Handling Management NQF level 5
- Learnership in Specialist Agricultural Machinery Technician NQF level 5
- Learnership in Agri Sales and Services NQF level 4
- National Certificate in Tobacco Services NQF level 4
- National Certificate in Cigarette Filter Rod Production Technology NQF level 4
- National Certificate in Cigarette Production Technology NQF level 4
- FETC: Seed Marketing: Execute Seed Trials NQF level 4
- FETC: Seed Research and Development: Certify a Seed Unit NQF level 4
- FETC: Seed Research and Development: Conduct a Field Inspection of a Seed Unit NQF level 4
- FETC: Seed Processing and Packaging Control NQF level 4
- FETC: Sugar Processing NQF level 4

PAETA and its sister body SETASA (Secondary Agriculture Education and Training Authority) were set to be amalgamated by mid-2005 into the AGRI-SETA as decided by the Minister of Labour amid concerns regarding the performance of these two SETAs. Even though the Learnerships envisaged by the AGRI-SETA have not all been brought into existence, it is worth noting that the intention is to introduce Learnerships at the NQF 4 and NQF 5 levels, which is the equivalent of FET and post-FET intermediate qualifications.

These developments may present valuable contributions to the flow of qualified people into the agricultural economy in general. This aspect is noted here but will not be analysed further being outside the brief of this project. Also, the Learnership system in the agriculture sector is still in a relatively early stage of development.

2.12 Flows between agricultural programmes

To summarise the foregoing analysis and to represent the qualification structures and the flows between them in a diagrammatic form, Figure 1 represents the various sources of agricultural education and training in South Africa in 2005.

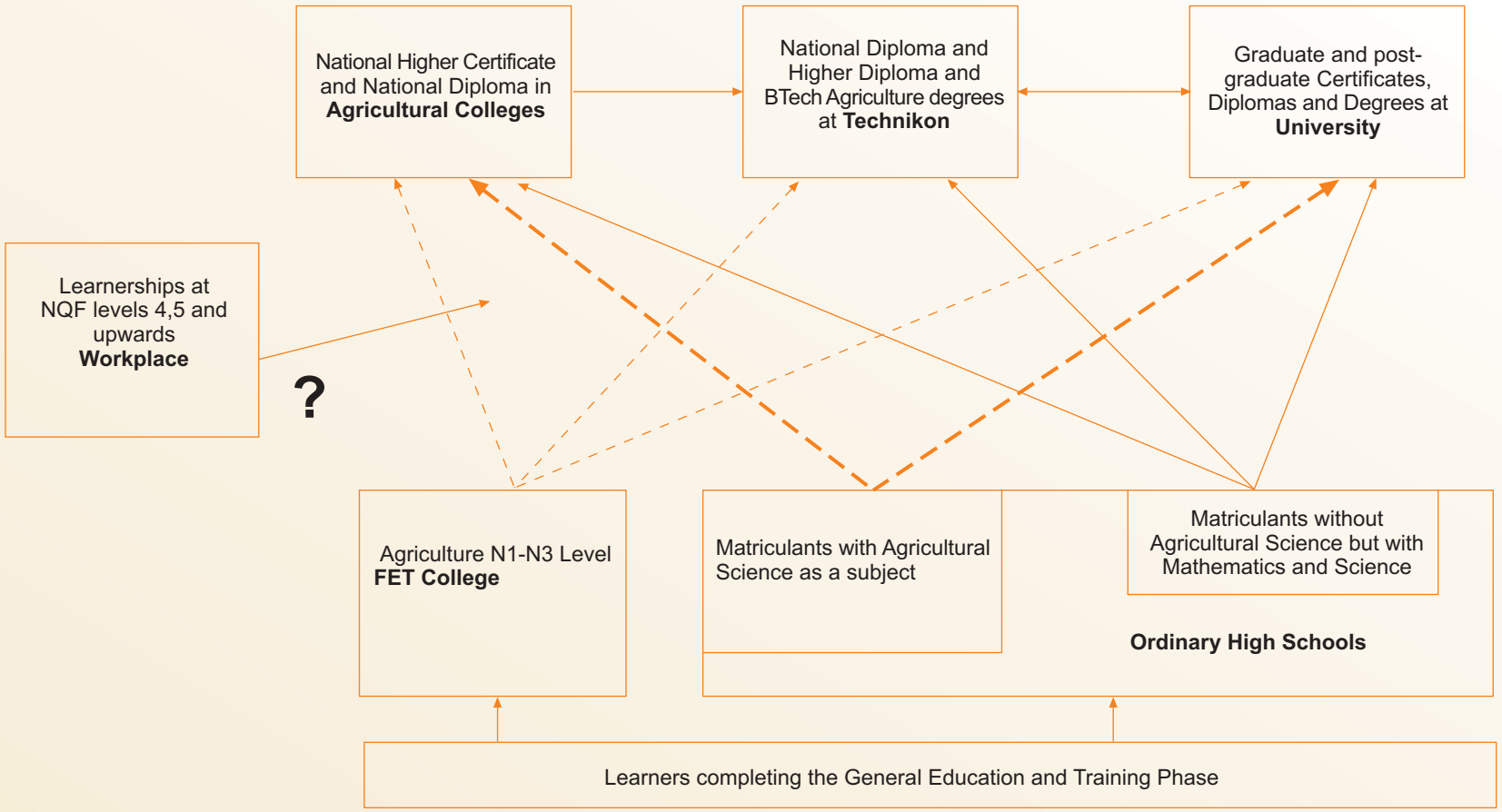
What it shows is that a large numbers of young people exit ordinary high schools some with Agricultural Science and others without the subject. This is an important distinction, because even though having Agricultural Science as a subject is a recommendation in some Agricultural Colleges or higher education institutions, it is nowhere a pre-requisite. On the other hand, learners without Agricultural Science who Matriculate with Mathematics and Science as subjects are qualified to enter BTech and BSc Agriculture programmes in universities and universities of technology.

The analysis in this chapter has focused in the main on the relationship between programmes at the undergraduate levels. Post-graduate flows are more difficult to capture since coursework programmes at the Masters and PhD levels tend to be smaller and highly specialized. Also, those students who elect to register for higher degrees via writing a dissertation or thesis cannot be captured within an analysis of learning programmes.

Tracing the flows of students between the different institutions and programmes would require a separate study that involves tracing a cohort of learners through the system. Such an undertaking is not within the scope of this study. However, Chapter 5 and Chapter 6 will examine the institutional factors such as admission criteria and fees charged for courses and programme which impact on student access.

An analysis of enrolment and graduation numbers by field of study – rather than per institution - is presented in the next Chapter - Chapter 3. Field of study is an important decider of student chances of obtaining employment upon completion of their programme

Figure 1: Flows between Agricultural programmes



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CHAPTER 3

Agricultural graduate enrolments and throughputs from higher and further education institutions

3.1 Introduction

The shape and distribution of agricultural enrolment and graduations is of critical interest to establishing the current and future potential of the public education system to supply appropriately skilled people into the agriculture labour market. For this reason, close attention is given in this chapter to analyzing these indicators as part of the process of assessing the relationship between demand and supply of agricultural skills in the South African labour market. Analysis is first presented of enrolments and throughputs in the universities and technikons, followed by Colleges of Education and FET Colleges

3.2 Analysis of higher education data

The data discussed below is drawn from the Higher Education Management Information System (HEMIS) database. For more information about the HEMIS database and how the data was extracted from HEMIS, please refer to the Methodology chapter in this report. This data is based on the standard headcount numbers of student enrolment and graduation that higher education institutions submit to the Higher Education Directorate of the National Department of Education.

As will become clear in the tables, the data sourced covers a ten year period from 1994 to 2003 - in effect the first decade of South Africa's democracy. It therefore reflects the institutional and curriculum changes in the higher education system from the perspective of the field of Agriculture. The fact that this series of data ends in 2003 is not accidental. This is because at the time of the commissioning of this research in January 2005, the HEMIS data for 2004 was not yet complete or validated for use on this project. On account of the fact that this data covers the period up to and including 2003, it does not address the recent merger process that has taken place in the higher education system which has involved the merging of 'university' and 'Technikon' forms to produce a different institutional landscape.

The data is analysed according to a system of categorizing all degree, diploma and certificate programmes offered in the higher education system. There are twenty-two broad categories into which all accredited certificate, diploma and degree courses offered in higher education are categorized. The broad categories are known as Categorisation of Education Subject Matter (CESM) categories. Each high level category (called a 1st order CESM category) contains a number of fields or sub-categories (called 2nd order CESM categories) in which cognate programmes are grouped. Thus, the 1st order CESM category called "Agriculture and Renewable Natural Resources" contains the following 2nd order CESM categories:

Table 1: Agriculture and Renewable Natural Resources contains the following 2nd order CESM categories	
0101	Agricultural Economics
0102	Agricultural Extension
0103	Agricultural Food Technology
0104	Animal Sciences
0105	Horticulture
0106	Plant Sciences
0107	Soil Sciences
0108	Fisheries
0109	Forestry
0110	Outdoor Recreation
0111	Wildlife
0112	Land Reclamation
0113	Renewable Natural Resources
0199	Other Ag. and Renewable Resources

For more information about the HEMIS database and how the data was extracted from HEMIS, please refer to the Methodology chapter in this report.

This analysis aims to establish the nature of the supply of persons who are accredited with some form of agriculture or related qualification. The analysis will attempt to show:

- how many people enroll within the broad field of agriculture
- how many people enroll in universities rather than technikons and vice-versa,
- in what subject areas or fields people enroll within agriculture
- what qualifications levels people choose to enroll in, and
- with what levels of efficiency people, who enroll, actually complete their intended programmes as reflected by throughput rates.

Specifically, the analysis will examine the pattern of student enrolments, throughput rates and graduations with reference to each of the following:

- the subject matter of the 1st order CESM category (ie: all agriculture and related subject matter grouped together)
- various subject matter at the 2nd order CESM category (ie: agricultural subject matter as defined in the fourteen categories or fields given above in Table 1)
- qualification levels from undergraduate to post graduate
- race and gender equity in student enrolment, throughput and graduations.

The analysis is presented as follows:

- First, enrolments with reference to the broad field of Agriculture and Renewable Natural Resources
- Second, graduation rates with reference to Agriculture and Renewable Natural Resources
- Third, throughputs with reference to Agriculture and Renewable Natural Resources
- Fourth, enrolments, graduation rates and throughput with reference to race and gender,
- Fifth, enrolments, graduation rates and throughput with reference to fields of study (2nd CESM)
- Sixth enrolments, graduation rates and throughput with reference to qualification type according to levels in the National Qualification Framework.

In the course of the analysis, selected tables will be presented which demonstrate the main trends and features of enrolment, throughput and graduations. All other essential tables (prefixed with an 'A') are provided in Appendix 3.

3.3 Agriculture and Renewable Natural Resources (ARNR) enrolments in higher education between 1994 and 2003

The total number of students that enrolled in Agriculture and Renewable Natural Resources (ARNR) increased by 71.5%, or from 6 528 to 11 196 from 1994 to 2003. Enrolments increased at a slightly faster rate in Universities (76.6%) than in Technikons (68.2%) across the ten years (Table 1).

The increases were not steady, but fluctuated over the ten years with a drop in enrolments in 1996 and a significant hike of over 22.1% in 2001.

Table 1: Change in the headcount number of ARNR students enrolled in university and Technikons, 1994 - 2003

Year	Enrolment			% Change		
	Universities	Technikons	Total	Universities	Technikons	Total
1994	2 581	3 946	6 528	-	-	-
1995	2 686	4 535	7 221	4.1	14.9	10.6
1996	2 746	4 281	7 027	2.2	-5.6	-2.7
1997	2 914	4 775	7 689	6.1	11.5	9.4
1998	2 963	4 778	7 741	1.7	0.1	0.7
1999	3 013	4 683	7 696	1.7	-2.0	-0.6
2000	3 411	5 258	8 669	13.2	12.3	12.6
2001	4 242	6 346	10 588	24.3	20.7	22.1
2002	4 223	6 125	10 348	-0.4	-3.5	-2.3
2003	4 558	6 638	11 196	7.9	8.4	8.2

It is necessary to clarify whether enrolments in ARNR changed in proportion to enrolments in higher education as a whole. Although gross enrolments within ARNR increased by 71,5%, this was more or less in line with increases across the higher education system. As can be seen from Table 2, the ARNR share of total enrolment in higher education rose from 1.32% in 1994 to 1.56% in 2003. If the ARNR percentage share of all higher education enrolments had remained constant between 1994 and 2003 (ie: had remained at 1.32%) enrolment would have been only 9 475 in 2003. But the enrolment share of all students in universities and technikons increased to 1.56% or 11 196 students in 2003. Even though enrolment in ARNR appeared to increase only slightly in percentage terms 1 721 more students enrolled in 2003 in comparison with 1994. Enrolments grew faster in the natural sciences than in the social sciences between 1993 and 2001 (CHE,2004,196) which to some extent explains the higher rate of increase in Agriculture - which encompasses mainly natural science - than the average for all entolments.

The data shows that ARNR enrolment as a proportion of enrolment differed between universities and Technikons. By 2003, in universities ARNR enrolment approached one per cent (0.93%) whereas in Technikons, enrolment approached three per cent (2.89%). The share of ARNR enrolment in Technikons declined between 1994 and 1999 but recovered to above the 1994 levels in 2001. In universities, there was a steady increase in the ARNR share of total enrolment from 1996 onwards.

Table 2: Comparison of headcount number of students enrolled in ARNR in university and Technikon compared to total enrolment in each institutional type, 1994 - 2003

Year	Universities			Technikons			Total		
	Agriculture Enrolment	Total Enrolment	% of Total	Agriculture Enrolment	Total Enrolment	% of Total	Agriculture Enrolment	Total Enrolment	% of Total
1994	2 581	347 568	0.74	3 946	147 780	2.67	6 528	495 348	1.32
1995	2 686	368 845	0.73	4 535	170 257	2.66	7 221	539 102	1.34
1996	2 746	375 615	0.73	4 281	189 540	2.26	7 027	565 155	1.24
1997	2 914	370 680	0.79	4 775	197 992	2.41	7 689	568 672	1.35
1998	2 963	362 746	0.82	4 778	197 819	2.42	7 741	560 565	1.38
1999	3 013	356 818	0.84	4 683	197 646	2.37	7 696	554 464	1.39
2000	3 411	387 361	0.88	5 258	202 792	2.59	8 669	590 153	1.47
2001	4 242	428 094	0.99	6 346	224 327	2.83	10 588	652 421	1.62
2002	4 223	460 470	0.92	6 125	214 690	2.85	10 348	675 160	1.53
2003	4 558	487 741	0.93	6 638	230 052	2.89	11 196	717 793	1.56

There is a consistent pattern of numerically larger enrolments in ARNR in Technikons than universities. Table 3 below demonstrates that over the last decade, the share of enrolments has been in the favour of Technikons on a 3:2 basis.

Table 3: Headcount number of students enrolled in ARNR and the percentage share per year in universities and Technikons, 1994 - 2003

Year	Enrolment			% Share		
	Universities	Technikons	Total	Universities	Technikons	Total
1994	2 581	3 946	6 528	40	60	100
1995	2 686	4 535	7 221	37	63	100
1996	2 746	4 281	7 027	39	61	100
1997	2 914	4 775	7 689	38	62	100
1998	2 963	4 778	7 741	38	62	100
1999	3 013	4 683	7 696	39	61	100
2000	3 411	5 258	8 669	39	61	100
2001	4 242	6 346	10 588	40	60	100
2002	4 223	6 125	10 348	41	59	100
2003	4 558	6 638	11 196	41	59	100

3.4 ARNR graduations from 1994 to 2003

The annual graduation 'output' from ARNR programmes, for universities and Technikons combined, rose from 967 to 1765 graduates between 1994 and 2003. In crude terms, this represents an increase of 82.5% (Table 4).

However, it is preferable to analyse graduation numbers over a specified period rather than on a year-to-year basis because of the potential for wide annual fluctuations in this measure. This is because graduation numbers are affected by inter alia: when enrolments take place, in what numbers students enroll in a particular year, the length of programmes for which students enroll (eg: from one year upwards to five or more years), the numbers of students who drop-out or return to study.

Table 4: Change in the headcount number of students graduated in ARNR from universities and Technikons, 1994 - 2003

Year	Enrolment			% Change		
	Universities	Technikons	Total	Universities	Technikons	Total
1994	612	355	967			
1995	556	584	1 140	-9.2	64.5	17.9
1996	582	630	1 213	4.7	7.9	6.3
1997	669	598	1 267	14.9	-5.2	4.5
1998	778	679	1 457	16.2	13.6	15.0
1999	762	624	1 386	-2.0	-8.1	-4.9
2000	907	627	1 534	19.0	0.4	10.6
2001	745	703	1 448	-17.9	12.2	-5.6
2002	802	811	1 614	7.8	15.4	11.5
2003	904	862	1 765	12.6	6.2	9.4

For the reasons given above, an annual average was calculated for graduations in the five year period 1994 – 1998, which is compared with an annual average for the five year period 1999 – 2003. Based on this method of averaging over a five year period, a more realistic picture of changes in graduation outputs is obtained. The data shows that there was no substantial difference between these institutional types in the extent to graduate output increased over the two periods (Table 5).

Table 5: Comparison of annual average ARNR graduation numbers in universities and Technikons for two five year periods, 1994 - 2003

Range of years	1994 – 1998	1999 - 2003	Increase over the two periods
Universities	639	824	29%
Technikons	569	725	27%
Total	1209	1549	28%

Although there was a nominal difference in growth in graduations, the following table shows how universities produced a larger percentage share of graduate output than Technikons on a relatively consistent basis, even though Technikons had higher enrolments in the same period (Table 6). This finding is best discussed with reference to the concept of 'throughput' which is the subject of the section below.

Table 6: Change in the headcount number of students from universities and Technikons graduating in ARNR, 1994 - 2003

Year	Enrolment			% Share		
	Universities	Technikons	Total	Universities	Technikons	Total
1994	612	355	967	63	37	100
1995	556	584	1 140	49	51	100
1996	582	630	1 213	48	52	100
1997	669	598	1 267	53	47	100
1998	778	679	1 457	53	47	100
1999	762	624	1 386	55	45	100
2000	907	627	1 534	59	41	100
2001	745	703	1 448	51	49	100
2002	802	811	1 614	50	50	100
2003	904	862	1 765	51	49	100

ARNR programme graduation numbers as a share of total graduations in higher education increased from 1.30% to 1.61% between 1994 and 2003 (Table A1 All tables referred to with the prefix 'A' are located in the Appendix and are numbered sequentially, viz: A1, A2, A3 etc.). This suggests that relatively, the efficiency of agriculture programmes increased slightly against the national average.

3.5 ARNR throughput rates from 1994 to 2003

Throughput is a measure of the efficiency of the institution and of the programme in bringing students from enrolment to graduation. Throughput can be defined as the average number of years that a cohort of students takes to complete the learning programme for the qualification for which they registered. Throughput rates are calculated on the length of time the cohort spends in the system, and the proportion of drop-outs and/or repetitions, that delay or prevent graduations taking place. Throughput rates are affected by a variety of factors or characteristics that inhere in the student or in the institution. These include inter alia:

- Admission policy of the institution
- Quality of students seeking enrolment
- The socio-economic context and household resources of students, especially disadvantaged students
- Quality of instruction and facilities offered by the institution, etc.

Currently there is no available accurate means of calculating the throughput rate in South African higher education institutions. This would require cohort studies that trace a group of students from first-year to graduation.

The South African higher education system calculates a 'graduation rate' as a proxy for throughput. The official definition of the graduation rate is the number of graduations divided by the number of enrolments for the same year (Subotzky, 2003). The through-put rate is expressed as a ratio or in this case as a percentage so as to facilitate comparisons.

Clearly this is a rough measure because it does not calculate the actual 'throughput' for any specific cohort of students who enrolled for the same programme together. As such, this average measure is affected by the timing of sudden changes in enrolment in a particular year. For example, a sharp rise in enrolment in a particular year can force the 'graduation rate' down while a sharp drop in enrolment can make the 'graduation rate' appear healthier.

Although the measure to be applied here is called the 'graduation rate' locally - and is in effect only a proxy for throughput - we will refer to it as the throughput rate in order to avoid confusion in discussion of graduation numbers.

While the Technikon throughput rate was relatively stable over time, the throughput rate for universities rose to a peak in 2000 at 27% and then plunged sharply to begin slowly recovering between 2001 and 2003 (Table 7). Overall, throughput rate for Technikons was consistently lower than the rate for universities throughout the period under discussion.

All tables referred to with the prefix 'A' are located in the Appendix and are numbered sequentially, viz: A1, A2, A3 etc.

Table 7: Throughput rates in ARNR for universities and Technikons, 1994 - 2003									
Year	Universities			Technikons			Total		
	Enrolment	Graduates	Through-put	Enrolment	Graduates	Through-put	Enrolment	Graduates	Through-put
1994	2 581	612	24	3 946	355	9	6 528	967	15
1995	2 686	556	21	4 535	584	13	7 221	1 140	16
1996	2 746	582	21	4 281	630	15	7 027	1 213	17
1997	2 914	669	23	4 775	598	13	7 689	1 267	16
1998	2 963	778	26	4 778	679	14	7 741	1 457	19
1999	3 013	762	25	4 683	624	13	7 696	1 386	18
2000	3 411	907	27	5 258	627	12	8 669	1 534	18
2001	4 242	745	18	6 346	703	11	10 588	1 448	14
2002	4 223	802	19	6 125	811	13	10 348	1 614	16
2003	4 558	904	20	6 638	862	13	11 196	1 765	16

The lower throughput rate reported here for Technikons was consistent with the overall differences in graduation rates reported for these institutions, though it appears that ARNR throughput rates in universities were higher than the national average in all university programmes (Table 8).

Table 8. Enrolments, graduations, and throughput rates in South African higher education institutions, by institutional type, 2002			
	Universities	Technikons	Total
Enrolments	214 690	460 470	675 160
Graduations	26 015	75 665	101 680
Graduation rate	12%	17%	16%

3.6 Race and gender equity in ARNR enrolments, graduations and throughput between 1994 and 2003

After 1994, a critical objective of higher education policy was to achieve representative access to Technikons and universities among those who were disadvantaged on the basis of race, gender or disability. The discussion below focuses on the shape of race and gender participation within the ARNR subject category.

The main feature of changing enrolment patterns in both universities and Technikons was a significant increase in enrolment proportions among Africans of 18% and 23% respectively between 1996 and 2003 (Table 9 and Table 10). White enrolments decreased proportionately in the same period, while enrolments among Coloured and Indian students were relatively stable. Actual enrolment numbers by race are given in Table A2, Table A3 and Table A4.

Table 9: Enrolment in ARNR by population group at universities in percentage, 1994 - 2003					
	Population group				
Year	African	Coloured	Indian	White	Total
1994	-	-	-	-	-
1995	-	-	-	-	-
1996	44	1	1	54	100
1997	45	1	0	53	100
1998	47	2	1	51	100
1999	58	1	1	40	100
2000	56	1	1	42	100
2001	64	1	1	35	100
2002	61	1	1	38	100
2003	62	1	1	36	100

Table 10: Enrolment in ARNR by population group at Technikons in percentage, 1994 - 2003					
	Population group				
Year	African	Coloured	Indian	White	Total
1994	-	-	-	-	-
1995	-	-	-	-	-
1996	40	3	2	55	100
1997	49	3	1	47	100
1998	52	3	1	44	100
1999	55	3	1	41	100
2000	57	2	1	40	100
2001	62	3	1	35	100
2002	61	3	1	35	100
2003	63	3	1	33	100

As can be seen, the enrolment patterns in universities and Technikons in the period under discussion were very similar in shape (Table 11). For this reason, when enrolment is aggregated for the sector, a similar pattern emerges.

Table 11: Enrolment in ARNR in university and Technikon by population group in percentage, 1994 - 2003					
	Population group				
Year	African	Coloured	Indian	White	Total
1994	-	-	-	-	-
1995	-	-	-	-	-
1996	42	2	1	55	100
1997	47	3	1	49	100
1998	50	3	1	47	100
1999	56	2	1	41	100
2000	57	2	1	41	100
2001	62	2	1	35	100
2002	61	2	1	36	100
2003	62	2	1	34	100

The discussion above highlighted significant increases in the proportion of African enrolments. In the same period, the number of African graduates increased on a similar scale (Table A5, Table A6 and Table A7). This is to be expected, given the assumption that increased enrolments should result in increased share of graduations as is evidenced below (Table 12). Consult Table A8 and A9 to see the share of graduations by race in Technikons and in universities.

Table 12: Graduates in ARNR in university and Technikon by population group in percentage, 1994 - 2003					
	Population group				
Year	African	Coloured	Indian	White	Total
1994	-	-	-	-	-
1995	-	-	-	-	-
1996	29	2	0	68	100
1997	33	2	1	64	100
1998	42	3	1	55	100
1999	49	2	0	48	100
2000	50	2	1	48	100
2001	49	2	1	49	100
2002	49	2	1	48	100
2003	59	2	0	39	100

There are differences between throughput rates for universities and Technikons as will become apparent below. In universities, the throughput rates for Coloured and Indian students vary widely because there are small numbers of these students in the system and fluctuation in enrolments can distort the throughput figures (Table 13). It is clear that the throughput rate among Africans is consistently below the average, while the throughput rate for White students is consistently above the average. This means that equity in access is not matched by equity in successful completion of programmes.

Table 13: Throughput rate for ARNR students at university by population group in percent, 1994 - 2003					
	Population group				
Year	African	Coloured	Indian	White	Total
1994	-	-	-	-	-
1995	-	-	-	-	-
1996	18	26	9	24	21
1997	20	18	67	25	23
1998	23	38	28	29	26
1999	24	32	13	27	25
2000	25	30	27	29	27
2001	13	10	15	25	18
2002	15	26	25	26	19
2003	19	19	7	22	20

It is striking that in all race categories, Technikon throughput rates were much lower than university throughput rates in the period under review (Table 14). As was the case in the universities, the throughput rates for African students were consistently below the average while White students throughput rates are consistently above the average.

Table 14: Throughput rate throughput rate for ARNR students in Technikons by population group in percent, 1994 - 2003					
	Population group				
Year	African	Coloured	Indian	White	Total
1994	-	-	-	-	-
1995	-	-	-	-	-
1996	8	19	2	20	15
1997	7	10	20	19	13
1998	12	12	7	17	14
1999	10	15	8	17	13
2000	10	10	4	15	12
2001	9	10	10	15	11
2002	11	11	11	17	13
2003	12	11	2	15	13

The graduation rate in both universities and Technikons which combines the two tables above is given in Table A10.

3.7 Gender

In the period under review, ARNR enrolments were consistently higher for men who accounted for 58% and 63% of enrolments at universities and Technikons respectively in 2003 (Table 15 and Table 16). Between 1996 and 1999 enrolment of men in universities declined and thereafter, Technikons sustained higher proportionate enrolments of men than universities. The raw enrolment numbers by gender are provided in Table A11, Table A12 and Table A13.

Table 15: Enrolment in ARNR at university by gender in percentage, 1994 - 2003			
	Gender		
Year	Female	Male	Total
1994	-	-	-
1995	-	-	-
1996	29	71	100
1997	30	70	100
1998	33	67	100
1999	41	59	100
2000	39	61	100
2001	43	57	100
2002	42	58	100
2003	42	58	100

Table 16: Enrolment in ARNR at Technikon by gender in percentage 1994 - 2003			
	Gender		
Year	Female	Male	Total
1994	-	-	-
1995	-	-	-
1996	33	67	100
1997	36	64	100
1998	37	63	100
1999	36	64	100
2000	36	64	100
2001	38	62	100
2002	37	63	100
2003	37	63	100

Overall, while men outnumbered women in enrolment in ARNR courses on a ratio of 3:2 in 2003, the data shows that enrolment proportions of men declined by 8% in the period of analysis (Table 17). Consult Table A14, Table A15 and Table A16 for raw data on graduate numbers by gender.

Table 17: Enrolment in ARNR in university and Technikon by gender in percentage, 1994 - 2003			
	Gender		
Year	Female	Male	Total
1994	-	-	-
1995	-	-	-
1996	31	69	100
1997	34	66	100
1998	35	65	100
1999	38	62	100
2000	37	63	100
2001	40	60	100
2002	39	61	100
2003			

Table 18: Graduates in ARNR in university and Technikon by gender in percentage, 1994 - 2003			
	Gender		
Year	Female	Male	Total
1994	-	-	-
1995	-	-	-
1996	28	72	100
1997	28	72	100
1998	33	67	100
1999	39	61	100
2000	36	64	100
2001	37	63	100
2002	40	60	100
2003	42	58	100

When the gender proportions of enrolments are compared with the gender proportions of graduates, the data suggests that there was a steady decrease in the proportion of male graduates (Table 18). Table A17 and A18 describe the gender breakdown of graduates at the level of the university and the Technikon respectively which underly Table 18 below.

But this observation must be tested by an examination of the throughput rates that will follow. Analysis has revealed that throughput rates clearly differ between universities and Technikons in all dimensions. Tables A19 and A20 show this also to be the case when looking at gender.

The data on throughput rates overall in universities and Technikons between 1996 and 2003 (Table 19) reveals relatively small differences between females and males, but hints toward a dip in male throughput rates from 2001 to 2003.

Table 19: Throughput rates in ARNR in university and Technikon by gender in percentage 1994 - 2003			
	Gender		
Year	Female	Male	Total
1994	-	-	-
1995	-	-	-
1996	15	18	17
1997	14	18	17
1998	18	19	19
1999	18	18	18
2000	17	18	18
2001	13	14	14
2002	16	15	16
2003	17	15	16

3.8 Analysis of enrolments, graduations and throughput by study field (ARNR Second Order CESM category) from 1994 to 2003

Having analysed the dimensions of student enrolment, graduates and throughput from an institutional perspective, it is necessary to examine these dimensions from within the knowledge sub-fields of ARNR.

Such analysis will reveal patterns in the enrolment, graduation and throughput rates within particular sub-fields. Analysis at this level is important, since the choice of study field, and the choice of qualification level in combination with throughput rates will directly affect the distribution of entrants to the labour market with expertise in particular fields of agriculture.

Enrolment

Enrolment will be discussed at the institutional level first with reference to proportionate share by sub-field of agriculture. (Actual enrolment numbers are presented in Table A21, Table A22 and Table A23).

In universities, the fields with the largest share of enrolment in 2003 were: Agricultural Economics (25%), Animal Sciences (18%), Plant Sciences (14%) and Soil Sciences (7%) (Table 20). It is observable that enrolment in Agricultural Economics showed an upward trend, while Animal Sciences enrolment fluctuated widely, and Plant Sciences declined between 1999 and 2003.

Table 20: Enrolment in 2nd order CESM category/sub field in Universities by percentage, 1994 - 2003

2nd order CESM category	% Share									
	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
0101 Agricultural Economics	-	-	-	-	-	18	24	20	20	25
0102 Agricultural Extension	-	-	-	-	-	5	9	13	9	11
0103 Agricultural Food Technology	-	-	-	-	-	6	5	4	5	4
0104 Animal Sciences	-	-	-	-	-	17	20	28	24	18
0105 Horticulture	-	-	-	-	-	5	4	3	3	4
0106 Plant Sciences	-	-	-	-	-	17	19	15	16	14
0107 Soil Sciences	-	-	-	-	-	7	9	7	8	7
0108 Fisheries	-	-	-	-	-	0	0	0	0	0
0109 Forestry	-	-	-	-	-	2	2	2	2	1
0110 Outdoor Recreation	-	-	-	-	-	0	0	0	0	0
0111 Wildlife	-	-	-	-	-	3	2	2	3	2
0112 Land Reclamation	-	-	-	-	-	0	0	0	0	0
0113 Renewable Natural Resources	-	-	-	-	-	4	0	0	5	7
0199 Other Ag. and Renewable Resources	-	-	-	-	-	18	5	5	6	6
Total	100	100	100	100	100	100	100	100	100	100

In Technikons, the fields with the largest share of enrolment in 2003 were: Animal Sciences (29%), Horticulture (14%), and Plant Sciences (12%) (Table 21). It is observable that enrolment in Animal Sciences and also Agricultural Economics (6%) showed upward trends between 1999 and 2003.

Table 21: Enrolment in 2nd order CESM category/sub field in Technikon by percentage, 1994 - 2003										
2nd order CESM category	% Share									
	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
0101 Agricultural Economics	-	-	-	-	-	2	4	8	5	6
0102 Agricultural Extension	-	-	-	-	-	4	1	2	4	3
0103 Agricultural Food Technology	-	-	-	-	-	0	0	0	0	0
0104 Animal Sciences	-	-	-	-	-	23	27	29	27	29
0105 Horticulture	-	-	-	-	-	13	11	16	15	14
0106 Plant Sciences	-	-	-	-	-	13	9	12	13	12
0107 Soil Sciences	-	-	-	-	-	4	3	0	2	2
0108 Fisheries	-	-	-	-	-	0	0	0	0	0
0109 Forestry	-	-	-	-	-	3	4	2	3	2
0110 Outdoor Recreation	-	-	-	-	-	2	6	8	9	8
0111 Wildlife	-	-	-	-	-	7	7	7	2	3
0112 Land Reclamation	-	-	-	-	-	0	0	0	0	0
0113 Renewable Natural Resources	-	-	-	-	-	5	7	4	6	4
0199 Other Ag. and Renewable Resources	-	-	-	-	-	23	21	11	14	15
Total	100	100	100	100	100	100	100	100	100	100

From observation of the tables above, it is clear there are differences between universities and Technikons in terms of registrations. Ultimately we are interested in the overall shape of enrolment in ARNR fields in both universities and Technikons, since this view enables an assessment of whether there are sufficient, in-sufficient or excessive enrolments in particular fields in relation to labour market needs.

There were clearly four key fields which shared the bulk of registration in 2003 (Table 22). They were: Animal Sciences (25%), Agricultural Economics (14%), Plant Sciences (13%), and Horticulture (10%).

Table 22: Enrolment in 2nd order CESM category/sub field in universities and Technikons by percentage, 1994 - 2003										
2nd order CESM category	% Share									
	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
0101 Agricultural Economics	-	-	-	-	-	9	12	13	11	14
0102 Agricultural Extension	-	-	-	-	-	5	4	6	6	6
0103 Agricultural Food Technology	-	-	-	-	-	2	2	2	2	2
0104 Animal Sciences	-	-	-	-	-	21	24	28	26	25
0105 Horticulture	-	-	-	-	-	10	8	11	10	10
0106 Plant Sciences	-	-	-	-	-	14	13	13	15	13
0107 Soil Sciences	-	-	-	-	-	5	5	3	4	4
0108 Fisheries	-	-	-	-	-	0	0	0	0	0
0109 Forestry	-	-	-	-	-	3	3	2	2	2
0110 Outdoor Recreation	-	-	-	-	-	1	4	5	5	5
0111 Wildlife	-	-	-	-	-	6	5	5	2	3
0112 Land Reclamation	-	-	-	-	-	0	0	0	0	0
0113 Renewable Natural Resources	-	-	-	-	-	5	4	3	5	5
0199 Other Ag. and Renewable Resources	-	-	-	-	-	21	15	9	10	12
Total	100	100	100	100	100	100	100	100	100	100

Graduates

The actual numbers of graduates by field are given in Table A24, Table A25 and Table A26. The shape of graduations across universities and Technikons reveals that the following fields produced the most graduates: Animal Sciences (30%), Plant Sciences (16%), and Agricultural Economics (13%). Lower proportions were produced in: Agricultural Extension (5%), Horticulture (5%), and Soil Sciences (4%) (Table 23). Table A27 and A28 describe the underlying distribution of graduations by field at the level of university and Technikon.

Table 23: Graduates in 2nd order CESM category/sub field in Universities and Technikons by percentage 1994 - 2003

2nd order CESM category	% Share									
	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
0101 Agricultural Economics	16	9	10	11	14	10	15	15	14	13
0102 Agricultural Extension	3	4	5	4	4	5	3	7	7	5
0103 Agricultural Food Technology	4	3	1	2	2	3	3	3	4	3
0104 Animal Sciences	22	21	22	17	18	22	24	26	24	30
0105 Horticulture	13	9	14	14	8	8	6	7	9	5
0106 Plant Sciences	11	15	13	14	14	15	17	13	15	16
0107 Soil Sciences	3	5	3	2	2	2	5	4	4	4
0108 Fisheries	0	0	0	0	0	0	0	0	0	0
0109 Forestry	8	6	5	5	5	3	3	4	4	2
0110 Outdoor Recreation	0	0	0	0	0	1	2	3	3	3
0111 Wildlife	4	4	4	4	8	6	6	7	5	6
0112 Land Reclamation	0	0	0	0	0	0	0	0	0	0
0113 Renewable Natural Resources	5	8	8	8	6	6	3	5	4	4
0199 Other Ag. and Renewable Resources	11	15	15	20	18	20	11	8	7	8
Total	100	100	100	100	100	100	100	100	100	100

It is important to interrogate the overall throughput rates within each of the study fields since this can point to areas where students are in the system but where they are not moving through the system as efficiently as possible.

Caution is important in analyzing throughput rates since this measure is sensitive to changes in annual enrolment and there are quite large fluctuations in rates between years. In the three fields which exhibit the largest share of output in ARNR, Plant Sciences and Animal Sciences, both reflected throughput rates which were higher than the average for ARNR as a whole in 2003 (Table 24). The relatively low rate for Agricultural Economics may be a sign of a downward trend, and will need to be monitored closely.

Table 24: Throughput rates in 2nd order CESM category/sub field in Universities and Technikons by percentage, 1994 - 2003										
2nd order CESM category	**Throughput rate (%)**									
	1994	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
0101 Agricultural Economics	-	-	-	-	-	20	24	15	20	15
0102 Agricultural Extension	-	-	-	-	-	19	14	14	17	12
0103 Agricultural Food Technology	-	-	-	-	-	21	28	22	33	28
0104 Animal Sciences	-	-	-	-	-	**19**	**18**	**12**	**14**	**19**
0105 Horticulture	-	-	-	-	-	14	13	9	15	9
0106 Plant Sciences	-	-	-	-	-	**19**	**23**	**13**	**16**	**20**
0107 Soil Sciences	-	-	-	-	-	8	17	17	13	17
0108 Fisheries	-	-	-	-	-	0	0	0	0	0
0109 Forestry	-	-	-	-	-	24	20	23	28	17
0110 Outdoor Recreation	-	-	-	-	-	15	10	8	8	10
0111 Wildlife	-	-	-	-	-	20	20	19	34	34
0112 Land Reclamation	-	-	-	-	-	0	0	0	0	0
0113 Renewable Natural Resources	-	-	-	-	-	22	14	25	12	10
0199 Other Ag. and Renewable Resources	-	-	-	-	-	17	13	13	10	10
Total	15	16	17	16	19	18	18	14	16	16

The throughput rates for sub-fields at the level of university and Technikon are given in Table A29 and A30.

3.9 Analysis of ARNR enrolments, graduations and throughput by qualification type from 1994 to 2003

There were differences between universities and Technikons in the distribution of enrolment by qualification type. Firstly, in universities, post-graduate enrolment comprised 38% of all enrolment, with a particularly large proportion of enrolment at the Masters Degree level which feeds a stable group of Doctoral students (Table 25). At the higher degree level (NQF Levels 7-8) there was very low enrolment of students at post-graduate levels within Technikons at only 2% of all enrolment. Technikon honours degree enrolment proportions declined after 1994, and there was a small Masters level enrolment (Table 26). (Tables A31 and A32 present the raw enrolment data).

The major share of enrolment in Technikons through the period under review was at the undergraduate level. Within this group it is striking that the proportion of diploma and certificate (NQF 5 – undergraduate diplomas and certificates) enrolments declined in the decade while the proportion of enrolments for a degree (NQF 6 - degrees) increased from zero in 1994 to 38% in 2003 (Table 26).

The key changes in enrolment patterns were increased enrolments for degree courses in the Technikons and increased enrolments in Master's degrees in universities (Table A33 and Table A34 contain combined data for universities and Technikons).

Table 25: Enrolment in ARNR by qualification type at Universities by percentage 1994 - 2003											
Qualification Type	**NQF Level**	**% Share**									
		1994	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
A: Certificate/ Diploma	5	1	4	4	3	3	11	1	10	9	7
B: Degree	6	64	61	61	60	60	51	58	56	52	55
A + B	-	66	65	64	63	63	62	59	66	60	62
Post-graduate up to Honours	7	12	12	14	12	11	11	10	6	9	8
Masters Degrees	7	17	17	16	19	20	22	24	21	23	23
Doctoral Degrees	8	5	6	6	6	5	5	7	6	7	7
Total		100	100	100	100	100	100	100	100	100	100

Table 26: Enrolment in ARNR by qualification type in Technikons by percentage 1994 - 2003											
Qualification Type	NQF level	% Share									
		1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
A: Certificate/ Diploma	5	95	95	94	91	91	86	65	55	62	60
B: Degree	6	0	1	4	7	9	13	34	43	36	38
A + B: Under-graduates	-	95	96	98	99	99	99	99	98	98	98
Post-graduate up to Honours	7	5	4	2	1	0	0	0	0	0	0
Masters Degrees	7	0	0	0	0	1	1	1	2	2	2
Doctoral Degrees	8	0	0	0	0	0	0	0	0	0	0
Total		100	100	100	100	100	100	100	100	100	100

The combined output of graduates from universities and Technikons who enter the labour market shows that the largest proportion of ARNR graduates (44%) entered the market with a diploma or certificate (NQF 5) qualification, followed by 32% with an under-graduate degree (NQF 6) and 24% with a post-graduate qualification (NQF 7 – 8) (Table 27). (Tables A35, A36, A37, A38 and A39 present the data for universities and Technikons separately).

Table 27: Graduates in ARNR by qualification type at Universities and Technikons in percentage, 1994 - 2003											
Qualification Type	NQF level	% Share									
		1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
A: Certificate/ Diploma	5	33	45	47	45	41	42	31	37	45	44
B: Degree	6	35	30	25	32	38	35	45	41	32	32
A + B	-	68	75	72	77	79	77	76	78	77	76
Post-graduate up to Honours	7	21	17	21	15	12	13	13	10	10	11
Masters Degrees	7	8	7	5	7	8	8	9	10	11	9
Doctoral Degrees	8	2	1	1	2	2	1	1	2	2	4
Total		100	100	100	100	100	100	100	100	100	100

Throughput rates are affected by a number of factors such as the quality of school preparation that undergraduates bring with them and the quality of programmes and support provided to post-graduates. Additionally, the length of the course impacts significantly on throughputs rates, with shorter courses having generally higher rates and longer courses having generally lower rates. This is due to the way in which the rate is derived from dividing the total number of graduates per year, by the total number of students (over all academic years) enrolled for that course. This provides an explanation for the exceptionally high thorughput rate of 55% in 2003 for the one-year Honours level progamme (Table 28). Factors other than course duration must however account for the different throuhput rates of the certificate and basic degree progammes, as both are generally 3 years in duration. (Underlying data is in Table A40 and Table A41).

Table 28: Through-put rate by qualification type and year in Universities and Technikons											
Qualification Type	NQF level	Through-put rate (%)									
		1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
A: Certificate/ Diploma	5	8	12	14	13	14	13	14	14	17	18
B: Degree	6	21	21	17	20	25	23	19	12	12	11
A + B	-	12	14	15	15	17	17	16	12	14	14
Post-graduate up to Honours	7	39	40	56	47	51	54	59	53	39	55
Masters Degrees	7	17	17	14	15	18	17	17	15	18	14
Doctoral Degrees	8	18	10	10	13	16	11	9	11	12	18
Total		15	16	17	17	19	18	18	14	16	16

3.10 Output of Agricultural Colleges

The graduate output data covers the years 1999 to 2004 and shows that the total output of graduates at years 1, 2 and 3 ranged from a low of 794 in 2001 to 1000 in 2004. This variation reflects the pattern of enrolments and of proportions of students completing in time or over a longer period than expected for each qualification – the Certificate, the Higher Certificate and the Diploma years respectively.

In terms of gender, male graduates consistently outnumber female graduates on a ratio of about 2.5 to 1. But this largely reflects the fact that more males enroll at the Colleges. It is interesting to note that in the universities, the enrolment of females is much more on a par with male enrolments.

Analysis of graduates on the basis of race shows that African and White males are the dominant groups in the Colleges. Overall, between 1999 and 2004, African students were the largest group of graduates (59%) followed by White students (39%).

Graduates from Agricultural Colleges 2000 – 2004					
	African	Coloured	Indian	White	Total
Graduates	3149	78	8	2090	5325
Percentage	59%	1%	0%	39%	100%

The enrolment data in the Colleges shows a consistent level of registrations between 1200 and 1600 from 1999 to 2003.

Table 29: Graduate output of Agricultural Colleges 2000 to 2004												
		Male					Female					
		African	Coloured	Indian	White	Total	African	Coloured	Indian	White	Total	Total
2004	Certificate	119	12	1	136	268	74	2	0	32	108	376
	Higher Cert	131	2	0	141	274	75	1	0	20	96	370
	Diploma	81	3	0	71	155	88	0	0	11	99	254
	Total	331	17	1	348	697	237	3	0	63	303	1000
2003	Certificate	127	2	1	137	267	67	1	0	26	94	361
	Higher Cert	110	3	0	98	211	57	2	0	14	73	284
	Diploma	68	2	0	62	132	56	0	0	12	68	200
	Total	305	7	1	297	610	180	3	0	52	235	845
2002	Certificate	109	1	1	131	242	53	2	1	29	85	327
	Higher Cert	85	1	0	99	185	66	1	0	16	83	268
	Diploma	99	1	0	68	168	102	0	0	12	114	282
	Total	293	3	1	298	595	221	3	1	57	282	877
2001	Certificate	92	2	1	133	228	77	2	0	10	89	317
	Higher Cert	47	6	0	99	152	42	1	0	14	57	209
	Diploma	101	2	0	58	161	87	0	0	10	97	258
	Total	240	10	1	290	541	206	3	0	34	243	784
2000	Certificate	52	1	0	102	155	37	2	0	15	54	209
	Higher Cert	65	3	0	115	183	51	2	1	16	70	253
	Diploma	222	2	2	61	287	170	0	0	5	175	462
	Total	339	6	2	278	625	258	4	1	36	299	924
1999	Certificate	101	6	0	80	187	70	4	0	13	87	274
	Higher Cert	78	7	0	127	212	38	1	0	13	52	264
	Diploma	120	1	0	97	218	132	0	0	7	139	357
	Total	299	14	0	304	617	240	5	0	33	278	895

3.11 Output of FET Colleges affected by sectoral and sub-sectoral factors

Of the fifty FET Colleges, only ten offer agricultural programmes. The current enrolment in agricultural instructional offerings of less than 1% constitutes a small proportion of the entire enrolment of students in all the FET Colleges across all programmes. Cumulatively, in 2004 students completed 625 instructional offerings in the field of agriculture. Each instructional offering is a component within a programme leading to a qualification. Therefore, the actual number of graduates will be considerably lower than these totals.

Table 30: Comparison of registration of students for all FET and only for Agriculture related instructional offerings, 2004

All FET Instructional Offerings	Jun	Registered	Wrote	Passed
	Nov	185 626	166 261	108 331
FET Instructional Offerings in Agriculture	Jun	266 488	222 938	140 755
	Nov	1 255	727	290
Agricultural Instructional Offerings as a %	Jun	990	751	335
of all FET Instructional Offerings	Nov	0.68% 0.37%	0.44% 0.34%	0.27% 0.24%

The data on rates of completion of the FET qualifications, which are N1 to N6 and the Diploma, show that between 2000 and 2004 overall between 119 and 161 people graduated across the different levels (Table 31 below).

It is clear that the main source levels at which students complete is N4 to N6 which indicates that prospective students are more interested in the post –N3 level programmes. These programmes have a required practical component which means that those enrolled are likely to be either working in an agricultural business environment or are themselves small business owners.

The data on the FET Colleges obtained from the National Department of Education was not provided with race breakdowns. However, in terms of gender, there is a visible pattern in which females constitute generally less than 20% of the graduate population

Table 31: Graduate output from FET Collees with N1 to N6 and Diploma from 2000 to 2004

	2000			2001			2002			2003			2004		
Qualification	**M**	**F**	**Total**	**M**	**F**	**Total**	**M**	**F**	**Total**	**M**	**F**	**Total**	**M**	**F**	**Total**
N1	3	3	6	6	1	7			-	9	1	10	4	1	5
N2	5	9	14	13	12	25	8	1	9	6	3	9	10	6	16
N3	31		31	32	6	38	21	7	28	23	2	25	10	5	15
N4	30	1	31	41	4	45	20	3	23	40	12	52	22	11	33
N5	31		31	20	1	21	27	9	36	26	3	29	21	11	32
N6	36		36	20	1	21	13		13	11	1	12	37	13	50
Diploma			10			10			10			10			10
Total	136	13	159	132	25	167	89	20	119	115	22	147	104	47	161

Notes:

1. The data for 2002 has to be checked with SITA
2. The data for the Diploma was provided as a grand total 50 graduates for all years between 2000 and 2004. This was proportionately allocated to each year so as to obtain an average output of the system. SITA has been approached to obtain the actual annual breakdown.

It is clear that the semester-based structure of instructional offerings provided by the FET Colleges lends itself to learners enrolling not for a whole qualification at one time, but on an intermittent basis. In some instances, learners will enroll for a one semester instructional offering from the N4 to the N6 level on a once-off basis because this meets a particular need they have for specific skills (eg: employees in the wine industry may take a single course in viticulture in the N4 to N6 level). In other instances, learners who are full time or part time employed will enroll for courses on an intermittent basis over a period of several years before they complete all the requirements for a particular qualification.

3.12 Conclusion

The annual graduation 'output' from agriculture programmes, for universities and Technikons combined, rose from 967 in 1994 to 1765 graduates in 2003. The agriculture share of total enrolment in higher education rose from 1.32% in 1994 to 1.56% in 2003. Even though enrolment in ARNR appeared to increase only slightly in percentage terms, 1 721 more students enrolled in 2003 in comparison with 1994. Agriculture programme graduation numbers as a share of total graduations in higher education increased from 1.30% to 1.61% between 1994 and 2003. This suggests that relatively, the efficiency of agriculture programmes increased slightly against the national average.

There is a consistent pattern of numerically larger enrolments in ARNR in Technikons than universities. Over the last decade, the share of enrolments has been in the favour of Technikons on a 3:2 basis. The main feature of changing enrolment patterns in both universities and Technikons was a significant increase in African enrolments from 42% in 1996 to 62% in 2003. In the period under review, agriculture enrolments were consistently higher for men who accounted for 58% and 63% of enrolments at universities and Technikons respectively in 2003.

In universities, the fields with the largest share of enrolment in 2003 were: Agricultural Economics (25%), Animal Sciences (18%), Plant Sciences (14%) and Soil Sciences (7%). In Technikons, the fields with the largest share of enrolment in 2003 were: Animal Sciences (29%), Horticulture (14%), and Plant Sciences (12%). Across higher education there were four key fields which shared the bulk of registration in 2003. They were: Animal Sciences (25%), Agricultural Economics (14%), Plant Sciences (13%), and Horticulture (10%).
In universities, post-graduate enrolment comprised 38% of all enrolment, with a particularly large proportion of enrolment at the Masters Degree level. At the higher degree level, there was very low enrolment of students at post-graduate levels within Technikons at only 2% of all enrolment.

In the Agricultural Colleges, the graduate outputs ranged from a low of 794 in 2001 to 1000 in 2004. In terms of gender, male graduates consistently outnumber female graduates on a ratio of about 2.5 to 1. Overall, between 1999 and 2004, African students were the largest group of graduates (59%) followed by White students (39%).

Rates of completion of the FET qualifications, which are N1 to N6 and the Diploma, show that between 2000 and 2004, overall between 119 and 161 people graduated across the different levels. It is clear that the levels at which most students complete is N4 to N6, which indicates that students are more interested in the post–N3 level programmes. The data on the FET Colleges obtained from the National Department of Education was not provided with race breakdowns. However, in terms of gender, there is a visible pattern in which females constitute less than 20% of the graduate population.

3.13 References

Subotsky, G. (2003) "Private Higher Education and Training" In: Human Sciences Research Council Human Resources Development Review, 2003 Pretoria, HSRC.

CHAPTER 4

Enrolment, graduation and throughput of agricultural graduates in higher education according race, gender and field of study from 2000 to 2003

4.1 Introduction

In South Africa, creating equality of access, opportunity and outcomes in education is a critically important mission for the public education system. This is a particularly important challenge given the historical background of Apartheid which involved state sponsored discrimination against people on the basis of race. Furthermore, educational issues are central to the transformation of the agriculture sector, given the history of land dispossession, racial demarcation of occupations in the agricultural sector and relegation of the agriculture curriculum in black schools to low-skills activities under Apartheid and colonialism.

It is thus important to monitor the patterns of access to the agriculture field in higher education as the study fields taken up by students from previously disadvantaged communities, can contribute to black economic empowerment, and gender parity in the sector.

This chapter therefore provides an intensive analysis of the race and gender proportions of enrolments, graduates and throughput in the fields of study associated with the broad category of Agriculture and Renewable Natural Resources (ARNR) created according to the Classification of Education Subject Matter (CESM) system employed in South Africa's higher education system.

The chapter will procede as follows: first, a set of summary tables is presented to show the overall race and gender distribution of enrolments and graduates for each ARNR study field (2nd Order CESM Category). In this set of tables as in all other tables in this chapter, the data is presented separately for universities and for technikons.

Following the presentation of data by field, each table is sorted in order to show highest to lowest representation of Africans per study field. The tables are also sorted to show highest to lowest representation of females per study field.

Then, the data for each field is presented separately to reveal shifts in student distributions by race and gender. In order to make the information more user friendly, each study-field is presented with:

- a list of sub-fields that it contains
- an example of at least one core occupation associated with the field
- tables describing distributions by race and gender for enrolments, graduations and throughput (universities and technikons separately)
- a table showing which institutions offered instruction in the field

Where appropriate, commentary is provided.

It is important to acknowledge that the data only covers a four year period – 2000 to 2003. Over such a short period, it may not be possible to discern clear trends. The data is only available from 2000 onwards because the HEMIS system was able to generate enrolment and graduation head-counts by field of study but not by the race and gender identity of students before that year. The data for 2004 has not been released by the Department of Education.

It should be noted that the numbers cited here include all qualification levels from undergraduate to post-graduate in order to show the overall pattern of access to each field.

4.2 Summary tables of enrolments and graduations by race and gender

This section will first compare the overall distribution of enrolment and graduation in the universities with the overall distribution of enrolment and graduation in the technikons.

In the universities, the data shows that there was an equally wide range in the distribution of Africans across the agriculture study fields from 100% to 14% for enrolments, and from 100% to 11% for graduations. In other words, in some fields only Africans were enrolled while in other fields, Africans constituted only 14% of enrolments (Table 1 and Table 2).

Differences in gender representation were less extreme, showing that the proportions of female students ranged from 72% to 17% and from 74% to 13% among enrolments and graduations respectively. Put differently, in some fields about three quarters of students enrolled were women and in other fields the proportion of women was less than one-in-five (Table 1 and Table 2). Despite the fact that the overall proportion of men in universities was 58% in 2003, it is clear that there are a few courses where women dominate enrolments (Table 15 Chapter 3).

Table 1: Race and gender share of University enrolments in Agriculture and Renewable Natural Resources between 2000 and 2003

2nd order CESM Category or Study field	Total	Race %				Gender %	
	N	African	Coloured	Indian	White	Female	Male
0101 Agricultural Economics	3613	69	1	1	30	32	68
0102 Agricultural Extension	3091	89	0	0	10	48	52
0103 Agricultural Food Technology	761	44	2	2	52	72	28
0104 Animal Sciences	3737	64	0	1	35	47	53
0105 Horticulture	599	40	1	1	58	38	62
0106 Plant Sciences	2616	54	3	1	43	41	59
0107 Soil Sciences	1248	49	1	1	49	32	68
0108 Fisheries	6	100	0	0	0	67	33
0109 Forestry	261	51	3	3	44	17	83
0110 Outdoor Recreation	0	-	-	-	-	-	-
0111 Wildlife	385	14	2	1	83	37	63
0112 Land Reclamation	0	-	-	-	-	-	-
0113 Renewable Natural Resources	530	92	1	3	5	47	53
0199 Other Ag. and Renewable Resources	890	46	1	3	50	40	60

Table 2: Race and gender share of University graduates in Agriculture and Renewable Natural Resources between 2000 and 2003

2nd order CESM Category or Study field	Total	Race %				Gender %	
	N	African	Coloured	Indian	White	Female	Male
0101 Agricultural Economics	720	58	1	1	40	32	68
0102 Agricultural Extension	219	95	0	0	4	47	53
0103 Agricultural Food Technology	213	28	2	2	67	74	26
0104 Animal Sciences	748	60	0	1	39	46	54
0105 Horticulture	150	30	0	1	70	37	63
0106 Plant Sciences	691	41	3	1	56	43	57
0107 Soil Sciences	271	51	0	2	48	38	62
0108 Fisheries	4	100	0	0	0	75	25
0109 Forestry	61	42	2	2	54	13	87
0110 Outdoor Recreation	0	-	-	-	-	-	-
0111 Wildlife	154	11	2	1	86	47	53
0112 Land Reclamation	0	-	-	-	-	-	-
0113 Renewable Natural Resources	25	91	0	0	9	52	48
0199 Other Ag. and Renewable Resources	124	70	0	1	29	37	63

In the technikons, the proportions of Africans across the study fields ranged from 75% to 5% for enrolments, and from 70% to 11% for graduations. This suggests that the distribution of African university students across the fields of study was more uneven than in the Technikons, bearing in mind that overall proportions of Africans in universities and technikons were close at 62% and 63% respectively (Table 9 and Table 10 in Chapter 3). In some courses in the universities (eg: Renewable Natural Resources 92% and Agricultural Extension 89%) Africans experienced higher levels of representation than in the technikons.

In the technikons, differences in gender representation were less extreme between enrolments and graduations showing that the presence of female students ranged from 58% to 11%, and from 55% to 19% respectively (Table 3 and Table 4) Overall, in technikons, enrolment of women in 2003 stood at 63% (Table 16 in Chapter 3). In terms of graduations, females at best barely outnumbered males in two fields and achieved lower rates in the balance of study fields. In comparison with universities, the technikons appeared to afford less opportunity for women, in that there were less courses where female enrolments outnumbered male enrolments.

Table 3: Race and gender share of Technikon enrolments in Agriculture and Renewable Natural Resources between 2000 and 2003

2nd order CESM Category or Study field	Total N	Race %				Gender %	
		African	Coloured	Indian	White	Female	Male
0101 Agricultural Economics	1395	72	3	0	25	42	58
0102 Agricultural Extension	666	75	1	0	24	50	50
0103 Agricultural Food Technology	0	-	-	-	-	-	-
0104 Animal Sciences	6875	67	2	0	31	39	61
0105 Horticulture	3182	53	5	2	40	39	61
0106 Plant Sciences	2551	62	3	0	35	31	69
0107 Soil Sciences	412	57	1	1	41	34	66
0108 Fisheries	10	5	0	0	95	41	59
0109 Forestry	684	56	3	1	40	11	89
0110 Outdoor Recreation	1883	55	2	2	40	58	42
0111 Wildlife	1169	35	0	0	64	36	64
0112 Land Reclamation	0						
0113 Renewable Natural Resources	1315	48	7	0	45	35	65
0199 Other Ag. and Renewable Resources	3655	66	3	2	28	25	75

Table 4: Race and gender share of Technikon graduates in Agriculture and Renewable Natural Resources between 2000 and 2003

2nd order CESM Category or Study field	Total N	Race %				Gender %	
		African	Coloured	Indian	White	Female	Male
0101 Agricultural Economics	145	66	4	1	29	34	66
0102 Agricultural Extension	106	69	0	0	31	55	45
0103 Agricultural Food Technology	0	-	-	-	-	-	-
0104 Animal Sciences	827	70	1	0	29	35	65
0105 Horticulture	265	34	11	2	54	39	61
0106 Plant Sciences	268	40	3	0	56	32	68
0107 Soil Sciences	?	14	0	0	86	14	86
0108 Fisheries	2	11	0	0	89	33	67
0109 Forestry	149	48	3	1	49	19	81
0110 Outdoor Recreation	167	26	1	2	71	51	49
0111 Wildlife	188	24	0	0	76	40	60
0112 Land Reclamation	0						
0113 Renewable Natural Resources	227	32	6	0	63	35	65
0199 Other Ag. and Renewable Resources	373	57	1	0	41	21	79

The analysis will now examine more closely how enrolments and graduations are distributed across the different study fields.

It should also be noted that the representation of persons classified as 'Coloured' and 'Indian' is very low across all agricultural fields. For this reason, discussion will focus mainly on the proportionate share of enrolments between African and White students. This does not detract from the question: why do Coloured and Indian students show low levels of interest in agriculture, which would require investigation beyond the scope of this study.

In the universities, the study fields with the highest proportions of African students were Renewable Natural Resources (92%) and Agricultural Extension (89%), whereas the lowest proportionate share of registration was in Agricultural Food Technology (44%), Horticulture (40%) and Wildlife (14%). The low enrolment in a technological subject such as Agricultural Food Technology can be partly understood in relation to small numbers of African learners completing Senior Certificate with Mathematics and Science. Yet, at the same time, African student enrolment in Agricultural Economics is relatively high which suggests that the gateway subjects of Mathematics and Science subjects cannot be the only reason for low enrolment in particular study fields. Easier admission criteria for Agricultural Extension – which generally do not specify high levels of Mathematics skills – can partially explain why enrolment of African students in that field is so high.

In some instances there is a particular pattern of enrolment in subjects by race and gender. For example, we have already shown that low numbers of Africans are enrolled for Agricultural Food Technology, and this is coupled with high female representation of 72%, which implies that the majority group enrolled is white females.

The following discussion focuses on comparing the enrolment share with the graduation share obtained by the different race groups. Of particular interest is where a race group has a lower share of graduations than its share of enrolments, or the other way round. In the former situation, where the proportionate share of graduations is much lower than enrolments this must be taken as a matter of concern.

When the pattern of enrolments is compared with graduations in the universities, there are certain fields in which the graduation figures of Africans are markedly lower than their enrolment figures: Agricultural Food Technology (16% lower), Plant Sciences (13% lower) and Agricultural Economics (11% lower).

Table 5: Share of University enrolments in Agriculture and Renewable Natural Resources by race and ranked by highest African share of 2nd order CESM Category or Study field from 2000 to 2003 (%)

2nd order CESM Category or Study field	Total	Race share %			
	N	African	Coloured	Indian	White
0108 Fisheries	6	100	0	0	0
0113 Renewable Natural Resources	530	92	1	3	5
0102 Agricultural Extension	3091	89	0	0	10
0101 Agricultural Economics	3613	69	1	1	30
0104 Animal Sciences	3737	64	0	1	35
0106 Plant Sciences	2616	54	3	1	43
0109 Forestry	261	51	3	3	44
0107 Soil Sciences	1248	49	1	1	49
0199 Other Ag. and Renewable Resources	890	46	1	3	50
0103 Agricultural Food Technology	761	44	2	2	52
0105 Horticulture	599	40	1	1	58
0111 Wildlife	385	14	2	1	83
0112 Land Reclamation	0	-	-	-	-
0110 Outdoor Recreation	0	-	-	-	-

Table 6:Share of University enrolments in Agriculture and Renewable Natural Resources by gender and ranked by 2nd order CESM Categoryor Study field category from 2000 to 2003 (%)

2nd order CESM Category or Study field	Total	Gender share %	
	N	Female	Male
0103 Agricultural Food Technology	761	72	28
0108 Fisheries	6	67	33
0102 Agricultural Extension	3091	48	52
0104 Animal Sciences	3737	47	53
0113 Renewable Natural Resources	530	47	53
0106 Plant Sciences	2616	41	59
0199 Other Ag. and Renewable Resources	890	40	60
0105 Horticulture	599	38	62
0111 Wildlife	385	37	63
0101 Agricultural Economics	3613	32	68
0107 Soil Sciences	1248	32	68
0109 Forestry	261	17	83
0112 Land Reclamation	0	-	-
0110 Outdoor Recreation	0	-	-

Table 7: Share of University graduates in Agriculture and Renewable Natural Resources by race and ranked by 2nd order CESM Category or Study field from 2000 to 2003 (%)

2nd order CESM Category or Study field	Total	Gender share %			
	N	African	Coloured	Indian	White
0108 Fisheries	4	100	0	0	0
0102 Agricultural Extension	219	95	0	0	4
0113 Renewable Natural Resources	25	91	0	0	9
0199 Other Ag. and Renewable Resources	124	70	0	1	29
0104 Animal Sciences	748	60	0	1	39
0101 Agricultural Economics	720	58	1	1	40
0103 Agricultural Food Technology	213	28	2	2	67
0107 Soil Sciences	271	51	0	2	48
0109 Forestry	61	42	2	2	54
0106 Plant Sciences	691	41	3	1	56
0105 Horticulture	150	30	0	1	70
0111 Wildlife	154	11	2	1	86
0110 Outdoor Recreation	0	-	-	-	-
0112 Land Reclamation	0	-	-	-	-

In the universities, female students tended to fare better academically than male students. There was only one field, Forestry, in which the graduation rate of female students was lower than their enrolment rate. In six other fields, the decline in graduation rates was among male students (Table 8).

Table 8: Share of University enrolments in Agriculture and Renewable Natural Resources by gender and ranked by 2nd order CESM Category or Study field from 2000 to 2003 (%)			
2nd order CESM Category or Study field	Total	Gender share %	
	N	Female	Male
0108 Fisheries	4	75	25
0103 Agricultural Food Technology	213	74	26
0113 Renewable Natural Resources	25	52	48
0102 Agricultural Extension	219	47	53
0111 Wildlife	154	47	53
0104 Animal Sciences	748	46	54
0106 Plant Sciences	691	43	57
0107 Soil Sciences	271	38	62
0105 Horticulture	150	37	63
0199 Other Ag. and Renewable Resources	124	37	63
0101 Agricultural Economics	720	32	68
0109 Forestry	61	13	87
0110 Outdoor Recreation	0	-	-
0112 Land Reclamation	0	-	-

In the Technikons, the subject field with the biggest proportion of African students was Agricultural Extension (75%) followed by Agricultural Economics (72%).

Table 9: Share of Technikon enrolments in Agriculture and Renewable Natural Resources by race and ranked by 2nd order CESM Category or Study field from 2000 to 2003 (%)					
2nd order CESM Category or Study field	Total	Gender share %			
	N	African	Coloured	Indian	White
0104 Animal Sciences	6875	67	2	0	31
0199 Other Ag. and Renewable Resources	3655	66	3	2	28
0106 Plant Sciences	2551	62	3	0	35
0107 Soil Sciences	412	57	1	1	41
0109 Forestry	684	56	3	1	40
0110 Outdoor Recreation	1883	55	2	2	40
0105 Horticulture	3182	53	5	2	40
0113 Renewable Natural Resources	1315	48	7	0	45
0111 Wildlife	1169	35	0	0	64
0108 Fisheries	10	5	0	0	95
0103 Agricultural Food Technology	0	-	-	-	-
0112 Land Reclamation	0	-	-	-	-

Table 10: Share of technikon enrolments in Agriculture and Renewable Natural Resources by gender and ranked by 2nd order CESM Category or Study field from 2000 to 2003 (%)			
2nd order CESM Category or Study field	Total	Gender share %	
	N	Female	Male
0110 Outdoor Recreation	1883	58	42
0102 Agricultural Extension	666	50	50
0101 Agricultural Economics	1395	42	58
0108 Fisheries	10	41	59
0104 Animal Sciences	6875	39	61
0105 Horticulture	3182	39	61
0111 Wildlife	1169	36	64
0113 Renewable Natural Resources	1315	35	65
0107 Soil Sciences	412	34	66
0106 Plant Sciences	2551	31	69
0199 Other Ag. and Renewable Resources	3655	25	75
0109 Forestry	684	11	89
0103 Agricultural Food Technology	0	-	-
0112 Land Reclamation	0	-	-

In the technikons there were several fields where African students suffered a significant slump between their shares of enrolments as compared with graduations such as in: Outdoor Recreation (29% down), Plant Sciences (22% down) and Horticulture (19% down). This is of concern particularly in the latter fields where African enrolment was high.

Table 11: Share of Technikon graduates in Agriculture and Renewable Natural Resources by race and ranked by 2nd order CESM Category or Study field from 2000 to 2003 (%)					
2nd order CESM Category or Study field	Total	Gender share %			
	N	African	Coloured	Indian	White
0104 Animal Sciences	827	70	1	0	29
0102 Agricultural Extension	106	69	0	0	31
0101 Agricultural Economics	145	66	4	1	29
0199 Other Ag. and Renewable Resources	373	57	1	0	41
0109 Forestry	149	48	3	1	49
0106 Plant Sciences	268	40	3	0	56
0105 Horticulture	265	34	11	2	54
0113 Renewable Natural Resources	227	32	6	0	63
0110 Outdoor Recreation	167	26	1	2	71
0111 Wildlife	188	24	0	0	76
0107 Soil Sciences	?	14	0	0	86
0108 Fisheries	2	11	0	0	89
0103 Agricultural Food Technology	0	-	-	-	-
0112 Land Reclamation	0	-	-	-	-

It is remarkable that whereas in universities, the performance of women is stronger than men, this is reversed in the technikons. In only three fields: Forestry (+8%), Wildlife (+4%) and Plant Sciences (+1%) did females manage to increase their share of graduations over their enrolments.

Table 10: Share of technikon enrolments in Agriculture and Renewable Natural Resources by gender and ranked by 2nd order CESM Category or Study field from 2000 to 2003 (%)			
2nd order CESM Category or Study field	Total	Gender share %	
	N	Female	Male
0110 Outdoor Recreation	1883	58	42
0102 Agricultural Extension	666	50	50
0101 Agricultural Economics	1395	42	58
0108 Fisheries	10	41	59
0104 Animal Sciences	6875	39	61
0105 Horticulture	3182	39	61
0111 Wildlife	1169	36	64
0113 Renewable Natural Resources	1315	35	65
0107 Soil Sciences	412	34	66
0106 Plant Sciences	2551	31	69
0199 Other Ag. and Renewable Resources	3655	25	75
0109 Forestry	684	11	89
0103 Agricultural Food Technology	0	-	-
0112 Land Reclamation	0	-	-

4.3 Analysis by agricultural study field

The data summarized above will now be presented and analysed by study field, according to the Classification of Education Subject Matter (CESM) categories given by the Department of Education (ie: each 2nd Order CESM Category is taken as a 'study field').

Three difficulties present themselves for this analysis. First, the short time-series over which the data is available makes long term trends difficult to discern. It will be useful to track the data in the longer term to confirm the trends that are apparent in this series. Second, it is important to bear in mind that where enrolment and/or graduation numbers are small, when these numbers are converted to percentages they are not analytically useful. Third, the tables showing throughput rates are most difficult to 'read' in a straightforward way because changes in throughput can fluctuate dramatically from year to year.

In order to take these difficulties into account, in each table, enrolment, graduates and throughput data over the period 2000 to 2003 are averaged. The analysis will mainly refer to these averages, which present a more stable and reliable picture of race and gender access.

4.3.1 Agricultural Economics

0101 Agricultural Economics	Agricultural Appraisal
	Agricultural Credit and finance
	Agricultural Marketing
	Agricultural Oranisations
	Agricultural supplies
	Economic development and international trade
	Farm management
	Public policy and Agriculture
	Other agricultural economics (specify)

Agricultural economists "analyse and advise on the optimal use of production factors for the environmentally sustainable production of food and fibres in an internationally competitive marketing milieu. They are also concerned with all economic activities which include the manufacture and distribution of agricultural means of production, the farming process, determination of government policy concerning agricultural and consumption affairs, purchasing, processing and distribution of agricultural products as well as the international trade policies." (Department of Agriculture, 2004, 7)

Table 13: CESM 0101 Agricultural Economics

Universities

Enrolment

		Race				Gender	
Year	**Total**	**A**	**C**	**I**	**W**	**F**	**M**
2000	761	389	9	6	357	197	564
2001	886	590	5	6	286	256	630
2002	824	594	5	7	219	279	545
2003	1142	919	7	6	210	416	727
Total	3613	2491	26	24	1071	1148	2465
%		69%	1%	1%	30%	32%	68%

Graduates

		Race				Gender	
Year	**Total**	**A**	**C**	**I**	**W**	**F**	**M**
2000	200	106	3	1	90	58	142
2001	191	111	1	1	78	54	137
2002	143	73	1	3	66	52	91
2003	186	130	0	0	56	70	116
Total	720	421	5	5	290	233	486
%		58%	1%	1%	40%	32%	68%

Throughput

		Race				Gender	
Year	**Average**	**A**	**C**	**I**	**W**	**F**	**M**
2000	26%	27%	30%	15%	25%	29%	25%
2001	22%	19%	21%	9%	27%	21%	22%
2002	17%	12%	22%	42%	30%	19%	17%
2003	16%	14%	0%	6%	27%	17%	16%
	20%	17%	18%	19%	27%	20%	20%

- There was a large increase overall in enrolments
- The share of African enrolments increased and White enrolments decreased
- The throughput of African students dropped while White throughput remained stable
- This field was dominated by male students in spite of the higher general levels of female enrolment in the universities

Table 14: CESM 0101 Agricultural Economics							
Technikons							
Enrolment							
		Race				Gender	
Year	Total	A	C	I	W	F	M
2000	199	173	2	2	22	88	111
2001	488	375	14	1	99	204	284
2002	314	208	12	1	92	126	188
2003	394	244	15	1	133	162	231
Total	1395	1000	43	5	346	581	814
%		72%	3%	0%	25%	42%	58%

Graduates							
		Race				Gender	
Year	Total	A	C	I	W	F	M
2000	37	10632	0	1	4	13	24
2001	26	21	0	0	5	7	19
2002	37	27	2	1	7	13	25
2003	45	16	3	0	26	17	28
Total	145	96	5	2	42	49	96
%		66%	4%	1%	29%	34%	66%

Throughput							
		Race				Gender	
Year	Average	A	C	I	W	F	M
2000	18%	18%	11%	55%	18%	15%	22%
2001	5%	6%	0%	0%	5%	3%	7%
2002	12%	13%	17%	80%	8%	10%	13%
2003	11%	7%	20%	0%	20%	10%	12%
	10%	10%	12%	39%	12%	9%	12%

- Agricultural economics enrolments are larger in the universities
- African proportions in this field in technikons are marginally higher than in universities
- The African share of graduates is slightly lower than the share of enrolment

Enrolments at institutions where Agricultural Economics (0101) was offered between 2000 – 2003:	
Technikons	
Institution	
Cape Technikon	98
Pretoria Technikon	570
Technikon SA	716
Witwatersrand Technikon	12
Universities	
Institution	
University of Fort Hare	295
University of Natal	394
University of the North	646
University of the Free State	824
University of Stellenbosch	317
University of Zululand	70
Vista University	13
University of Transkei	5
University of North West	88
University of Venda	410

4.3.2 Agricultural Extension

0102 Agricultural Extension	No subfields specified

Agricultural extension is defined as: “The provision of information to farmers on agricultural production technologies designed to increase production, protect natural resources and the environment, or achieve some other objective” (), or as: “the application of scientific research and new knowledge to agricultural practices through farmer education” (http://en.wikipedia.org/wiki/Agricultural_extension)

Table 15: CESM 0102 Universities							
Enrolment							
Race							
		Race				Gender	
Year	Total	A	C	I	W	F	M
2000	891	879	2	1	10	420	471
2001	1323	1299	3	1	20	672	651
2002	391	275	2	3	112	166	226
2003	486	300	5	8	173	220	265
Total	3091	2753	12	13	314	1478	1613
%		89%	0%	0%	10%	48%	52%

Graduates							
		Race				Gender	
Year	Total	A	C	I	W	F	M
2000	34	30	1	0	4	10	24
2001	50	45	0	1	4	22	28
2002	79	78	0	0	1	46	33
2003	55	55	0	0	1	24	31
Total	219	208	1	1	9	103	116
%		95%	0%	0%	4%	47%	53%

Throughput							
		Race				Gender	
Year	Average	A	C	I	W	F	M
2000	4%	3%	25%	0%	38%	2%	5%
2001	4%	3%	0%	43%	19%	3%	4%
2002	20%	28%	0%	0%	1%	28%	15%
2003	11%	18%	0%	0%	0%	11%	12%
	7%	**8%**	**4%**	**4%**	**3%**	**7%**	**7%**

- Overall enrolment in this field was unstable which affects throughput rate calculations
- African enrolment proportions were high and throughput was positive
- White enrolment increased significantly from a small base

Table 16: CESM 0102 Agricultural Extension							
Technikons							
Enrolment							
		Race				Gender	
Year	Total	A	C	I	W	F	M
2000	67	29	1	0	37	20	47
2001	155	112	1	0	43	89	67
2002	252	197	3	0	52	120	132
2003	192	164	0	0	28	102	91
Total	666	501	6	0	159	330	336
%		75%	1%	0%	24%	50%	50%

Graduates							
		Race				Gender	
Year	Total	A	C	I	W	F	M
2000	14	4	0	0	10	5	9
2001	45	34	0	0	11	28	17
2002	19	11	0	0	8	13	7
2003	29	24	0	0	4	13	16
Total	106	73	0	0	33	58	48
%		69%	0%	0%	31%	55%	45%

Throughput							
		Race				Gender	
Year	Average	A	C	I	W	F	M
2000	21%	14%	0%	0%	26%	22%	20%
2001	29%	30%	25%	0%	25%	32%	25%
2002	8%	6%	0%	0%	16%	11%	5%
2003	15%	15%	0%	0%	16%	13%	17%
	16%	15%	4%	0%	21%	18%	14%

- Agricultural extension enrolments at technikons were smaller than at universities
- African enrolments dominated but to a slightly lesser extent than universities
- African students' share of graduations was 6% smaller than their share of enrolments

Enrolments at institutions where Agricultural Extension (0102) was offered between 2000 – 2003:		
Technikons		
Code	Institution	
301	Cape Technikon	81
303	Mangosuthu Technikon	333
308	Port Elizabeth Technikon	71
309	Pretoria Technikon	181
Universities		
Code	Institution	
103	University of Fort Hare	291
106	University of the North	56
107	University of the Free State	11
110	University of Pretoria	788
117	University of Zululand	27
120	University of North West	22
121	University of Venda	1897

4.3.3 Agricultural Food Technology

0103 Agricultural Food Technology	Dairy Technology
	Fruit Technology
	Meat Technology
	Vegetable Technology
	Wine Technology
	Other agricultural food technoloy (specify)

The food technologist is “concerned with aspects pertaining to the production, preservation and development of high-quality foods. They also manage processing plants and quality assurance laboratories. They are charged with monitoring of food-quality standards by government bodies (namely SABS)” (Department of Agriculture, 2004, 21).

Table 17: CESM 0103 Agricultural Food Technology							
Universities							
Enrolment							
		Race				Gender	
Year	Total	A	C	I	W	F	M
2000	177	74	3	3	96	127	50
2001	183	84	2	4	93	132	51
2002	207	97	2	4	104	150	57
2003	195	80	6	6	103	143	52
Total	761	335	14	17	396	552	210
%		44%	2%	2%	52%	72%	28%

Graduates							
		Race				Gender	
Year	Total	A	C	I	W	F	M
2000	50	12	2	3	35	33	17
2001	41	8	0	0	33	30	11
2002	67	30	0	2	35	51	17
2003	54	11	3	0	41	44	11
Total	213	60	5	5	143	157	56
%		28%	2%	2%	67%	74%	26%

Throughput							
		Race				Gender	
Year	Average	A	C	I	W	F	M
2000	28%	16%	45%	83%	36%	26%	35%
2001	22%	9%	16%	0%	35%	23%	22%
2002	33%	31%	0%	50%	34%	34%	30%
2003	28%	13%	49%	0%	40%	30%	21%
	28%	18%	35%	27%	36%	28%	27%

- Enrolments were stable but there are disparities in access and achievement between race groups
- African enrolment was relatively low with a low success rate as measured in the difference between enrolment and graduation proportions
- The share of graduations among White students was higher than their share of enrolment
- Disparities in access and achievement of graduation share suggests that African students need support

NOTE: The Department of Education HEMIS data showed no students in the Technikons enrolled or graduating in the study field "CESM 0103 Agricultural Food Technology"

Enrolments at institutions where Agricultural Food Technology (0103) was offered between 2000 – 2003:		
Universities		
Code	Institution	
105	University of Natal	6
107	University of the Free State	76
110	University of Pretoria	430
114	University of Stellenbosch	184
121	University of Venda	66

4.3.4 Animal Sciences

0104 Animal Sciences	Animal anatomy physioloy and biochemistry
	Animal or animal products selection and evaluation
	Animal diseases parasites and insects
	Animal genetics and reproduction
	Animal health and care
	Animal management and production
	Animal nutrition
	Other animal sciences (specify)

Animal scientists are "involved in research and development and give advice to the livestock industry concerning the production of animals and their products. These scientists focus areas include: animal nutrition, breeding, genetics and meat science, as well as various production systems with regard to a variety of farm animals."(Department of Agriculture, 2004, 14).

Table 18: CESM 0104 Animal Sciences							
Universities							
Enrolment							
		Race				Gender	
Year	Total	A	C	I	W	F	M
2000	695	360	3	7	325	307	388
2001	1202	867	2	6	327	590	612
2002	1000	644	4	8	344	476	524
2003	840	509	4	10	317	393	447
Total	3737	2380	14	31	1313	1766	1971
%		64%	0%	1%	35%	47%	53%

Graduates							
		Race				Gender	
Year	Total	A	C	I	W	F	M
2000	185	105	1	0	0	81	105
2001	169	99	0	0	0	75	94
2002	165	81	2	1	1	76	89
2003	229	162	0	3	3	116	113
Total	748	447	3	4	4	347	401
%		60%	0%	1%	1%	46%	54%

Throughput							
		Race				Gender	
Year	Average	A	C	I	W	F	M
2000	27%	29%	39%	0%	24%	26%	27%
2001	14%	11%	0%	5%	21%	13%	15%
2002	16%	13%	39%	9%	24%	16%	17%
2003	27%	32%	0%	34%	20%	29%	25%
	20%	19%	20%	14%	22%	20%	20%

- This is an important field especially because the overall enrolment is large
- Of concern was the fluctuation in African enrolment
- African participation was relatively strong – although graduation proportions were slightly under enrolment rates

Table 19: CESM 0104 Animal Sciences							
Technikons							
Enrolment							
		Race				Gender	
Year	Total	A	C	I	W	F	M
2000	1384	979	13	4	389	511	874
2001	1860	1210	29	5	616	714	1146
2002	1675	1105	28	7	533	674	1001
2003	1955	1311	62	4	579	815	1140
Total	6875	4605	132	19	2117	2713	4161
%		67%	2%	0%	31%	39%	61%

Graduates							
		Race				Gender	
Year	Total	A	C	I	W	F	M
2000	193	132	0	1	61	65	128
2001	211	142	2	1	67	65	146
2002	118	81	1	0	36	35	83
2003	305	226	4	0	74	127	178
Total	827	580	7	2	238	292	535
%		70%	1%	0%	29%	35%	65%

Throughput							
		Race				Gender	
Year	Average	A	C	I	W	F	M
2000	14%	13%	0%	26%	16%	13%	15%
2001	11%	12%	5%	20%	11%	9%	13%
2002	7%	7%	5%	0%	7%	5%	8%
2003	16%	17%	7%	0%	13%	16%	16%
	12%	13%	5%	11%	11%	11%	13%

- Enrolment of African and White students in Animal Sciences grew between 2000 and 2004
- African students constituted just over two thirds of enrolments
- The share of graduations among African students was higher than their share of enrolments

Enrolments at institutions where Animal Science (0104) was offered between 2000 – 2003:		
Technikons		
Code	Institution	
301	Cape Technikon	280
303	Mangosuthu Technikon	1118
306	Technikon Free State	432
308	Port Elizabeth Technikon	245
309	Pretoria Technikon	2791
310	Technikon SA	2003
311	Vaal Triangle Technikon	5

Universities		
Code	Institution	
103	University of Fort Hare	104
105	University of Natal	189
106	University of the North	161
107	University of the Free State	351
110	University of Pretoria	935
113	University of South Africa	1
114	University of Stellenbosch	290
117	University of Zululand	148
118	Vista University	23
120	University of North West	1379
121	University of Venda	157

4.3.5 Horticulture

0105 Horticulture	Arboriculture
	Floriculture
	Greenhouse and nursery
	Landscaping
	Production of fruits
	Production of vegetables
	Production of vegetables in plastic tunnels
	Lawns
	Other horticulture

Horticulturalists "are involved in the application of scientifically based production systems of vegetables, fruit and ornamental plants" (Department of Agriculture, 2004, 23).

Table 20: CESM 0105 Horticulture

Universities

Enrolment

		Race				Gender	
Year	**Total**	**A**	**C**	**I**	**W**	**F**	**M**
2000	151	64	0	1	86	58	93
2001	143	52	1	3	88	56	87
2002	145	59	1	2	83	54	91
2003	160	66	2	3	88	57	103
Total	599	241	4	8	345	225	374
%		40%	1%	1%	58%	38%	62%

Graduates

		Race				Gender	
Year	**Total**	**A**	**C**	**I**	**W**	**F**	**M**
2000	46	17	0	0	29	14	32
2001	37	8	0	0	29	18	18
2002	31	9	0	1	21	11	20
2003	37	10	0	0	26	13	24
Total	150	44	0	1	105	56	94
%		30%	0%	1%	70%	37%	63%

Throughput

		Race				Gender	
Year	**Average**	**A**	**C**	**I**	**W**	**F**	**M**
2000	30%	27%	0%	0%	33%	24%	34%
2001	26%	15%	0%	0%	33%	33%	21%
2002	21%	15%	0%	33%	26%	20%	22%
2003	23%	15%	0%	0%	30%	22%	23%
	25%	18%	0%	9%	30%	25%	25%

- African enrolment was relatively low in proportion to their share of the general population
- The African share of graduation was lower than their enrolment indicating that some attention needs to be given to supporting throughput

Table 21: CESM 0105 Horticulture							
Technikons							
Enrolment							
		Race				Gender	
Year	Total	A	C	I	W	F	M
2000	534	266	31	15	221	224	310
2001	852	448	46	16	341	331	522
2002	900	465	55	18	361	333	567
2003	896	493	38	25	341	361	535
Total	3182	1671	171	73	1264	1249	1933
%		53%	5%	2%	40%	39%	61%

Graduates							
		Race				Gender	
Year	Total	A	C	I	W	F	M
2000	48	16	3	0	28	19	29
2001	62	24	7	2	30	23	39
2002	95	26	9	2	58	32	63
2003	60	23	9	1	27	30	30
Total	265	89	28	5	143	104	161
%		34%	11%	2%	54%	39%	61%

Throughput							
		Race				Gender	
Year	Average	A	C	I	W	F	M
2000	9%	6%	10%	0%	13%	9%	9%
2001	7%	5%	15%	13%	9%	7%	8%
2002	11%	6%	16%	11%	16%	10%	11%
2003	7%	5%	24%	4%	8%	8%	6%
	8%	5%	16%	7%	11%	8%	8%

- Enrolment in this field grew quickly with increases among both African and White students
- There were significant differences between African and White students in graduation share. African students' share of enrolments was 53% but the share of graduations dropped to 34%.

Enrolments at institutions where Horticulture (0105) was offered between 2000 – 2003:		
Technikons		
Code	Institution	
301	Cape Technikon	511
305	Natal Technikon	238
307	Peninsula Technikon	346
309	Pretoria Technikon	597
310	Technikon SA	1395
316	Unknown	95
Universities		
Code	Institution	
103	University of Fort Hare	14
105	University of Natal	96
106	University of the North	2
107	University of the Free State	138
110	University of Pretoria	166
114	University of Stellenbosch	157
117	University of Zululand	21
121	University of Venda	6

4.3.6 Plant Sciences

	Plant anatomy physiology and microbiology	
	Plant genetics and reproduction	
	Plant	
	Plant insects and plant insect control	
0106 Plant Sciences	Plant management and production	Production of field crops Production of pastures Production of speciality crops
	Plant nutrition	
	Plant pathogens and prevention	
	Plant or plant products selection and evaluation	
	Weed control	
	Other plant sciences (specify)	

Agronomists "are responsible for the successful growing of corn, maize, grain sorghum, groundnuts, sunflower, cotton, sugar cane, potatoes and forage crops. Agronomists must develop and implement production systems with the aim to have optimal economic production without harm to the environment" (Department of Agriculture, 2004, 10).

Plant pathologists "are scientists concerned with the understanding of the dynamic process involved in plant health. Their work is more research orientated" (Department of Agriculture, 2004, 28).

The pasture/grassland scientist "answers questions such as how often, how severe and at what time of the year grazing plants should be defoliated, how many animals can be kept on a certain pasture and why it is necessary to put up fences and make camps" (Department of Agriculture, 2004, 30).

Work in the field of weed science involves "searching for natural enemies of invasive plants in the weed's country of origin and studying the natural enemies in quarantine to determine whether they have potential in controlling the invasive plant, and whether they are host-specific" (Department of Agriculture, 2004,47).

Table 22: CESM 0106 Plant Sciences

Universities

Enrolment

		Race				Gender	
Year	**Total**	**A**	**C**	**I**	**W**	**F**	**M**
2000	641	367	20	6	249	257	384
2001	637	334	19	7	277	271	366
2002	690	361	19	4	306	292	398
2003	648	338	11	3	296	262	386
Total	2616	1400	68	20	1128	1083	1534
%		54%	3%	1%	43%	41%	59%

Graduates

		Race				Gender	
Year	**Total**	**A**	**C**	**I**	**W**	**F**	**M**
2000	201	97	5	2	98	89	112
2001	134	47	2	1	85	62	72
2002	175	51	8	3	113	82	93
2003	180	85	6	1	89	67	114
Total	691	280	20	6	385	300	390
%		41%	3%	1%	56%	43%	57%

Throughput							
		Race				Gender	
Year	Average	A	C	I	W	F	M
2000	31%	26%	27%	25%	39%	35%	29%
2001	21%	14%	8%	11%	31%	23%	20%
2002	25%	14%	40%	76%	37%	28%	23%
2003	28%	25%	51%	21%	30%	25%	29%
	26%	20%	29%	29%	34%	28%	25%

- African enrolments in this field of study show no growth while White enrolments have increased slightly
- The graduation rate of African students was 13% lower than their enrolment rate, whereas the graduation rate of white students was 13% higher than their enrolment rate

Table 23: CESM 0106 Plant Sciences							
Technikons							
Enrolment							
		Race				Gender	
Year	Total	A	C	I	W	F	M
2000	487	251	17	3	217	163	323
2001	458	303	17	2	137	135	324
2002	807	514	17	1	274	258	549
2003	799	512	22	1	265	234	564
Total	2551	1580	73	6	892	791	1761
%		62%	3%	0%	35%	31%	69%

Graduates							
		Race				Gender	
Year	Total	A	C	I	W	F	M
2000	61	24	2	0	35	15	46
2001	52	14	3	1	35	15	37
2002	49	11	1	0	37	12	37
2003	106	60	3	0	43	43	63
Total	268	108	8	1	150	85	183
%		40%	3%	0%	56%	32%	68%

Throughput							
		Race				Gender	
Year	Average	A	C	I	W	F	M
2000	13%	10%	10%	0%	16%	9%	14%
2001	11%	5%	15%	67%	25%	11%	12%
2002	6%	2%	8%	0%	14%	5%	7%
2003	13%	12%	13%	0%	16%	18%	11%
	10%	7%	12%	17%	17%	11%	10%

- Enrolment of African students in this field grew quickly
- There were significant differences between African and White students in graduation share. African students' share of enrolments was 62% but the share of graduations was 40%.
- The conversion rate of African students requires support

Enrolments at institutions where Plant Sciences (0106) was offered between 2000 – 2003:		
Technikons		
Code	Institution	
301	Cape Technikon	446
303	Mangosuthu Technikon	91
306	Technikon Free State	74
307	Peninsula Technikon	39
308	Port Elizabeth Technikon	305
309	Pretoria Technikon	913
310	Technikon SA	658
311	Vaal Triangle Technikon	26

Universities		
Code	Institution	
103	University of Fort Hare	195
105	University of Natal	231
106	University of the North	180
107	University of the Free State	331
110	University of Pretoria	507
114	University of Stellenbosch	640
117	University of Zululand	107
120	University of North West	385
121	University of Venda	41

4.3.7 Soil Sciences

0107 Soil Sciences	Soil Cemistry
	Soil classification
	Soil chemistry and land use
	Soil fertility
	Soil Physics
	Soil texture
	Other soil sciences (specify)

Soil scientists specialise “in the development of soil, profile differentiation and morphology. (They are) (a) also concerned with soil fertility, classification and chemistry. The various divisions with focus areas of specialisation comprise the following: soil survey and analyses; soil physicists and hydrologists; soil chemists and fertility specialists and soil biologists” (Department of Agriculture, 2004, 32).

Table 24: CESM 0107 Soil Sciences

Universities

Enrolment

		Race				Gender	
Year	**Total**	**A**	**C**	**I**	**W**	**F**	**M**
2000	317	157	2	2	155	107	210
2001	300	135	3	5	157	96	205
2002	317	160	3	3	151	94	223
2003	314	156	4	2	153	106	209
Total	1248	609	12	11	616	402	846
%		49%	1%	1%	49%	32%	68%

Graduates							
		Race				Gender	
Year	Total	A	C	I	W	F	M
2000	80	52	0	0	28	34	45
2001	58	28	0	4	27	22	37
2002	56	22	0	1	33	18	39
2003	77	35	0	0	41	30	46
Total	271	137	1	5	129	104	167
%		51%	0%	2%	48%	38%	62%

Throughput							
		Race				Gender	
Year	Average	A	C	I	W	F	M
2000	25%	33%	10%	0%	18%	32%	22%
2001	19%	20%	0%	80%	17%	23%	18%
2002	18%	14%	11%	30%	22%	19%	17%
2003	24%	23%	0%	0%	27%	29%	22%
	22%	22%	5%	43%	21%	26%	20%

- There was hardly any change in the year on year enrolment or throughput among African and White students
- Also of interest was a slight advantage for African students in their graduation rates
- Parity in performance of students across race groups is positive, but African students are not represented proportionate to their share of the general population

Table 25: CESM 0107 Soil Sciences							
Technikons							
Enrolment							
		Race				Gender	
Year	Total	A	C	I	W	F	M
2000	135	78	5	2	51	51	84
2001	10	0	1	0	9	2	9
2002	128	77	0	1	50	44	84
2003	139	80	1	0	58	41	98
Total	412	235	6	3	168	139	274
%		57%	1%	1%	41%	34%	66%

Graduates							
		Race				Gender	
Year	Total	A	C	I	W	F	M
2000	0	0	0	0	0	0	0
2001	1	0	0	0	1	0	1
2002	0	0	0	0	0	0	0
2003	1	0	0	0	1	0	1
Total	2	0	0	0	2	0	2
%		14%	0%	0%	86%	14%	86%

Throughput							
		Race				Gender	
Year	Average	A	C	I	W	F	M
2000	0%	0%	0%	0%	0%	0%	0%
2001	10%	0%	0%	0%	11%	14%	9%
2002	0%	0%	0%	0%	0%	0%	0%
2003	1%	0%	0%	0%	1%	0%	1%
	0%	0%	0%	0%	1%	0%	1%

- The data for technikon soil science graudates may not be strickly reliable on account of data problems combined with small numbers
- For the above reasons throughput data is also unreliable

Enrolments at institutions where Soil Sciences (0107) was offered between 2000 – 2003:		
Technikons		
Code	Institution	
301	Cape Technikon	17
303	Mangosuthu Technikon	1
306	Technikon Free State	2
307	Peninsula Technikon	12
309	Pretoria Technikon	265
310	Technikon SA	112
311	Vaal Triangle Technikon	4
Universities		
Code	Institution	
103	University of Fort Hare	176
105	University of Natal	154
106	University of the North	55
107	University of the Free State	353
110	University of Pretoria	165
114	University of Stellenbosch	265
117	University of Zululand	53
118	Vista University	8
121	University of Venda	20

4.3.8 Fisheries

0108 Fisheries	Fisheries biology	
	Fisheries management	Commercial fisheries
		Non-edible water life
		Sport fisheries
	Other fisheries (specify)	

A fishery is defined as: “an organized effort by humans to catch fish or other aquatic species Generally, a fishery exists for the purpose of providing human food, although other aims are possible (such as sport or recreational fishing), or obtaining ornamental fish or fish products such as fish oil. Industrial fisheries are fisheries where the catch is not intended for direct human consumption” (http://en.wikipedia.org/wiki/Fisheries). The work of fisheries includes: using artificial or natural water environments to improve fish stocks through methods such as: breeding, hatching and rearing certain kinds of fish species.
(http://www.practicalfishkeeping.co.uk/pfk/pages/glossary.php?entry_name=Fisheries). Aspects of fishery work includes obtaining and analysing available fish stock information to advise policy on stock levels and strategies for management.

Table 26: CESM 0108 Fisheries							
Universities							
Enrolment							
		Race				Gender	
Year	Total	A	C	I	W	F	M
2000	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0
2002	2	2	0	0	0	1	1
2003	4	4	0	0	0	3	1
Total	6	6	0	0	0	4	2
%		100%	0%	0%	0%	67%	33%

Graduates							
		Race				Gender	
Year	Total	A	C	I	W	F	M
2000	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0
2003	4	4	0	0	0	3	1
Total	4	4	0	0	0	3	1
%		100%	0%	0%	0%	75%	25%

Throughput							
		Race				Gender	
Year	Average	A	C	I	W	F	M
2000	0%	0%	0%	0%	0%	0%	0%
2001	0%	0%	0%	0%	0%	0%	0%
2002	0%	0%	0%	0%	0%	0%	0%
2003	100%	100%	0%	0%	0%	100%	100%
	67%	67%	0%	0%	0%	75%	50%

- Fisheries enrolment numbers are very low
- Although equity is always an issue, the question is whether the numbers studying in this field is adequate to the industry needs

Table 27: CESM 0108 Fisheries							
Technikons							
Enrolment							
		Race				Gender	
Year	Total	A	C	I	W	F	M
2000	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0
2003	10	1	0	0	9	4	6
Total	10	1	0	0	9	4	6
%		5%	0%	0%	95%	41%	59%

Graduates							
		Race				Gender	
Year	Total	A	C	I	W	F	M
2000	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0
2003	2	0	0	0	2	1	2
Total	2	0	0	0	2	1	2
%		11%	0%	0%	89%	33%	67%

Throughput							
		Race				Gender	
Year	Average	A	C	I	W	F	M
2000	0%	0%	0%	0%	0%	0%	0%
2001	0%	0%	0%	0%	0%	0%	0%
2002	0%	0%	0%	0%	0%	0%	0%
2003	23%	50%	0%	0%	22%	19%	26%
	23%	50%	0%	0%	22%	19%	26%

- Fisheries numbers are very low
- Although equity is always an issue, the question is whether the numbers studying in this field is adequate to the industry needs

Enrolments at institutions where Fisheries (0108) was offered between 2000 – 2003:		
Technikons		
Code	Institution	
309	Pretoria Technikon	10
Universities		
Code	Institution	
106	University of the North	6

4.3.9 Forestry

0109 Forestry	Forest management	Forest economics
		Forest fire control and fire breaks
		Forest land use planning
		Forest mensuration
		Forest watershed management and hydrology
		Timber harvestign and transport
	Forest biology	Forest botany
		Theory of silviculture
		Practise of silviculture
		Tree improvement
	Forest products and wood technology	Lumber manufacturing
		Pulp manufacturing
		Paper manufacturing
		Composite wood products manufacturing
	Physical properties of wood	Wood anatomy
		Wood chemistry
		Wood identification
		Wood preservation
	Other wood products (specify)	

Forestry is defined as: “The science, art and practice of managing and using trees, forests and their associated resources for human benefit” (www.calforests.org/glossary.html). There is considerable research and development associated with managing forest ecosystems, improving varieties of trees, and methods of planting, pest control, thinning, controlled burning, felling, and in the extraction and processing of timber into usable products.

Table 28: CESM 0109 Forestry							
Universities							
Enrolment							
		Race				Gender	
Year	Total	A	C	I	W	F	M
2000	63	26	2	1	34	7	56
2001	78	43	3	1	31	16	62
2002	63	34	2	2	25	12	51
2003	57	30	2	2	24	10	48
Total	261	133	8	7	114	45	216
%		51%	3%	3%	44%	17%	83%

Graduates							
		Race				Gender	
Year	Total	A	C	I	W	F	M
2000	18	4	0	1	13	2	15
2001	21	11	0	0	9	4	17
2002	14	8	0	0	7	2	13
2003	9	4	1	0	5	1	8
Total	61	26	1	1	33	8	53
%		42%	2%	2%	54%	13%	87%

Throughput							
		Race				Gender	
Year	Average	A	C	I	W	F	M
2000	28%	16%	14%	59%	37%	33%	28%
2001	27%	25%	9%	20%	30%	24%	27%
2002	23%	22%	0%	0%	27%	13%	25%
2003	15%	12%	33%	0%	19%	5%	17%
	24%	20%	12%	16%	29%	18%	25%

- There was a small population of forestry students
- Overall student numbers did not change in the period and nor did the race share of enrolments
- The proportions of African students who graduated was lower than their enrolment proportions and the opposite was true for White students

Table 29: CESM 0109 Forestry							
Technikons							
Enrolment							
		Race				Gender	
Year	Total	A	C	I	W	F	M
2000	207	101	6	2	99	15	192
2001	149	85	6	2	57	10	139
2002	182	113	5	2	62	36	146
2003	146	87	2	1	57	17	128
Total	684	385	18	7	274	78	605
%		56%	3%	1%	40%	11%	89%

Graduates							
		Race				Gender	
Year	Total	A	C	I	W	F	M
2000	35	14	3	0	19	3	32
2001	34	14	2	0	19	3	31
2002	56	34	0	1	20	22	34
2003	25	10	0	0	15	2	23
Total	149	72	4	1	73	29	120
%		48%	3%	1%	49%	19%	81%

Throughput							
		Race				Gender	
Year	Average	A	C	I	W	F	M
2000	17%	13%	45%	0%	19%	20%	17%
2001	22%	16%	25%	0%	33%	25%	22%
2002	31%	30%	6%	50%	33%	60%	23%
2003	17%	12%	0%	0%	26%	11%	18%
	22%	19%	24%	15%	26%	37%	20%

- Enrolment in the field was higher at technikons than in universities
- Enrolment was unstable in the period
- African students were not as successful as white students in converting their share of enrolments into a similar share of graduates

Enrolments at institutions where Forestry (0109) was offered between 2000 – 2003		
Technikons		
Code	Institution	
308	Pretoria Technikon	650
310	Technikon SA	32
311	Vaal Triangle Technikon	2
Universities		
Code	Institution	
105	University of Natal	39
114	University of Stellenbosch	214
121	University of Venda	8

4.3.10 Outdoor Recreation

0110 Outdoor	Recreation No subfields specified

Outdoor recreation studies aim to enable students to become competent and successful recreation managers in the public or the commercial sector. The recreation industry requires people who can: manage recreational service provision in local government, provide professional services as recreation consultants, facilitate outdoor recreation programmes (eg: adventure tourism, corporate teambuilding), and provide guiding services in recreational tourism. To achieve this, expertise in or knowledge of the following is needed: Commercial Recreation Management, Leisure and Tourism, Outdoor Recreation, Sport Didactics and Coaching, Amenity Horticulture, and Community Recreation Management.

NOTE: The Department of Education HEMIS data showed no students in the Universities enrolled or graduating in the study field “CESM 0110 Outdoor Recreation”

Table 30: CESM 0110 Outdoor Recreation							
Technikons							
Enrolment							
		Race				Gender	
Year	Total	A	C	I	W	F	M
2000	298	116	7	8	167	153	145
2001	474	256	11	6	201	269	205
2002	553	325	13	14	201	337	216
2003	558	336	13	17	192	339	219
Total	1883	1034	44	45	760	1099	784
%		55%	2%	2%	40%	58%	42%

Graduates							
		Race				Gender	
Year	Total	A	C	I	W	F	M
2000	30	6	0	0	24	9	21
2001	41	10	0	0	31	19	22
2002	41	8	0	4	29	23	18
2003	55	19	1	0	35	34	21
Total	167	43	1	4	119	85	82
%		26%	1%	2%	71%	51%	49%

Throughput							
		Race				Gender	
Year	Average	A	C	I	W	F	M
2000	10%	5%	0%	0%	14%	6%	14%
2001	9%	4%	0%	0%	15%	7%	11%
2002	7%	2%	0%	29%	14%	7%	8%
2003	10%	6%	8%	0%	18%	10%	10%
	9%	4%	2%	9%	16%	8%	10%

- The numbers of African students enrolling increased producing a share of 55%
- The proportion of African students who graduated was 29% less than the proportion who enrolled
- The throughput rate of African students must be supported

Enrolments at institutions where Outdoor Recreation (0110) was offered between 2000 – 2003:		
Technikons		
Code	Institution	
302	Northern Gauteng Technikon	2
304	M.L. Sultan Technikon	29
308	Port Elizabeth Technikon	1
309	Pretoria Technikon	581
310	Technikon SA	79
312	Witwatersrand Technikon	1103
316	Unknown	88

4.3.11 Wildlife

0111 Wildlife	Wildlife biology
	Wildlife management
	Other wildlife (specify)

The wildlife subject area deals with wild animals in their natural environment such as wildlife ranching or nature reserves as well as in environments created by humans (eg: zoo enclosures) and deals with management, biology, ecology, scientific and philosophical and ethical issues regarding interaction with wildlife. Coursework may include: animal population dynamics, wildlife management techniques and nutrition, wildlife capture and diseases, range evaluation of ecological capacity, wildlife ecology, vegetation classification and dynamics, soil classification and social anthropology. In addition, practical aspects of wildlife study include: wildlife counts, age determination, age and sex ratios, translocation of animals, chemical immobilisation, mechanical capture techniques, transport of wildlife, land-use, predator control and predator-prey studies.

Table 31: CESM 0111 Wildlife							
Universities							
Enrolment							
		Race				**Gender**	
Year	**Total**	**A**	**C**	**I**	**W**	**F**	**M**
2000	77	10	2	2	64	27	50
2001	96	13	2	0	81	37	59
2002	106	17	2	0	86	41	65
2003	106	15	3	0	88	38	68
Total	385	55	8	2	319	144	242
%		14%	2%	1%	83%	37%	63%

Graduates							
		Race				**Gender**	
Year	**Total**	**A**	**C**	**I**	**W**	**F**	**M**
2000	36	4	1	2	29	14	22
2001	42	4	1	0	38	19	23
2002	40	8	1	0	31	21	20
2003	35	1	0	0	33	19	16
Total	154	17	3	2	132	73	81
%		11%	2%	1%	86%	47%	53%

Throughput							
		Race				Gender	
Year	Average	A	C	I	W	F	M
2000	47%	39%	83%	100%	46%	52%	44%
2001	44%	26%	55%	0%	47%	52%	40%
2002	38%	46%	34%	0%	36%	50%	30%
2003	33%	8%	10%	100%	38%	50%	24%
	40%	30%	40%	100%	41%	51%	34%

- Enrolments in Wildlife are small and have increased slightly
- Access is very skewed towards White students

Table 32: CESM 0111 Wildlife							
Technikons							
Enrolment							
		Race				Gender	
Year	Total	A	C	I	W	F	M
2000	375	121	1	1	252	135	240
2001	451	202	3	1	245	173	278
2002	119	23	0	0	96	44	76
2003	224	64	0	1	159	64	160
Total	1169	410	4	3	752	416	753
%		35%	0%	0%	64%	36%	64%

Graduates							
		Race				Gender	
Year	Total	A	C	I	W	F	M
2000	53	5	0	0	48	20	33
2001	59	10	0	0	49	27	32
2002	0	0	0	0	0	0	0
2003	76	31	0	0	45	28	48
Total	188	46	0	0	142	75	113
%		24%	0%	0%	76%	40%	60%

Throughput							
		Race				Gender	
Year	Average	A	C	I	W	F	M
2000	14%	4%	0%	0%	19%	15%	14%
2001	13%	5%	0%	0%	20%	16%	12%
2002	0%	0%	0%	0%	0%	0%	0%
2003	34%	48%	0%	0%	28%	44%	30%
	16%	11%	0%	0%	19%	18%	15%

- Enrolments in this field were unstable though cumulatively larger in the universities
- African students share of enrolment was relatively low and compounded by a low throughput rate

Enrolments at institutions where Wildlife (0110) was offered between 2000 – 2003:		
Technikons		
Code	Institution	
308	Port Elizabeth Technikon	20
309	Pretoria Technikon	1149
Universities		
Code	Institution	
105	University of Natal	22
110	University of Pretoria	180
114	University of Stellenbosch	178
121	University of Venda	6

4.3.12 Land Reclamation

0112 Land Reclamation	No subfields specified

Human settlements and population movements have historically affected the landscape. Land has been used for multiple purposes, and converted for different types of land use which has had adverse effect on ecosystems. There is constantly increasing pressure on the use of land with the concomitant need to ensure conservation of existing ecosystems and for land restoration. Land reclamation and restoration is an important focus of activity for scientists, professionals and practitioners in a range of disciplines, from engineering through archaeology and biology to the social sciences.

NOTE: The Department of Education HEMIS data showed no students in the Universities or the Technikons enrolled or graduating in the study field “CESM 0112 Land Reclamation”

4.3.13 Renewable Natural Resources

0113 Renewable NaturalResources	No subfields specified

Sustainable utilization of renewable natural resources among communities and the incorporation of nature conservation in development programmes has become more important in developing countries. This may include strategies for protected area management (PAM) which a society may apply to defend against the loss of renewable resources including natural heritage and genetic resources. Study in this field emphasises the theory and practice of maintaining biological diversity ('biodiversity') through conservation biology, the sustainable utilization of renewable natural resources and the contribution of renewable natural resources to the livelihoods of communal area households.

Table 33: CESM 0113 Renewable Natural Resources							
Universities							
Enrolment							
		Race				**Gender**	
Year	**Total**	**A**	**C**	**I**	**W**	**F**	**M**
2000	2	2	0	0	0	0	2
2001	12	12	0	0	0	7	576
2002	205	195	1	1	8	94	111
2003	311	278	3	15	16	149	162
Total	530	487	4	16	24	249	280
%		92%	1%	3%	5%	47%	53%

Graduates							
		Race				Gender	
Year	Total	A	C	I	W	F	M
2000	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0
2003	25	23	0	0	2	13	12
Total	25	23	0	0	2	13	12
%		91%	0%	0%	9%	52%	48%

Throughput							
		Race				Gender	
Year	Average	A	C	I	W	F	M
2000	0%	0%	0%	0%	0%	0%	0%
2001	0%	0%	0%	0%	0%	0%	0%
2002	0%	0%	0%	0%	0%	0%	0%
2003	8%	8%	0%	0%	14%	9%	7%
	5%	5%	0%	0%	9%	5%	4%

- Renewable Natural Resources enrolment increased rapidly in enrolment off a small base
- Enrolment was majority African with Indian and White minorities evident

Table 34: CESM 0113 Renewable Natural Resources Technikons							
Enrolment							
		Race				Gender	
Year	Total	A	C	I	W	F	M
2000	389	134	30	2	223	106	282
2001	278	127	32	0	118	111	167
2002	350	179	19	0	152	138	212
2003	298	192	8	0	98	110	188
Total	1315	633	89	2	592	465	850
%		48%	7%	0%	45%	35%	65%

Graduates							
		Race				Gender	
Year	Total	A	C	I	W	F	M
2000	53	8	5	0	41	19	35
2001	72	23	3	0	46	26	47
2002	62	22	4	0	37	23	39
2003	39	19	2	0	19	11	28
Total	227	72	13	0	142	79	148
%		32%	6%	0%	63%	35%	65%

Throughput							
		Race				Gender	
Year	Average	A	C	I	W	F	M
2000	14%	6%	15%	0%	18%	18%	12%
2001	26%	18%	10%	0%	39%	23%	28%
2002	18%	12%	19%	0%	24%	17%	18%
2003	13%	10%	19%	0%	19%	10%	15%
	17%	11%	14%	0%	24%	17%	17%

- The technikon share of enrolment in this field was higher than that of the universities African students share of enrolment was 48% while their share of graduates dropped to 32% which means that throughput was lower than for Whites

Enrolments at institutions where Renewable Natural Resources (0113) was offered between 2000 – 2003:		
Technikons		
Code	Institution	
301	Cape Technikon	306
303	Mangosuthu Technikon	323
306	Technikon Free State	255
308	Port Elizabeth Technikon	92
309	Pretoria Technikon	223
310	Technikon SA	111
311	Vaal Triangle Technikon	5
Universities		
Code	Institution	
105	University of Natal	7
106	University of the North	367
107	University of the Free State	24
115	University of Western Cape	47
118	Vista University	2
120	University of North West	83

4.3.14 Other Agricultural and Renewable Natural Resources

0199 Other Ag. and Renewable Natural Resources (Specify)	No subfields specified

Table 35: CESM 0199 Other Agricultural and Renewable Natural Resources Universities

Enrolment

		Race				Gender	
Year	Total	A	C	I	W	F	M
2000	172	125	1	3	44	67	106
2001	200	81	3	5	111	89	112
2002	222	85	2	7	128	78	144
2003	295	122	3	11	159	122	173
Total	890	412	10	25	442	355	535
%		46%	1%	3%	50%	40%	60%

Graduates

		Race				Gender	
Year	Total	A	C	I	W	F	M
2000	56	46	0	1	8	23	33
2001	25	16	0	1	8	11	14
2002	31	14	0	0	17	11	20
2003	13	10	0	0	3	1	12
Total	124	86	0	2	36	46	78
%		70%	0%	1%	29%	37%	63%

Throughput

		Race				Gender	
Year	Average	A	C	I	W	F	M
2000	32%	37%	0%	40%	19%	34%	31%
2001	12%	20%	0%	10%	8%	13%	12%
2002	14%	17%	0%	0%	13%	13%	14%
2003	4%	8%	0%	0%	2%	1%	7%
	14%	21%	0%	6%	8%	13%	15%

This category contains a range of study fields which must be separately identified for further analysis

Table 36: CESM 0199 Other Agricultural and Renewable Natural Resources Technikons							
Enrolment							
		Race				**Gender**	
Year	**Total**	**A**	**C**	**I**	**W**	**F**	**M**
2000	1120	726	12	9	373	389	730
2001	687	510	6	6	166	169	518
2002	844	529	45	26	242	155	689
2003	1004	664	51	38	251	211	793
Total	3655	2429	114	79	1032	924	2730
%		66%	3%	2%	28%	25%	75%

Graduates							
		Race				**Gender**	
Year	**Total**	**A**	**C**	**I**	**W**	**F**	**M**
2000	108	55	1	0	53	26	82
2001	91	49	2	1	40	11	81
2002	54	27	2	0	24	9	45
2003	120	83	1	1	35	34	86
Total	373	214	6	2	151	80	293
%		57%	1%	0%	41%	21%	79%

Throughput							
		Race				**Gender**	
Year	**Average**	**A**	**C**	**I**	**W**	**F**	**M**
2000	10%	8%	4%	0%	14%	7%	11%
2001	13%	10%	35%	8%	24%	6%	16%
2002	6%	5%	4%	0%	10%	6%	7%
2003	12%	13%	2%	3%	14%	16%	11%
	10%	9%	5%	2%	15%	9%	11%

Enrolments at institutions where Animal Science (0104) was offered between 2000 – 2003:		
Technikons		
Code	Institution	
301	Cape Technikon	8
303	Mangosuthu Technikon	212
306	Technikon Free State	146
308	Port Elizabeth Technikon	286
309	Pretoria Technikon	969
310	Technikon SA	2034
Universities		
Code	Institution	
103	University of Fort Hare	3
105	University of Natal	135
106	University of the North	60
107	University of the Free State	316
110	University of Pretoria	298
117	University of Zululand	46
118	Vista University	6
121	University of Venda	27

4.3.15 Veterinary Science

Veterinary Science	No subfields specified

Veterinarians "provide services to farmers, pet owners, breeders, animal welfare organisations, game reserves zoos, etc. At government level they are involved in regulatory services, ie: diagnostic services, control of diseases, prevention of disease introduction into the country and eradication of diseases. They are also concerned with small and large animal practice and the conducting of research" (Department of Agriculture, 2004, 36).

The degree of Bachelor of Veterinary Science is now offered only at the University of Pretoria's Faculty of Veterinary Science. The number of people graduating with the BVSc degree has not increased largely because the faculty does not have sufficient laboratory and other infrastructure to offer this programme to a larger group.

Table 37: Bachelor of Veterinary Science graduates by race from 1994 to 2003

	African	Coloured	Indian	White	Total
1994				91	91
1995				79	79
1996		1		94	95
1997				90	90
1998			1	81	82
1999				78	78
2000	1	1	4	91	97
2001	1	1	2	77	81
2002		3	5	72	80
2003	1		7	64	72
Total	3	6	19	817	845
%	0.7	0.7	2.2	96.7	100

- The annual number of veterinarians graduating each year has declined since 2000 which is worrying given the shortage of these professionals
- The group of students graduating with this degree is still overwhelmingly White. This is slowly beginning to change only over the last four years

Table 38: Bachelor of Veterinary Science graduates by gender from 1994 to 2003

Year	Female	Male	% Female	% Male
1994	35	56	38.5	61.5
1995	35	44	44.3	55.7
1996	43	52	45.3	54.7
1997	44	46	48.9	51.1
1998	39	43	47.6	52.4
1999	36	42	46.2	53.8
2000	43	54	44.3	55.7
2001	50	31	61.7	38.3
2002	41	39	51.3	48.7
2003	47	25	65.3	34.7
2004	55	27	67.1	32.9

There is an evident decline in the proportion of white males who are graduating with a BVSc. Clearly, White females are the dominant group enrolling and graduating for this qualification

4.3.16 Agricultural Engineering

Agricultural Engineering	No subfields specified

The category of agricultural engineers "plans, designs and develops the equipment or infrastructure needed for the production and processing of agricultural products and they specialise in a specific field such as agricultural mechanisation, soil and water conservation, agricultural structures, irrigation and drainage and technology for food processing"(Department of Agriculture,2004,4).

The combined output of agricultural engineers across universities and technikons over the four years from 2000 to 2003 was 113. The majority (over 80%) of graduate engineers were male. The larger group of graduates emanated from the universities which produced 83/113 agricultural engineers or 73% compared to the 27% produced in the technikons. The racial composition of the graduate engineers from the universities was 72% white, whereas the output of engineers from the technikons was 53% black. Thus technikons are driving equity in the field of agricultural engineering far more strongly than the universities.

Table 39: CESM 0802 Agricultural Engineering Universities

Enrolment

		Race				Gender	
Year	Total	A	C	I	W	F	M
2000	117	31	0	3	84	12	105
2001	133	45	0	5	83	15	118
2002	130	54	0	6	70	26	104
2003	144	75	0	6	63	33	111
Total	523	204	0	19	300	86	438
%		39%	0%	4%	57%	16%	84%

Graduates

		Race				Gender	
Year	Total	A	C	I	W	F	M
2000	23	4	0	1	18	4	18
2001	29	6	0	1	22	3	26
2002	18	4	0	1	14	4	14
2003	30	16	0	1	13	5	25
Total	100	30	0	4	67	16	83
%		30%	0%	4%	67%	16%	83%

Throughput

		Race				Gender	
Year	Average	A	C	I	W	F	M
2000	20%	13%	0%	40%	22%	34%	17%
2001	22%	13%	0%	21%	27%	20%	22%
2002	14%	7%	0%	0%	20%	15%	13%
2003	21%	21%	0%	17%	21%	15%	23%

- Enrolments for Agricultural Engineering are small and stable
- African student's share of enrolment was 39%, dropping to 30% of graduates

CESM 0802 Agricultural Engineering Technikons							
Enrolment							
		Race				**Gender**	
Year	**Total**	**A**	**C**	**I**	**W**	**F**	**M**
2000	36	24	2	0	9	8	28
2001	16	3	1	1	12	0	16
2002	56	40	3	0	13	16	40
2003	43	34	0	2	8	14	29
Total	151	102	6	2	42	38	113
%		67%	4%	1%	28%	25%	75%

Graduates							
		Race				**Gender**	
Year	**Total**	**A**	**C**	**I**	**W**	**F**	**M**
2000	0	0	0	0	0	0	0
2001	6	1	1	1	3	0	6
2002	11	6	0	1	4	2	9
2003	8	4	0	1	3	2	6
Total	25	11	1	3	10	4	21
%		44%	4%	12%	40%	16%	84%

Throughput							
		Race				**Gender**	
Year	**Average**	**A**	**C**	**I**	**W**	**F**	**M**
2000							
2001	38%	32%	133%	200%	26%	0%	38%
2002	20%	15%	0%	0%	31%	13%	22%
2003	18%	12%	0%	67%	40%	14%	21%

- Technikons have a far smaller enrolment than universities
- In contrast to the universities African student share of enrolment is two thirds in relation to one third White students
- Of concern is that 44% of African students graduated which is 23% lower than enrolments, whereas White student's share of graduations increased
- This suggests that access to this programme is available to African students but attention to supporting African students is needed

Table 40: Agricultural Engineering graduation trend by level of qualification at universities

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	Total
First Degree	11	8	7	18	15	15	11	5	11	8	109
Post Graduate Diploma	0	0	0	0	0	0	0	0	0	0	0
Honours Degree	6	6	2	4	2	0	2	6	0	2	30
Masters Degree	3	0	0	3	1	2	3	5	3	4	24
Doctoral Degree	0	0	0	1	0	1	1	0	0	0	3
Total	20	14	9	26	18	18	17	16	14	14	166

- The number of agricultural engineers graduating with first degrees has remained consistently low between 1992 and 2004
- There is no discernable increase in the number of post-graduate agricultural engineering degrees

Institutions where Agricultural Engineering was offered from 2000 – 2003:		
Technikons		
Code	Institution	
306	Technikon Free State	-
308	Port Elizabeth Technikon	-
309	Pretoria Technikon	-
312	Technikon Witwatersrand	-
Universities		
Code	Institution	
107	University of the Free State	-
108	University of Port Elizabeth	-
110	University of Pretoria	-
116	University of Witwatersrand	-

4.4 Summary

This chapter has shown that there are clear gender and race differentials in the extent to which enrolment, graduations and throughput are distributed. The data provided here reveals patterns that occur between institutions and, as importantly, between different study fields. However, the data in itself does not provide sufficient information as to the full background and causes of the differential patterns of access and of achievement. Further analysis needs to be undertaken to address the situation.

4.5 References

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South African Qualifications Authority (2004) Trends in Public Higher Education in South Africa 1992 – 2001 Analysis of the National Learner Records Database Report 1 Pretoria, SAQA.

CHAPTER 5

The influence of admissions policy and costs on access to agricultural education programmes in higher and further education

5.1 Introduction

Providing access to education in South Africa is a challenge for government, business and the society at large. It is important to create the conditions in which young people who qualify to enroll for study beyond the compulsory education phase (NQF 1 or Grade 9) have the opportunity to do so for two main reasons. First, so that young people can exercise their ability and interests to develop and fulfill themselves and second, so that they can apply their skills and contribute to economic and social development.

In the context of globalization, all economies are striving to increase the skills and knowledge base of the labour force so as to remain competitive. Skills and knowledge are essential in the effort to produce services and products that will compete on global markets. These pressures are no less strong in the agricultural sector of the South African economy. In addition, it is important in South Africa to address the need for equity and redress arising out of the discriminatory history of access to education.

Strydom (2002, 7) writing about higher education points to the following policy imperatives:

- The need for increased academic access to higher education cannot be over emphasised.
- The quality of academic access can be improved if access initiatives are in harmony with notions of equity and redress.
- Increasing participation should ultimately contribute to the social interests, the economic needs, the technological developments and the overall advancement of the country.
- The issue of student admission and selection is still complicated by the lack of clarity surrounding the criteria used to admit students in a way that would recognise prior learning and acknowledge other further education certificates besides matriculation endorsement.
- Language is earmarked as one of the priorities in the academic access debate.
- Student financial aid can help advance the cause of increased participation.
- Academic access for historically disadvantaged learners should not culminate in a revolving door syndrome, but should be structured to achieve the desired throughput rates.

From the set of wide ranging issues raised above, we can see that there are four main dimensions that influence whether students can access intermediate and higher education opportunities. The first dimension is based on the characteristics of the would-be student herself and her household circumstances:

- The financial resources in the household to support her further study
- The quality of her school based academic foundations
- Her access to adequate career guidance and information to facilitate her decision making
- The geographic location of her home and proximity to the institution
- Cultural and language dimensions affecting her choice of course of study and her sense of belonging in the institution (adapted from: Strydom,2002, 14-16):

The next two dimensions affect student access and are decided by the management and policy makers of the education institution. These are: institutional policy on admissions, and institutional policy on costs to be levied. The last dimension concerns the extent to which financial assistance is accessible to would-be students and whether the sources of this financial assistance are: government; the institution itself; the business sector; or other agencies such as international development and funding organisations.

The personal and household circumstances and characteristics of students are important in understanding who gets access to further education opportunities at intermediate and higher education levels. However, this study does not permit an exploration of the social context in which access to agricultural education is achieved. The aim for this research project is to focus on the institutional factors affecting student access to intermediate and higher education.

This chapter will examine the factors under the control of the institutions, namely admissions and costs related to agriculture studies. The next chapter will address bursary availability related to agricultural study. This analysis will examine admissions policy first in the FET Colleges and then move through Agricultural Colleges to Technikons and universities.

5.2 Admissions policy: FET Colleges

Admission requirements for FET colleges are specified for each year from N1 to N6. There are effectively only two points of admission to the FET Colleges:

- National Certificate in Agriculture (N1-N3)
- National N Diploma in Farming Management (N4-N6)

Table 1 below specifies the admission requirements, which are straightforward where based on South African pre-requisites (See Appendix 1 for the specification of FET Admissions). The phrase "or an equivalent qualification" makes it possible for alternative routes into the programmes.

Table 1: Admissions requirements for FET Colleges		
Qualification		**Admission requirements**
National Certificate: N6: Farming Management	**National N Diploma**	National Certificate: N5: Farming Management, or an equivalent qualification
National Certificate: N5: Farming Management		National Certificate: N4: Farming Management, or an equivalent qualification
National Certificate: N4: Farming Management		A Senior Certificate, or a National Certificate: N3, or a National Senior Certificate, or an equivalent qualification.
National N Diploma: Farming Management		As for the admission to N4 of the applicable instructional programme, or on the basis of recognition granted for admission to the relevant N4 instructional programme
National Certificate: N3: Agriculture	**National Senior Certificate**	National Certificate: N2: Agriculture, or an equivalent qualification.
National Certificate: N2: Agriculture	**National Intermediate Certificate**	National Certificate: N1: Agriculture, or an equivalent qualification.
National Certificate: N1: Agriculture		Grade 9 Certificate or an equivalent qualification
National Certificate (Orientation): Agriculture	**National Certificate (Orientation)**	Grade 8 Certificate or an equivalent qualification

5.3 Admissions policy: Colleges of Agriculture

The Colleges of Education all adhere to a standard minimum requirement for admission for the three courses that are offered most frequently: Certificate in Agriculture (1 year), Higher Certificate in Agriculture (2 years) and the Diploma in Agriculture (3 years) (Table 2).

Table 1: Admissions requirements for FET Colleges		
Qualification		**Admission requirements**
B Agric		*Offered only by Elsenberg in association with Stellenbosch University*
BTech Agriculture		*Offered only by Potchefstroom College in association with Pretoria*
Diploma in Agriculture		*Technikon*
Higher Certificate in		Higher Certificate in Agriculture or equivalent
Agriculture		Certificate in Agriculture or equivalent
Certificate in Agriculture		Senior Certificate or equivalent qualification with an overall Standard Grade pass. Student must have passed English

In a number of Agricultural Colleges, the minimum entrance requirement is the first step towards admission. There are several examples of how individual Colleges apply additional criteria. At Cedara it is recommended that students have a "fair working knowledge" of at least two Grade 12 subjects from: Biology, Physical Science, Mathematics and Geography (Cedara College). At Lowveld College, it is stated that subjects relevant to agriculture such as Mathematics, Science, Biology, Geography, and Accountancy "will count in the favour of an applicant". Taung College indicated a preference to entrants who had done Agricultural Science as part of their Senior Certificate. Other Colleges like Glen College emphasis that there is "strict screening" of candidates and that selection is carried out "solely on academic achievement". At Grootfontein College a preference is indicated for candidates with higher education qualifications and/or experience in farming.

In a different way, Cedara College of Agriculture also has a points system in which points are awarded according to the school subjects passed: English, Mathematics and Physical Science have highest weightings followed by Biology, Geography, Home Economics and Agricultural Science.

Colleges such as Elsenberg offer extra Mathematics and Science classes in order to support students, which indicate that Elsenberg is making an effort to assist students to deal with the harder science elements of the curriculum. This strategy means that admissions policy can be slightly more forgiving on students who do not have a strong background in the gateway subjects.

Also, in what appears to be a more recent innovation, the Elsenberg College is offering a BAgric in association with the University of Stellenbosch, and the Potchefstroom College is offering a BTech Agriculture in association with the Pretoria Technikon. These are examples where some Colleges are collaborating with other higher education institutions in offering NQF level 6 qualifications.

Overall, it appears that the minimum admission requirements offered by the Colleges are the same across all these institutions, but there are instances where certain additional criteria are imposed on an ad-hoc basis. The situation with Technikons and universities is more complex as the following sections will reveal.

5.4 Admissions policy: Technikons

The basis of admissions policy for Technikons was set out in the 2002 document: "Minimum admission requirements based on South African school, technical and other examinations approved by CTP in November 2002. The core policy (summarized below) specified that no person should be registered in an instructional programme in a Technikon unless he/she had:

- "obtained a Senior Certificate" or an equivalent qualification
- provided that "the subjects passed (minimum of 5) in obtaining the Senior Certificate or a certificate contemplated in the said section of the Act, are subjects passed on the Higher Grade or the Standard Grade or a combination of subjects on the Higher Grade and the Standard Grade; or that the person has obtained the Senior Certificate with a minimum of four subjects (which may not include more than two of the official languages) passed on the Higher Grade or the Standard Grade, and provided further that the remaining subject(s) passed on the Lower Grade subject shall not be a prerequisite for the proposed instructional programme" and also
- "Provided he/she can prove communicative competence in the particular technikon's language of instruction…"

This basic specification is extended in a variety of different ways in the Technikons to suit their specific needs and curriculum structure. This is evident at each of the three different undergraduate qualifications levels offered by Technikons (Table 3 below).

Table 3: Admission Requirements for Technikons		
Qualification		**Admission requirements**
Bachelor of Technology: Agriculture		• National Diploma (eg: Cape Technikon) • Senior Certificate (eg: Technikon Tshwane (Pretoria))
National Higher Diploma in Agriculture		National Diploma in Agriculture or Senior Certificate or equivalent qualification. Two of the official languages on the Higher Grade
National Diploma in Agriculture		Senior Certificate or a National Certificate N3 or equivalent qualification.

Starting with the National Diploma in Agriculture, certain institutions express their requirements more explicitly as follows:

- by stating the quality of the pass in one of the official languages. Most commonly this is specified for English as follows: English (HG) E.
- by specifying a pass in Mathematics.
- by specifying subjects that are relevant to the programme for which the applicant seeks admission such as in the case of Mangosuthu Technikon which required the subject Biology for the NDip in Nature Conservation.

Only in very few instances did "Agricultural Science" at the Senior Certificate level give the holder any advantage for admission purposes. For example, Free State Technikon stated that "Agricultural Science is recommended" for the NDip Agricultural Management. Notably, there was no evidence that Agricultural Science was a pre-requisite for any Technikon programme. Thus there would be no explicit advantage in getting entry to a programme for an applicant holding a Matric with the subject 'Agricultural Science'. On the other hand, for a student who took Agricultural Science instead of Mathematics or Science or even Biology at Matric level this may well be a disadvantage.

The next level in the qualifications structure in Technikons is the National Higher Diploma in Agriculture (NHDA). For this programme, the logical requirement is the National Diploma in Agriculture (NDA). But the NDA is not the only requirement. If this were the case, the Technikon would be dependent entirely on flow through from its own NDA students – and from NDA students in other Technikons – into the next level NHDA. However requirements to enter the NHDA are slightly stricter because they specify a language requirement (two official languages at the Higher Grade).

In addition to this, some Technikons make further specifications such as:

- "Recommended Matric subjects: Mathematics, Physical Science, Biology or Agricultural and Economic subjects" or
- "one or more of the following subjects will be a recommendation: Biology, Physical Science, Mathematics and Geography" (Cape Technikon)

As can be seen, there are some differences between the requirements stated by Technikons at this level, which will work for or against Matriculants who have or don't have a listed subject such as 'Geography'.

At the Bachelor of Technology level, institutions that do not offer the NDA must provide for admission to the Bachelors programme such as through a Senior Certificate. This was the case with Technikon Tshwane (Pretoria), which did not offer a National Diploma but offered the higher BTech. The highest requirements in the Technikons at the Bachelors level were for the BTech in Civil Engineering Agriculture at the Pretoria Technikon. For this programme, a Senior Certificate (or an equivalent qualification) was required including: Mathematics and Physical Science at HG with an E symbol or at SG with a C symbol. In addition compulsory Matric subjects were specified - Mathematics and Physical Science.

In order to forewarn potential applicants regarding Mathematics and Science marks some Technikons draw attention to the importance of having marks in these subjects that are "good enough" and also refer students to opportunities for getting extra lessons in these subjects at the Grade 11 and Grade 12 levels.

This survey of the admission requirements for programmes in the Technikons highlighted another dimension of admissions. In addition to some variation between institutions with respect to their formally stated requirements, various institutions state that candidates may be subjected to an additional selection process. This is stated variously as follows:

- "Admission is subject to an evaluation process based on academic potential."
- "Applicants will be invited to undergo (a) series of tests to determine their potential…"
- "Evaluation: Admission is based on potential tests."

The documentation is in some instances somewhat vague on the nature of the 'evaluation process' and in other instances it refers to particular tests the nature of which is unstated. It is possible that academic departments only resort to these forms of selection when the demand for places exceeds supply. Alternatively, these tests may well be applied for the purposes of screening for quality candidates. There are two important points arising from the stipulation of additional selection processes over and above the setting of explicit admission criteria. First, the differences in admission criteria between institutions can be compared if those criteria are publicly stated. But where tests or other processes are implemented, further differences in the application of admission criteria in the institutions are hidden from public view. Second, the existence of such additional criteria makes sustained comparison of admission criteria un-useful in obtaining a full picture.

The overall tendency seems for prerequisites to become gradually more stringent as the programmes become more senior. But there is no easily identifiable change because of slight variations between institutions.

5.5 Admissions policy: Universities

Admissions policy in agricultural faculties and departments differs (a) between the various Bachelors degree programmes (eg: between BAgric and BInstAgric) and (b) between departments at different universities offering the same degree programme. This will become clear as we compare the admission requirements for selected universities in the following agricultural degree types: BAgric, BScAgric, BAgricAdmin and BInstAgric.

BAgric

Within the group of universities that offer the BAgric programme, all specify the basic Matriculation exemption, but they differ how they extend their requirements. The University of Venda expects candidates to have a Higher Grade (HG) pass with an 'F' symbol, whereas the University of the Free State states that it will accept any pass in Standard Grade (SG) Mathematics which represents a lower benchmark. The University of Venda further raises the requirement by specifying a pass in two other school subjects: Agriculture or Biology.

BAgric		
University offering degree	**Duration**	**Admission requirements**
University of Venda	3 years	Matriculation Exemption with Mathematics HG F and a pass in Agriculture or Biology.
University of the Free State	3 years	Senior Certificate with Matriculation Exemption. Maths SG or Dipl Agric (1st year) with certain modules.
University of Fort Hare	3 years	Senior Certificate with Matriculation Exemption. Contact University regarding Faculty requirements.

It is interesting that only at the university level has the subject 'Agricultural Science' been specified as a part requirement – rather than as a recommendation. Also of interest is that the University of the Free State requires that students can possess a Diploma in Agriculture (with certain modules) as an alternative to the Matriculation exemption. This means that this agricultural department or faculty sees the opportunity to attract students from other programmes or institutions – such as Agricultural Colleges - into the BAgric programme. Here we see part of another programme – in this instance the first year of a Diploma that may be offered in the institution or elsewhere – acting as a form of bridging course which allows students to enter the BAgric programme if they did not satisfy the requirements with their senior certificate results.

BScAgric

Requirements for admission to BScAgric programmes in four universities seem to show quite wide variation beyond the basic Matriculation exemption. The agriculture faculty or department at the University of Pretoria requires a 50% pass in the Afrikaans or English languages. This suggests that academics are chiefly concerned with ensuring basic language skills to cope with the programme. As such the University of Pretoria requirements are the most modest of this group.

BSc Agric		
University offering degree	**Duration**	**Admission requirements**
University of Venda	4 years	Matriculation Exemption with HG E in Mathematics and Physical Science and a pass in either Biology or Agriculture.
University of the Free State	4 years	Senior Certificate with Matriculation Exemption. Maths HG or SG E or BAgric (1st year) 60%.
University of Pretoria	4 years	Matriculation Exemption with Afr or Eng HG 50%
University of Fort Hare	4 years	Senior Certificate with Matriculation Exemption. Pass in Matric Maths.

A step up in difficulty is required by the University of Fort Hare, which requires a pass in Mathematics. This is a requirement with higher difficulty because so few Matriculants have a pass in Mathematics. Presumably the agriculture faculty at Fort Hare consider mathematics a better predictor of coping skills or success than language, or on the basis of policy the Faculty do not want to disadvantage any second language English/Afrikaans speaker who will almost always be African. The next step up is to be found in the qualifications requirements given by the University of the Free State. Here, the actual grade of the Mathematics pass is specified.

The most stringent admission requirements were stipulated by the University of Venda which not only required a HG pass with an 'E' symbol for both Mathematics and Physical Science. Venda also specified a pass in either Biology or Agriculture. Thus, in effect this faculty/department placed three layers of requirements viz:

- layer one Mathematics
- layer two Physical Science and
- layer three (Biology or Agriculture)

We conclude the discussion of requirements at the BScAgric programme level by pointing out that the University of the Free State includes the completion of the first year in another course (BAgric) as part of its requirements for BScAgric first year. This is another instance where that faculty or department has made it possible for a student who, based on his/her Senior Certificate results, could not go straight into the BScAgric programme, to have a second chance by converting after completing the first year of another course that had a lower entry requirement.

BAgricAdmin

From the examples of admission requirements given for BAgricAdmin, three observations can be made. First, admission requirements differ, with Stellenbosch indicating an additional requirement in the form of a mimimun aggregate of 50%. Second, Stellenbosch provides a more detailed specification that enables a student without Physical Science but with Biology to qualify. Third, Stellenbosch put in place particular requirement for a specialist programme (Viticulture) within the BAgricAdmin degree.

BAgric Admin			
University offering degree	**Duration**	**Admission requirements**	BAgric Admin
University of the North	3 years	Matriculation Exemption with Maths and Physical Science.	Agricultural Economics
University of Stellenbosch	3 years	Matriculation exemption with an aggregate of at least 50% with Phys Sc or Biol SG E and Math HG E or SG D. Industry-specific Farming Management - Viticulture: The Higher Certificate in Agriculture (Elsenburg) A pass mark of at least 60% in Viticulture and	BAgricAdmin

BInstAgric

The degree with the lowest admission requirement among the Bachelor level programmes reviewed here is the BInstAgric offered at the University of Pretoria, which posts lower admission criteria than the same university's requirement for BScAgric. Noteably, there are no requirements with respect to science-related subjects. Also the requirement is restricted only to a language, English, where the cut-off mark is Higher Grade 40%. This particular requirement could be interpreted as a strategy to attract second language English speakers.

BInst Agric		
University offering degree	**Duration**	**Admission requirements**
University of Pretoria	4 years	Matriculation Exemption with Eng HG 40% or SG 50%

BAgric Economics

The following example of entrance requirements to the BAgric Economics is used not for the purposes of comparison but rather to demonstrate that there are varying methods for specifying admission requirements. In this instance, the agriculture faculty/department of the University of the Free State has introduced the M-Score as a means of setting the standard of admissions to a certain level.

BInst Agric		
University offering degree	**Duration**	**Admission requirements**
University of Free State	4 years	Matriculation Exemption with an M-Score of at least 28 points

The important difference between the M-Score and specification of one or two particular subject requirements is that the M-Score brings into account the whole performance of a candidate. To take the example of the Free State's specifications, based on the minimum requirement of 28, a Standard Grade (SG) student would have to achieve nearly a 'B' average for all six subjects for an MScore of 30. To achieve the same M-Score, a Higher Grade (HG) candidate would have to achieve a 'D' average. Thus subject specific referencing of requirements can lead to the admission of a student who performed unevenly in the Matric whereas the M-score provides a measure of overall performance.

M-Scores Calculation

M-Scores are calculated in terms of the table below. This is based on the symbol obtained in Grade 12. The symbol for each subject (by grade) is converted into a score. These scores are added up for each subject. For example a student who gets an 'A' symbol in Higher Grade for a subject earns 8 points

Symbol	A	B	C	D	E	F	FF	G
Higher Grade points	8	7	6	5	4	3	2	0
Standard Grade points	6	5	4	3	2	1	0	0

For each of a candidate's official languages - which have to include either English or Afrikaans - a bonus point may be added, on condition that the languages have been passed with a D symbol on HG.

This is also known as the "Swedish Scale" points rating system.

Summary: Admissions policy analysis

Admission requirements are set by an education institution in accordance with the level of difficulty of a programme of learning in order to ensure that candidates possess the required skills and capacity to complete the prospective course of study.

Admission requirements for FET colleges are specified for each year from N1 to N6, and are uniformly applied in all of these institutions. In the Agricultural Colleges, uniform minimum entrance requirements are stated, but there are several Colleges that apply additional criteria (eg: senior certificate subjects relevant to agriculture).

In general, admissions policy at the institutions:

- is more stringent as qualifications rise up the NQF levels and increasingly extends beyond common standard requirements
- is more complex for entry at higher qualifications levels (eg: where institutions apply many different criteria that become difficult to compare)

Only at the university level was the subject 'Agricultural Science' specified explicitly as a part requirement for admission to programmes. In the Colleges, it was a recommendation rather than a requirement to have Agricultural Science in Matric. Clearly there is no explicit advantage in getting entry to a programme for an applicant holding a Matric with the subject 'Agricultural Science'. Therefore a student who took Agricultural Science instead of Mathematics or Science or even Biology at Matric level could well be at a disadvantage.

The analysis of admission requirements across the institutions revealed that for programmes which are presented in almost exactly the same way across institutions, where each programme contains a limited number of courses and where students have a limited number of options, it should be feasible to compare the effects of admissions policy on outcomes (eg: FET Colleges programmes). However, in the case of higher education and especially universities, investigating the impact of admissions criteria across institutions and across programmes is not possible. This is because in the universities the following conditions apply: each programme (eg: BSc Animal Science) will offer a different set of courses in each institution, and because there will be a variety of options students can select individual combinations of courses. This means that degree programmes differ across institutions and even students taking the same degree will have different emphases. For these reasons, comparison of student achievement is not strictly comparable unless at a highly aggregated level (eg: type of degree such as BSc or broad field of study such as animal health).

In addition we must take into account admissions criteria that are not comparable. The different institutions each set different criteria for admission to studies leading to a degree (eg: BScAgric). For example, requirements for admission to BScAgric programmes in the universities show quite wide variation beyond the basic Matriculation exemption. The difficulty is that variations between institutions are difficult to equate (eg: is a rule stating that a student must have a E symbol in Biology (HG) more – or less - restrictive than a rule stating that a student musts have a D symbol in English (SG)?). Some institutions use a so-called M-Score to equate students' eligibility. Essentially the simple M-Score provides a score that measures overall performance of the students across all subjects. If the institutions involved translated their specifications into an M-Score format, this would enable a more standardized and reliable approach to comparing admissions policy between different degree programmes and comparing admissions policy between universities offering the same degree programme. But this score in any case cannot replace the specification of other criteria.

Interpretation of the admission requirements is therefore not an exact process. In addition, many institutions refer to their prerogative to subject students to an 'evaluation process' and in other instances refers to particular tests the nature of which is unstated. The main point here is that if these processes – which are vaguely state - are applied, then the outcome of admissions cannot be the product only of the stated criteria.

Ultimately, analysing the impact of admission requirements must be undertaken within specific programmes and within specific student groups. For example, the degree with the lowest admission requirement among the Bachelor level programmes reviewed is the BInstAgric offered at the University of Pretoria, which posts lower admission criteria than the same university's requirement for BScAgric. Noteably, there are no requirements with respect to science-related subjects. Also the requirement is restricted to only to a language, English, where the cut-off mark is Higher Grade 40%. This particular requirement could be interpreted as a strategy to attract second language English speakers in order to accommodate students from formerly disadvantaged population groups. Even though this degree is accredited with the HEQC and is offered by a credible university, the question is: what prospects for employment does the degree provide? The second question is about the quality of instruction and support within the programme: to what extent does the programme and its structure enable access (eg: through bridging), support and build students in the process of their studies? Therefore, we must consider examining particular programmes and the prospects for employment and contribution in the market place. This is analytically feasible whereas a survey approach across admission criteria will not provide answers.

5.6 The cost of study

Cost of studying is an important factor that affects access to study opportunities. Unless costs of studying are very low, usually as a result of heavy state subsidies, they constitute a serious barrier to students who wish to enroll and who qualify academically for admission but do not have access to sufficient financial resources to meet fee requirements and other financial needs. For this reason, the cost of study must be taken into account since this is the barrier below which students who cannot raise this amount are excluded.

How institutions set out their fees structure is a complex and strategic process, which must balance income with operational expenditure. The calculation of fees is affected by the proportionate income from several sources: state subsidy, income from research activities, support from philanthropic foundations, the institution's own investments, and finally student fees. In South Africa, at higher education levels, there is no rule that sets the same fees across all institutions. This means that the various institutions are in competition with each other in attempting to maximize the quality of education they provide while holding direct costs to the individual student or her/his household to a minimum.

The calculation of fees is also subject to other influences. First, the costs of programmes within institutions will differ with each other. For example, medical and high technology related programmes tend to be more expensive on account of equipment, laboratory and other expenses. Second, institutions or faculties/departments may seek to cross-subsidise expensive programmes – those with small classes but studying high profile disciplines - with other programmes which generate more income.

Also, the academic reputations of institutions and faculties– whether well earned or not – will influence their fee setting. Lastly, the location of an institution and the wealth of the client populations that are resident in the same locality will also affect how the institution's managers set fee structures.

All these factors will to some extent inform the setting of fees for agricultural studies, but will not be addressed in any detail. The discussion now turns to specific analysis of the costs themselves.

5.7 How higher education costs are presented to students

In order to calculate and compare study costs, a critical starting point is to consider which costs to include in the calculation. This is problematic because institutions do not levy fees in a consistent way. Even if we take the three basic cost categories: registration, academic and residence fees, we can see that some institutions do not levy registration fees while others do (Table 5). This means that if we were to leave registration fees out of the calculation, because some institutions do not charge these fees, we would obtain data that is biased against those that levy low or no registration fees or which bundle their fees in different ways.

There is a range of categories of fees that are charged separately by some and not other institutions. Where an institution levies these various costs separately, the amount required for academic fees may be proportionately reduced. Examples of the costs identified separately by institutions include:

Cost category	Example of amount(s) given
Library access card fee	R45
Library subscriptions	R amount not stated
Field trips	R amount not stated
Administration Services Fee	R330
Learning centre tutorial levy	R100
Students Representative Council Levy	R225
Information and learning for publication (on submission of dissertation for examination)	R275
Books	Massive cost variation possible depending on programme and whether the institution provides its own reading materials
Equipment levy	R varied

High degrees of accuracy in this level of detail are difficult to obtain, since institutions provide their costs in different forms and in different documents. In addition, because there is no official requirement, there is no standard means of reporting these costs.

In a number of universities, first degrees in particular - but also many post graduate diplomas, and BEd degrees - are charged per course, whereas fees are somewhat simpler at higher degree level where Honours, Masters and Doctoral degrees are still charged per qualification. This means that the undergraduate degree costs are dependent on the student's choice of curriculum and course options.

The actual fees payable by a student will depend on the specific modules taken during the year. Therefore what is compulsory and what is elective will affect fees. Annual fees will also differ according to whether a student is part time or full time. Finally, tuition fees will differ per year within a programme such as shown in the example below from the University of Venda (Table 4):

Table 4: Academic fees in the School of Agriculture, Rural Development and Forestry, University of Venda, 2005 (ZAR)					
	Undergraduate	**First year**	**Second year**	**Third year**	**Fourth year**
BAgric	Bachelor of Agriculture	9 100	10450	8230	10690
BAgBM	Bachelor of Agribusiness Management	8 010	9 680	8100	12040
BScFor	Bachelor of Science in Forestry	10 230	7 860	10560	10690
	Postgraduate	**First year**	**Second year**	**Third year**	**Fourth year**
MScAgr	Master of Science in Agriculture	8 890	4 480	-	-
BSc (Hons) Agric	Bachelor of Agric Honours	8 890	4 480	-	-
PhD(Agr)	Doctor of Philosophy in Agriculture	9 880	4 910	-	-

Based on this discussion, it is clear that an attempt to define full costs of study and affordability of study across agriculture programmes would require further in-depth data gathering and analysis.

The analysis below will therefore focus on institutional level costs as in academic fees, registration fees and residence fees to produce an indication of the full cost of study. It is important to include residence fees because agricultural programmes are not offered in all higher education institutions, and a sizeable proportion of agriculture students will probably have to seek accommodation at the specific institutions that do.

5.8 Comparison of full cost of study in higher education - projections for 2005

The following discussion is based on cost of study projections in academic fees, registration and residence fees for all higher education institutions in South Africa. In Table 5 below, a list of 28 institutions have been given, which reflects the fact that a number of institutions are still in the process of mergers and in the interim are still levying fees independently.

This brief comparison across all institutions is necessary to establish whether the institutions that offer agriculture related programmes are overall more or less expensive than the mean. Furthermore, it should be noted that the cost parameters given below are averages generated for each institution across all faculties/departments. These figures may be sufficient, as a strarting point for comparison, as long as there is no large variation in fees applied between schools/faculties/departments within institutions.

Nevertheless, Table 5 shows that around the average of R12 191 over all institutions, academic fees range in price from R5 900 at Border Technikon to R20 787 at the University of Cape Town. Registration fees range from nil to R4 400 at MEDUNSA although this institution's registration fees are an outlier, the next highest being R1380 at University of Venda. The average registration fee across all institutions is R770.

The lowest average residence fees of R11 437 are levied at Cape Technikon and the highest are R23 726 at University of Pretoria. The average residence fee across all higher education institutions is R18 227.

Table 5: Full Cost of Study projections for 2005 in South African higher education (ZAR)				
Institution	**Academic Fees**	**Registration**	**Residence Fees**	**Full Cost of Study**
BORDER Tech	5 900		11 790	**17 690**
CAPE Tech	10 414	100	11 437	**21 951**
CAPE TOWN, Univ of	20 787		23 360	**44 147**
CENTRAL Univ of Tech	11 232	248	19 732	**31 212**
DURBAN Inst of Tech	9 443	660	20 576	**30 679**
EASTERN CAPE Tech	6 138	263	12 760	**19 161**
FORT HARE, Univ of	7 124	946	18 154	**26 224**
FREE STATE, Univ of	11 963	535	19 870	**32 368**
KZN, Univ of	15 352	250	19 659	**35 261**
MANGOSUTHU Tech	12 112		14 619	**26 731**
MEDUNSA	18 438	4 400	22 976	**45 815**
NORTH WEST Univ	15 227	650	13 498	**29 375**
NORTH, Univ of	11 528	1 165	13 130	**25 823**
PENINSULA Tech	8 736	518	21 680	**30 934**
PORT ELIZABETH Tech	8 694	200	17 372	**26 266**
PORT ELIZABETH, Univ of	11 788	380	16 812	**28 980**
PRETORIA, Univ of	16 805		23 726	**40 531**
RAND AFRIKAANS Univ	12 657	350	22 548	**35 556**
RHODES Univ	18 118		20 966	**39 084**
STELLENBOSCH Univ	17 238		18 248	**35 486**
TRANSKEI Univ	11 214	450	20 376	**32 040**
TSHWANE Univ of Tech	9 259	320	15 192	**24 771**
VAAL Univ of Tech	8 945	320	20 044	**29 309**
VENDA Univ	12 711	1 380	19 070	**33 161**
WESTERN CAPE, Univ of the	11 154	500	19 748	**31 401**
WITWATERSRAND Tech	11 620	1 360	20 565	**33 545**
WITWATERSRAND, Univ of the	15 404		15 286	**30 689**
ZULULAND, Univ of	11 333	1 172	17 178	**29 683**
Total	**R 341 335**	**R 16 167**	**R 510 372**	**R 867 874**
Average	**R 12 191**	**R 770**	**R 18 228**	**R 31 188**

Source: NSFAS Personal Communication (2005)
Note: This table does not contain reference to University of South Africa (incorporating the former TechnikonSA), which is a distance institution.

In the next table, we include only those institutions that offer agriculture in our analysis. The institution with the lowest average academic fees is Fort Hare University (R7 124) and the institution with the highest average fees is the University of Stellenbosch (R17 238). Overall, the Technikons/Universities of Technology that offer agriculture programmes generally set much lower academic fees and registration fees than the universities that offer agriculture. There is a much smaller difference in residence fees between the institutions.

Table 6: Full Cost of Study projections for 2005: Institutions offering Agriculture programmes (ZAR)				
Technikons/Universities of Technology				
Institution	**Academic Fees**	**Registration**	**Residence Fees**	**Full Cost of Study**
CAPE Tech	10 414	100	11 437	**21 951**
CENTRAL Univ of Tech	11 232	248	19 732	**31 212**
DURBAN Inst of Tech	9 443	660	20 576	**30 679**
MANGOSUTHU Tech	12 112	-	14 619	**26 731**
PENINSULA Tech	8 736	518	21 680	**30 934**
PORT ELIZABETH Tech	8 694	200	17 372	**26 266**
TSHWANE Univ of Tech	9 259	320	15 192	**24 771**
VAAL Univ of Tech	8 945	320	20 044	**29 309**
WITWATERSRAND Tech	11 620	1 360	20 565	**33 545**
Total	R 90 455	R 3 726	R 161 217	R 255 398
Average	R 10 051	R 414	R 17 913	R 28 378
Universities				
FORT HARE, Univ of	7 124	946	18 154	**26 224**
FREE STATE, Univ of	11 963	535	19 870	**32 368**
KZN, Univ of	15 352	250	19 659	**35 261**
NORTH WEST Univ	15 227	650	13 498	**29 375**
NORTH, Univ of	11 528	1 165	13 130	**25 823**
PRETORIA, Univ of	16 805	-	23 726	**40 531**
STELLENBOSCH Univ	17 238	-	18 248	**35 486**
VENDA Univ	12 711	1 380	19 070	**33 161**
WESTERN CAPE, Univ of the	11 154	500	19 748	**31 401**
ZULULAND, Univ of	11 333	1 172	17 178	**29 683**
Total	R 130 435	R 6 598	R 182 281	R 319 313
Average	R 13 044	R 660	R 18 228	R 31 931

5.9 Costs in the Colleges of Agriculture and FET Colleges

The costs information provided in the Colleges is difficult to bring into comparison because the Colleges independently structure their fees and bundle their costs in different ways. Table 7 below provides an indication of how these costs are quoted.

Table 7: Study costs in the Colleges of Agriculture		
Cost category	**Range of costs ZAR**	**Comments**
Registration	R384 – R1250	Ranges between these amounts some do not indicate whether they levy registration
Examination fees	R80 per subject	Not all Colleges indicate they charge these fees
Certificate (Year 1)	Approx. R 8 000?	In most cases the Certificate is not charged separately but is included in the 2 year Higher Certificate cost. Eg in one College the combined cost would be R18 295
Higher Certificate (Year 2)	R 1 690 – R 9 120	Some Colleges do not offer all three qualifications so their fees structures are different from those offering all three years.
Diploma (Year 3)	R 2 500 – R13 955	Large range of tuition fee quoted
Residence p.a.	R 6 500 – R11 800	Ranges between these amounts. Some Colleges charge different registration fees for different programmes

Based on the above indications, the average costs of study for one year across the different qualifications given above could be R 15 000 consisting of R1 000 registration, R7 000 Tuition fees, and R7 000 residence fees. Although this is only an approximate amount, it does tally for overall costs of completing both the Certificate and the Higher Certificate of R28 000 quoted by one College.

The FET Colleges have a standard fee structure with some variations. Currently the progression through from N1 to N6 is not taught in every college. The costs of the more popular N4 and N5 (one year) and N6 (1 year) are R3 150, R3 000 and R6 650 respectively. Variations in the scale of costs between FET Colleges do exist. Most of the FET Colleges levy a registration of about R200. Books for a full programme cost about R1 200 per year, and Practical Courses bear costs of approximately R1 000 per year. The South Cape FET Colleges offers an Agriculture Learnership over 32 weeks (rather than courses from N1 to N6) which receives funding from the AGRISETA to the amount of about R8 000 per employed learner and R15 000 per unemployed learner. This funding is drawn from the skills development levies that employers are obliged to pay and is not paid by the learners themselves. Other Colleges such as Lovedale also offer Learnerships.

5.10 Summary: Cost of study analysis

For the sake of discussion, we could calculate the cost of study as the amount required to study a particular course at a particular institution. This amount could be compared with the average income of households – either in the local area or in the whole country - to generate an understanding of how many households could in theory be able to support one member studying in an institution.

However, there are a large number of factors that contribute to how the affordability of educational opportunity is measured in a household. People differ in the extent to which they will consider education affordable on the basis of the culture and social class. Many poor households will spend a much higher proportion of their disposable income on education than better earning households. Therefore a student might have access to funds that are more or less adequate for registration at a higher education institution, but not enough to register for the programme of her/his first choice.

In effect the decision of a student to enroll for an agriculture course may be a complex compromise between: which institution to attend, which programme she would like to enroll for, which is the closest institution, which institution is perceived to have the best reputation and which faculty (say of agriculture) is perceived to be the best. The best overall institution does not necessarily have the best agriculture faculty or department across all institutions.

Ultimately, the costs levied by the higher education institution are not the final measure of total costs of study. Students who do not live in residence have to meet costs such as: accommodation, food, and travel. In addition there are, of course, personal expenses according to the lifestyle that the student's budget can support. Excluding the direct and unavoidable registration and academic fees, there is wide variation possible in the way in which students can apportion or conserve their finances, especially with respect to living costs where they live away from home.

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CHAPTER 6

Financing higher and further education students in the field of agriculture

6.1 Introduction

The availability of various forms of financial assistance is of critical importance to ensuring that adequate numbers of students access the opportunity to study at various levels of the education system. These opportunities are provided through various vehicles such as loans, bursaries and scholarships.

As in other fields of study, students who seek to pursue studies in the agriculture field at the further and higher education levels can seek financial assistance from a range of providers:

- the National Student Financial Aid Scheme (NSFAS) a statutary body
- government agencies such as the NRF which provide post-graduate funding for research degrees
- government departments which seek to improve services by supporting students who enroll in particular fields and occupations
- enterprises and industry sectors which aim to improve human resources in their sphere of operations
- corporate social investment sources
- foreign government aid agencies
- local and international philanthropic foundations
- commercial banks which offer student loans at preferential interest rates
- other funders

It is clear that there is a range of potential financing sources from which students in general could seek financial support. However, it should not be assumed that financial support will necessarily be equally available irrespective of study field. The analysis that follows will consider the extent to which students in the Agriculture field have recourse to a proportionate share of financial aid resources, and the conditions that apply to the granting of financial aid.

6.2 Background to the public provision of financial aid in South Africa since 1990

It is necessary to provide a brief background to the provision of financial support to higher education students in South Africa in order to understand the data more clearly.

Until the 1990s South Africa did not have a government driven financial aid scheme for students. Post-school institutions had to raise funds to support students who needed such assistance. In general institutions appealed to local and international donors for assistance and allocated part of their general operating budgets to student financial aid. Then in 1991 the Tertiary Education Fund of South Africa (TEFSA) was established as a non profit making company to administer a national scheme of student bursaries and loans, in particular to support historically disadvantaged students with academic ability to embark on tertiary study.

However, the fragile financial situation at tertiary institutions was aggravated with student fee debt rising from R89 million in 1992 to R137 million in 1993. In 1995 the Minister of Education appointed the National Commission on Higher Education (NCHE) to investigate this situation. The Commission found that TEFSA was in the position to support a comprehensive, nationwide financial aid scheme and received the mandate to manage the government's National Student Financial Aid Scheme (NSFAS) in 1996. In 1999, the National Student Financial Aid Scheme Act (No 56 of 1999) was passed. From 2000, TEFSA became a statutory agency - with a board - called the NSFAS.

The NSFAS functions as an income-contingent loan and bursary scheme, where recipients start repayments once they are employed and earn above a sub-minimum threshold. Students receive 100% loans between R2 000 and R25 000. Up to 40% of the loan is converted into a bursary (which does not have to be repayed) depending on the student's academic results. (CHE, 2004, 194).

NSFAS works in partnership with institutions. It allocates funding to higher education institutions on the basis of a formula that factors in the number of students, student needs and cost of study. Students are assessed on basis of need and merit to determine the size of awards (Ngomane, 2004). Because the awards are made at the institutional level it is important to assess whether students in agriculture overall receive an equitable share of the opportunities to access funding in this scheme.

As can be seen from Table 1 below, in addition to government, contributions are made to the NSFAS by the higher education institutions themselves, and also by foreign donors and the South African private sector. This suggests that certain foreign donors and local private sector funders see the value of making their contribution through the infrastructure of the NSFAS rather than by administering their own bursaries. As a result, the funding flowing through other channels will presumably be smaller than the NSFAS. The value of funding made available to higher education other than through the NSFAS is however difficult to quantify as will become clear below.

Table 1: Amount and source of NSFAS funding, 1991- 2002 (in R000)

Financial Year	IDT & Kagiso Trust	Foreign Donors	SA Private Sector	Higher Education Institutions	Recovered Funds	State	Other	TOTAL
1991/92	21.5	-	-	-	-	-	-	21.5
1992/93	25.0	14.0	-	-	-	-	-	39.0
1993/94	30.0	39.0	-	-	-	-	-	59.0
1994/95	30.0	37.0	-	-	-	10.5	-	77.5
1995/96	20.0	76.0	-	-	-	57.1	-	153.1
1996/97	16.0	18.5	-	15.0	-	283.8	-	333.3
1997/98	48.2	71.9	-	30.3	2.0	198.3	-	350.9
1998/99	-	37.9	4.6	26.7	23.1	296.5	5.5	394.5
1999/00	-	19.2	4.9	17.7	14.2	384.9	-	441.0
2000/01	-	35.0	5.0	24.1	9.3	437.4	-	510.8
2001/02	-	7.2	5.6	32.9	146.6	439.9	2.8	635.0
2002/03	-	19.5	1.3	44.4	147.9	506.7	13.5	733.4
TOTAL	**190.7**	**365.2**	**21.4**	**191.1**	**343.1**	**2615.1**	**21.8**	**3749.0**

Source: CHE (2004, 197)

The data shows that government is increasing its commitment to supporting students financially through NSFAS from R10.5 million to R506, 7 million between 1994 and 2002. This produces a challenge for administrators of the funding at the national level in NSFSA as well as in the higher education institutions:

> "the challenge to institutions in the administration of financial aid is to try and balance several factors which are to some extent contradictory: on the one hand what we are trying to do is to assist financially needy students. On the other hand we have to ensure that the funds are given to students who have the potential to succeed, to people who have the capacity to acquire degrees and to find employment so that they can pay back." (Ngara, 2003, 2)

In addition, the administrators of NSFAS must consider how funding can be focused – eg: by targeting particular fields or occupations - so as to direct the flow of students into occupations and economic sectors that are important in ensuring growth and development in the country. In this regard, Ngomane (2004) of the Financial Aid Practitioners society of South Africa (FAPSA) who represent managers of financial aid in higher education institutions commented recently on the "(L)ack of a strategy (in FAPSA) to address the human resource needs of our country."

The analysis that follows will be presented in two separate sections. In the first section, the NSFAS will be addressed. Thereafter, the nature of other funding will be considered.

6.3 NSFAS funding of higher education studies in Agriculture

In 2004/05, the government allocation to the NSFAS was expected to be 6% of the national budget for higher education institutions (Department of Education, 2004, 5). In 2004, the funds awarded by NSFAS to nearly one hundred thousand students approached one billion rands (Table 2). In the same year, 1 372 students in Agricultural fields were awarded R12 348 million rands. The critical question is whether these disbursements favoured or did not favour students in Agriculture.

Table 2: NSFAS Recipients 1994 - 2004

	All NSFAS Recipients			Recipients studying Agriculture		
Year	**No of Students**	**Award in ZAR**	**Bursary Amount in |ZAR**	**No of Students**	**Award in ZAR**	**Bursary Amount in ZAR**
1994	25 577	R 70 480 838	R 0	34	R 114 373	R 0
1995	40 008	R 154 322 566	R 39 731 071	297	R 1 045 521	R 164 513
1996	67 646	R 333 358 020	R 88 515 312	752	R 3 847 843	R 1 014 151
1997	63 280	R 350 997 798	R 101 508 387	756	R 3 940 077	R 1 180 524
1998	67 562	R 394 497 978	R 116 088 116	1 005	R 5 907 093	R 1 772 100
1999	68 368	R 441 054 768	R 127 939 823	1 105	R 7 776 352	R 2 240 111
2000	72 045	R 510 829 288	R 149 950 809	1 363	R 10 147 172	R 2 984 481
2001	80 528	R 635 091 085	R 183 734 508	1 420	R 11 563 049	R 3 417 448
2002	86 161	R 733 474 559	R 210 297 329	1 391	R 11 538 599	R 3 418 315
2003	96 641	R 893 672 472	R 251 750 612	1 463	R 11 625 277	R 3 304 628
2004	95 074	R 917 725 497	Not yet available	1 372	R 12 348 994	Not yet available

Data source: Personal Communication NSFAS (2005)

Table 3 shows that in the period of analysis, even though students in Agriculture were a relatively small proportion of all recipients, between 1998 and 2002, they received a greater share of financial aid than their share of enrolment. This was a positive trend for the field of agriculture. However, the year 2003 shows that students in agriculture received less NSFAS awards (1.5%) and a smaller award amount (1.3%) than their share of enrolment (1.56%). This recent decline must be monitored to ensure that agriculture students have equitable access to the NSFAS resources.

Table 3: Recipients in agricultural fields as a proportion of total enrolment and of NSFAS recipients, award amount and bursary amount

Year	% of all students enrolled in higher education*	% of all Recipients of NSFAS	% of award amount	% of bursary amount
1994	1.32	0.1	0.2	-
1995	1.34	0.7	0.7	0.4
1996	1.24	1.1	1.2	1.1
1997	1.35	1.2	1.1	1.2
1998	1.38	1.5	1.5	1.5
1999	1.39	1.6	1.8	1.8
2000	1.47	1.9	2.0	2.0
2001	1.62	1.8	1.8	1.9
2002	1.53	1.6	1.6	1.6
2003	1.56	1.5	1.3	1.3
2004	-	1.4	1.3	-

Data in this column is from Table 2 in Chapter 3 of this report.
Data source: Personal Communication NSFAS (2005)

In Table 4 below, the average award to students in agriculture is compared to the average award to all NSFAS recipients in 2003. This shows that, on average agriculture students received R7 946, which was 14% less than the national average. Likewise, the average bursary amount for agricultural students was 13% less than the average of all NSFAS recipients. These averages are affected the proportions of students who take undergraduate and post graduate courses in each group as well as their academic performance in determining the bursary amount. Therefore the differences shown here may not necessarily reflect a bias against agriculture students. Further investigation is necessary to understand these patterns more completely.

Table 4: Comparison of the value of NSFAS disbursements to all students with disbursements to agriculture students in 2003

Year	Number	Total award in ZAR	Total bursary mount in |ZAR	Average award in ZAR	Average bursary amount in ZAR
All NSFAS Students	96 641	R 893 672 472	R 251 750 612	9247	2605
Agriculture Students	1 463	R 11 625 277	R 3 304 628	7946	2259
Difference				**14% less**	**13% less**

It is equally important to monitor the proportion of agriculture students who are recipients of NSFAS financial assistance. This provides some sense of the extent of the financial 'safety-net' that is extended to Agriculture students. As can be seen, the proportions of agriculture students who were recipients of NSFAS assistance was at its highest in 2000 and then declined to 13.1% in 2003 (Table 5). In effect, this means that 13 in every 100 agriculture students received assistance.

Table 3: Recipients in agricultural fields as a proportion of total enrolment and of NSFAS recipients, award amount and bursary amount

Year	Total enrolment in higher education in agricultural fields	Students enrolled in Agriculture and NSFAS recipients	Agriculture student recipients of NSFAS as a proportion of total enrolment in Agriculture %
1994	6 528	34	0.5
1995	7 221	297	4.1
1996	7 027	752	10.7
1997	7 689	756	9.8
1998	7 741	1 005	13.0
1999	7 696	1 105	14.4
2000	8 669	1 363	15.7
2001	10 588	1 420	13.4
2002	10 348	1 391	13.4
2003	11 196	1 463	13.1
2004	-	1 372	-

Data source: Personal Communication NSFAS (2005)

Within the overall levels of access to financial assistance, it is necessary to consider the distribution of support on the basis of race, given the history of disadvantage suffered by black people in South Africa. The NSFAS does not currently supply data on the racial breakdown of recipients at the level of study field, such as agriculture. However, data for all students receiving NSFAS support suggests that the overwhelming majority of recipients by 2001 were African (Table 6). Given this pattern, it is likely that the shape of access among agriculture students was similar.

Table 1: Amount and source of NSFAS funding, 1991- 2002 (in R000)						
Year	African	Coloured	Indian	White	Unknown	Total
1995	37 280	2 367	1 362	196	2 664	43 869
1998	63 800	2 063	1 144	1 563	7 197	75 767
2001	20 335	524	365	397	71 916	93 537
(b) Students receiving awards in percent (%)						
Year	African	Coloured	Indian	White	Unknown	Total
1995	85	5	3	0	6	100
1998	84	3	2	2	9	100
2001	22	1	0	0	77*	100

* This is a data error, and the group allocated as 'unknown' is assumed to be majority African Source: CHE (2004,197)

Currently, the NSFAS data does not enable analysis of the share of support between university and technikon students disaggregated to study field. At the aggregate level, we know that in 2002, university students received 59% of NSFAS expenditure, while technikons received 41% of expenditure (CHE, 2004, 197).

We are able to describe the breakdown of grants within agriculture by the qualification for which they were registered (Table 7 and Table 8). Within the group of recipients who were registered for a degree or an under-graduate diploma, a shift has occurred over the decade in which the proportion of diplomates has increased from 36% in 2000 to 48% in 2004, while recipients registered for degrees declined from 64.0% to 51.3% in the same period (Table 8).

Table 7: Number of NSFAS recipients in agriculture by qualification level, 1994 - 2004											
Qualification	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Diploma	3	114	255	309	344	404	491	599	620	662	658
Degree	31	183	497	447	661	701	872	821	770	800	704
Post Grad Diploma	-	-	-	-	-	-	-	-	-	1	-
Honours	-	-	-	-	-	-	-	-	-	-	7
Masters	-	-	-	-	-	-	-	-	-	-	3
Doctorate	-	-	-	-	-	-	-	-	1	-	-
Total	**34**	**297**	**752**	**756**	**1005**	**1105**	**1363**	**1420**	**1391**	**1463**	**1372**

Data source: Personal Communication NSFAS (2005)

Evidently, the NSFAS awards were not targeted at post-graduate levels – or post-graduate students did not apply for assistance - until very recently. From 2002, evidence suggests that the rates of post-graduate applications are increasing (Table 7 and Table 8). This will need to be monitored. Some coordination may be appropriate to establish that post-graduate students are supported by the appropriate funding body, given that the National Research Foundation is also a source of post-graduate research funding.

Table 8: NSFAS recipients in agriculture by qualification level in percentage, 1994 - 2004											
Qualification	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Diploma	8.8	38.4	33.9	40.9	34.2	36.6	36.0	42.2	44.6	45.2	48.0
Degree	0.2	61.6	66.1	59.1	65.8	63.4	64.0	57.8	55.4	54.7	51.3
Honours	-	-	-	-	-	-	-	-	-	0.1	-
Post Grad Diploma	-	-	-	-	-	-	-	-	-	-	0.5
Masters	-	-	-	-	-	-	-	-	-	-	0.2
Doctorate	-	-	-	-	-	-	-	-	0.1	-	-
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Data source: Personal Communication NSFAS (2005)

The share of award amounts shifted to a similar extent between diploma and degree levels (Table 9). This suggests that the value of financial awards between diploma and degree levels is similar in size.

Table 9: Share of NSFAS award amounts to Agriculture by qualification level in percentage, 1994 - 2004

Qualification	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Diploma	7.6	25.1	24.6	27.3	28.0	32.3	32.2	36.7	39.8	45.5	50.7
Degree	92.4	74.9	75.4	72.7	72.0	67.7	67.8	63.3	60.1	54.4	48.4
Post Grad Diploma	-	-	-	-	-	-	-	-	-	0.1	-
Honours	-	-	-	-	-	-	-	-	-	-	0.6
Masters	-	-	-	-	-	-	-	-	-	-	0.3
Doctorate	-	-	-	-	-	-	-	-	0.1	-	-
Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Data source: Personal Communication NSFAS (2005)

6.4 Funding of higher education studies in Agriculture outside of the NFSAS

There is a wide range of institutions that offer financial assistance to students in higher education. In order to obtain an overview of the characteristics of financial assistance offered other than through the NSFAS, three sources of bursary information were used: the "Bursary Register" editions for 2004 and 2005, a hard copy book that is widely used and recommended as a source, the website www.careers.co.za (continuously updated), and "Career Mentor" (2005 edition). The latter is a computer based Career Guidance Information System available on CD that consists of a database of careers, bursaries and study information in South Africa. This is a competitive product available on the market and on this basis was considered to provide reasonably comprehensive and reliable information. For further details on sources, please refer to the Methodology section at the beginning of this report.

The data from Career Mentor and the other two sources were searched using key words to reveal a set of 60 bursary opportunities in the field of agriculture. Just over half of all the bursaries obtained in this sample were dedicated specifically to agriculture or a sub-field within agriculture (Table 10). In the other cases, students from one or more fields other than agriculture were also eligible to compete for the bursary on offer. Therefore it cannot be assumed that agriculture students would automatically qualify and receive the award.

Table 10: Fields of study for which bursaries are offered, 2004 - 2005

Field	N	%
Agriculture only	34	56.7
Agriculture and 1 other field	7	11.7
Agriculture and 2 other fields	6	10.0
Agriculture and 3 other fields	1	1.7
Agriculture and 4 other fields	3	5.0
Agriculture and 5 other fields	1	1.7
Agriculture and 6 – 10 other fields	6	10.0
Agriculture and more than 10 other fields	2	3.4

Note: Percentage may not add up to 100 because of rounding

This group of bursaries was then coded for analysis according to:

- value of bursaries
- period for which the award is available
- eligibility criteria
- specification of institution(s) where the study programme must be undertaken
- associated service conditions for successful candidates

The value of the bursaries ranged from R400 to R25 000 with an average value of R6 928. This average value was derived from bursaries where the actual amount was specified, or where an amount could be inferred from what cost categories (ie: fees only) the bursary was stated to cover. About one quarter of the bursaries on offer did not specify an amount or an expenditure purpose (Table 11). In 18.4% of the cases, the bursary was worth R20 000 or more which would cover most of an undergraduate's tuition and residence costs. Other bursaries would contribute to, but would not provide sufficient support in themselves.

Table 11: Value of bursaries over one year

Value	N	%
<R2000	8	13.4
<R5000	8	13.4
<R10000	5	8.3
<R20000	4	6.7
<R30000	7	11.7
Stated as variable	12	20.0
No amount given	16	26.7
Total	60	100.0

Note: The percentages do not equal 100% because of rounding.

Within the scope of this study is not possible to investigate the number of students to whom bursaries are awarded by the various organisations. Organisations may also award more or fewer bursaries in a particular year based on the number and quality of applicants. Such information is not necessarily made public. This means that there is no simple means of establishing the number of students assisted or the gross value of non-NSFAS financial assistance over time.

The period for which a bursary is offered is important especially where this affects the security of students in obtaining funding for the duration of the programme for which they enroll. Fortunately, the majority of bursaries either directly offered support for the duration of the study programme (26.7%), or provided for this opportunity conditional only on acceptable performance (23.3%) (Table 12). An additional 5.0% of bursaries were offered for either a three or four year period which normally covers a basic undergraduate programme. In one quarter of the cases, the bursary was offered for only one year, which creates some concern about continuity of funding for those students who receive this award.

Table 12: Period for which the bursary available		
Duration	**N**	**%**
One Year	14	23.3
Three Years	2	3.3
Four Years	1	1.7
Duration of the study programme	16	26.7
Renewable subject to acceptable performance	14	23.3
No period specified	13	21.7
Total	60	100.0

Organisations that offer bursaries apply a variety of conditions, which are intended to focus the opportunity on particular students. The list of conditions given in Table 13 is arrayed in ascending order. Some bursaries included several conditions and others specified no conditions. Clearly, academic merit is an important requirement because organisations wish to maximize the chance that their contribution will support students with the greatest likelihood of successfully completing their academic programmes. In 38.3% of cases, demonstrated academic merit was a condition.

The focus was also on undergraduate students: undergraduate students were mentioned in 37.8% of the bursaries, while first year students and second year students were mentioned in 8.9% and 10% of the bursaries respectively. By offering their bursary in the second year only, organisations appear to be attempting to reduce the risk associated with high attrition among first year students.

Conditions for bursary eligibility that focus on disadvantaged populations were also evident. Reference was made specifically to black students, students from rural areas, and students with financial need in 5.0%, 8.3% and 31.7% of the bursaries respectively. In the agricultural related bursaries, there were no opportunities that focused specifically on female students.

Table 13: Bursary is offered subject to the following conditions or student characteristics:		
Description	**N**	**%**
For post-graduate students	3	5.0
For Black students	3	5.0
For first year students	4	6.7
For students from rural areas	5	8.3
For full time students	5	8.3
For students prepared to work in a particular industry	8	13.3
For students resident in a particular area (eg: Province, Town etc.)	12	20.0
For second year students	16	26.7
For students with financial need	19	31.7
For undergraduate students	17	28.3
For students who demonstrate academic merit	23	38.3
Other	5	8.3

Note: Many bursaries were offered on the basis of a number of conditions. The percentage indicates how often a particular condition was specified out of the 60 bursaries that were included in this survey.

In some instances bursaries were tied to enrolment in particular education institutions. Not all bursaries specified a particular institution by name, but sometimes institutions in a particular area. Also where a student is committed to a particular programme, the fact that such a programme – in a particular field or with a particular qualification - will only be offered in particular institutions, therefore limits her/his selection where bursaries are only offered in particular institutions. The following institutional types were referred to in a certain percentage of the bursaries: any College (13%), any FET institution (17.7%) any Technikon (17.8%) or any university (31%) (Table 14).

There were ten Technikons and nine Universities offering courses in Agriculture. But where an institution was referred to by name as the preferred place of study, Technikons were named six times and Universities are named 35 times. This means that universities are advantaged by the specification of institution.

Table 14: Specification of institution at which bursary is tenable:

Description	Total	%
At a particular Agricultural College	4	6.7
At one of the higher education institutions in a particular province	5	8.3
At any Agricultural College	10	16.7
At a particular Technikon	6	10.0
At any FET institution	2	3.3
At any Technikon	10	16.7
At any University	17	28.3
At a particular University	35	58.3

Note: The percentage indicates how often a particular institution was specified out of the 60 bursaries that were included in this survey.

From Table 13 above, there is evidence that 13.3% of bursaries attempt to attract students to obtaining qualifications in a particular industrial sector. This is an indirect way of drawing human capital into a sector because it does not involve any compulsory link with the sector via an employment contract. Organisations utilize bursaries to supplement their own human resources and recruitment strategy by offering bursaries on condition that the successful candidate will work for the organisation for a specified period. This was the case with nearly one fifth of the bursaries offered (Table 15).

Table 15: Bursary conditional on a service contract

Service contract provisions	N	%
No service contract conditions	49	81.7
Service contract required	11	18.3
Total	60	100.0

6.5 Bursaries in the Colleges of Agriculture

Financial support in the Colleges of Agriculture is set to improve as the NSFAS begins to offer support for students enrolled in these institutions. However, non-NSFAS bursaries tend to be offered in Universities and Technikons, with Colleges being specified in only 23.4% of the cases. This suggests a lack of bursary support in these institutions, which may help to explain in part why the enrolment of Colleges appears to be in decline.

In some Colleges, bursaries are offered by provincial Departments of Agriculture, as is the case with Cedara in KwaZulu Natal where five bursaries were offered recently, and Glen College in the Free State. In other instances, sectoral bodies such as the Sugar Industry Trust offer Bursaries for students registered at the Lowveld and Owen Sithole Colleges of Agriculture.

6.6 Financial support for higher degree research

The support of research and higher degrees in South Africa is of critical importance in all fields to replenish the stock of personnel in R&D so that this country can maximize innovation for economic development. For this reason, in addition to the financial support provided by government and private bodies for standard agricultural qualifications, it is important to consider support for studies at higher degree levels that involve training in research.

The NRF offers the following categories of scholarships in the natural, social and human sciences, engineering and technology to meet national priorities and global challenges:

- Free-standing scholarships for full-time honours study (DoL scarce skills scholarships)
- Free-standing scholarships for full-time Master's and doctoral study in South Africa (DoL scarce skills scholarships)
- Free-standing postdoctoral fellowships for research in South Africa (DoL scarce skills fellowships)
- Free-standing scholarships for full-time honours, Master's and doctoral study in South Africa as well as postdoctoral fellowships for research in South Africa for students that are physically challenged (disabled) (DoL scarce skills scholarships)
- Free-standing prestigious scholarships for full-time Master's and doctoral study in South Africa as well as doctoral study abroad
- Free-standing equity scholarships for full-time Master's and doctoral study in South Africa as well as doctoral study abroad
- Free-standing postdoctoral fellowships for research, either in South Africa or abroad
- Free-standing scholarships in targeted areas for full-time Master's and doctoral study in South Africa in metallurgy, biochemistry, laser and optical physics as well as engineering (NLC/NRF laser research scholarships)
- The Cambridge Commonwealth Trust (CCT) and the NRF joint funding of five (5) South African doctoral scholars
- DAAD In-country Scholarships

Research, especially in the natural sciences, can be an expensive undertaking. Support for the research process itself and the related costs beyond basic tuition fees is therefore important. Based on strategic areas in the national research system, the National Research Foundation (NRF) provides support through the Thuthuka Programme to build the research support environment, improve the qualifications, and accelerate the progression of designated groups, (NRF, 2004). Funding is provided for: research running costs; research instrumentation; conference attendance; and costs of mentorship and supervision leading to a Doctoral degree and writing a publication. Sub-programmes include:

- Women In Research
- Research Development Initiative for Black Academics
- Research in Training

It was not possible in the constraints of this project to gather information on agricultural students who successfully applied for the different forms of NRF scholarships, but this would be important to assess the extent to which enrolment in agriculture at the graduate and immediate post-graduate levels actually converts to high level training and skilling at the Masters, Doctoral and post-Doctoral levels.

6.7 Comments

In the discussion above, evidence was presented of increases in overall government support for the NSFAS scheme. This can be broken down according to the source departments or tiers of government. Most significant for this analysis is the appearance of specific support from the Department of Agriculture of R5.3million and R5.7million in 2004 and 2005 respectively. It is a matter of concern that the full amount of funding made available by the Department of Agriculture and ring-fenced for agricultural study was not spent in the 2004 year. The reason why this money was not allocated to students needs to be followed up.

Table 7: Number of NSFAS recipients in agriculture by qualification level, 1994 - 2004

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Department of Education	10,3	57,1	283,8	197,7	296,5	390	444	450	500	545	578	864
Department of Labour	0	0	0	0	0	0	0	0	22	106	73	16.9
Department of Agriculture	0	0	0	0	0	0	0	0	0	0	5.3	5.7
Provincial Governments	0	0	0	0	0	0	0	0	14	15	21	22.6
Total from State Sources	**10,3**	**57,1**	**283,8**	**197,7**	**296,5**	**390**	**444**	**450**	**536**	**666**	**677.3**	**909.2**

NSFAS (2005)

The Department of Agriculture has also put in place its Agricultural Bursary Scheme in order to contribute towards human resource development in the agricultural sector. It seeks to "mobilise learners at pre-tertiary level in order to identify and nurture potential at an early stage and to have more agricultural scientists at the highest level, relevant to the present and future market needs of the sector and the economy." At the same time, it seeks to: "increase the number of agricultural scientists in designated groups, and, consequently, to increase the number of farmers from designated groups at commercial level."(Department of Agriculture, 2003, 1). It will be important for the Department to track students who were awarded these bursaries as they progress through their studies and into their careers that will hopefully remain in agriculture or cognate fields.

6.8 References

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CHAPTER 7

Demand for intermediate to high-level skills within the South African agricultural sector

7.1 Introduction

Different activities across the South African agricultural sector require particular agricultural skills or qualifications. Together these requirements constitute the demand for intermediate to high-level agricultural qualifications in the labour market. The demand for skills is not static, but is dependent on the interplay of various global, national and intra-sectoral pressures. Thus while on the one hand it is important to establish overall demand trends for intermediate and high-level agricultural qualifications from data sources such as the Labour Force Survey, on the other hand it is even more important to gain a clearer understanding of the dynamic nature of demand for agricultural qualifications at the meso and micro levels within the agricultural sector and the ways in which the various forces acting on and within the sector are shaping these demands.

This chapter aims firstly to present the available macro-level data on the demand for intermediate to high-level agricultural skills. Secondly, it aims to identify and understand the various types of activities requiring agricultural skills within the agricultural sector. Finally, it aims to identify the pressures that are influencing the sector's demand for skills over time.

The basic structure of this chapter is as follows: A macro-level overview of the demand for intermediate to high-level agricultural qualifications within the South African labour market is derived from Labour Force Survey March 2004 data. In moving towards understanding the structure of the sector and how this impacts on potential skill requirements, the macro level analysis is followed by the generation of a schematic map representing a broad structural overview of the South African agricultural sector as it pertains to specific activities. This broad level identification of possible skill-demanding activities within the sector is expanded upon through an overview of the distribution of the full range of formal skills requirements within the sector.

The main body of this chapter comprises an extensive analysis of information about current employment and skills needs that was gathered from enterprises, organisations, institutions and other key role-players operating within the sector. These findings span: primary agricultural activities; secondary agricultural activities; activities involved in generating agricultural sector-specific input needs (eg: seeds); non sector-specific inputs (eg: information technology); and governance and support activities.

7.2 Employment of people with intermediate to high-level skills in the agricultural sector

An analysis of the data from the Labour Force Survey March 2004 provides macro-level employment information, which while unable to provide a specific figure, allows for the emergence of a picture of the overall employment of individuals with intermediate to high-level agricultural qualifications. The data analysis refers to overall employment levels within the South African agriculture sector; employment levels within occupational and industrial categories associated with agriculture; and within the group of people who hold agricultural qualifications. Income levels (which generally related to presence or absence of skills) are used as an additional indicator to triangulate across datasets.

7.2.1 Overall employment in the agriculture sector

It is necessary to contextualize employment patterns within the agricultural sector in relation to the whole economy. Table 1 below shows that 1,271 million people were employed in agriculture in early 2004, a figure which constituted just over 10% of all people employed. Agriculture as a sector has the fifth largest share of formal employment, but has the second largest share of informal employment such as subsistence or small scale farming. The majority of those employed in agriculture - 73.4% - were however located in the commercial sector. It is likely that most graduates with intermediate to high-level skills will find employment in the commercial sector. However, it cannot be ruled out that people with these skills are active in subsistence and small scale farming activities.

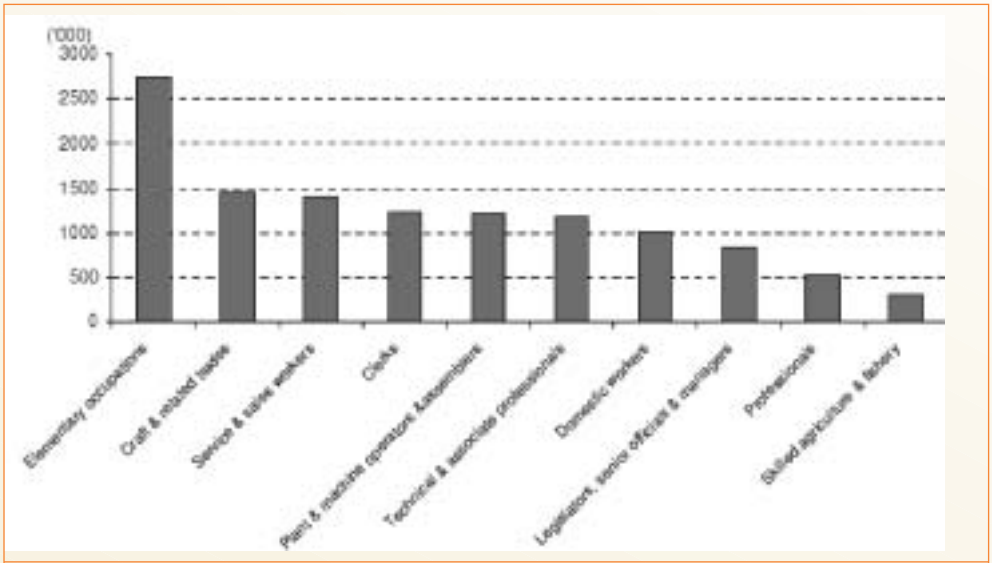
Table 1: Employment nationally and in the agricultural sector in 2004 (000 people)		
	(000)	%
Total employed nationally	11	-
Total employed in agriculture	984	10.60
Out of which:	1271	
Commercial agriculture		73.4
Subsistence & small scale	930	26.6
agriculture	337	100%

Source: LFS 2004 March p.iv-v

7.2.2 Agricultural employment by occupational category

When agricultural employment is viewed from the perspective of occupational category, we see that approximately 308 000 people were "Skilled agriculture and fishery workers" (Figure 1). This category includes: skilled field crop and vegetable growers; gardeners, horticultural and nursery growers; dairy and livestock producers; poultry producers; and forestry workers and loggers. The output of intermediate skilled graduates especially those from the FET Colleges and the Colleges of Agriculture would probably form part of this category. However, this occupational category excludes all workers in the agricultural sector with training in the agricultural field who are "Technical and associate professionals", "Legislators, senior officials and managers' and "Professionals". Therefore, this category does not assist in estimating the size of the population of all intermediate and high skills workers in the agricultural sector. This category would also include some agricultural and fishery workers who do not necessarily have agricultural qualifications.

Figure 1: Workers by main occupation: March 2004



Source: "Figure 3: Workers by main occupation: March 2004" In LFS 2004 March p.viii

The problem is that the occupational categories utilized in the Labour Force Survey reflect differences between occupations according to several dimensions: the job function or role, the type of work environment and skills levels. As a result it is difficult to isolate workers who work in the agriculture sector and have "intermediate" skills and "high skills" qualifications from other workers who have lower level qualifications.

Analysis by occupational category thus needs a more secondary indicator of the skills levels of workers, for instance the selection of a variable from the Labour Force Survey that can be used as a proxy for skills. In general in market economies, increased income is fairly strongly associated with increased skills levels with private rates of return to education rising with increased qualifications.

For the purposes of the ensuing analysis, monthly income will be used as the proxy for skills levels. The data from the Labour Force Survey provides four broad income categories. This discussion will employ the two highest categories: 'earning R2 501 – R8 000 per month' (or R30 000p.a. to R96 000p.a.) and 'earning R8 001 and more per month' (above R96 000p.a.). We will assume that most – though not necessarily all – workers with intermediate and high-level skills earn at these levels.

To demonstrate, we apply this approach to the "skilled agricultural and fishery worker" occupational category where we can see that there are 18 000 and 11 000 workers in the' R2 501 – R8 000' and 'R8 001 and more' categories respectively (Table 2). This data suggests that there are 29 000 workers in the "skilled agriculture and fishery workers" occupational category with intermediate to high-level skills. But we must recall that this excludes workers involved in the agriculture sector who are in the 'professional', 'management' and 'associate professional' occupational categories. Therefore we can assume that the actual number of intermediate and high skilled agricultural workers in South Africa is higher than 29 000 workers.

Table 2: Workers by main occupation and monthly income

	Field of study	None	R2500 or less	R2501- R8000	R8001 or more	Total
LFS 2004 Mar	**Total employment**	277	6968	2943	1004	11984
	Skilled agriculture and fishery workers	178	88	**18**	**11**	**308**
	Total employment	23.1%	58.1%	24.7%	8.4%	100%
	Skilled agriculture and fishery workers	57.8%	28.6%	5.8%	3.6%	100%

- Total includes "Don't know" "Refused" or "Unspecified Income"
- Figures in 000

Source: LFS 2004 March p.30

7.2.3 Employment in the 'agricultural, hunting, forestry & fishing' industry category

Other than 'occupational category', another approach to capture the number of intermediate to high skills workers is to look at employment by industry category. The category relevant to this analysis is the "agriculture, hunting, forestry and fishing industry". When we cross-tabulate the same income categories with employment numbers in that industry, a total of 47 000 and 20 000 are given in the 'R2 501 to R80 00' and the 'R8 001 and above' income categories (Table 3). However, this total figure of 67 000 captures all workers in the agricultural sector in the relevant income range and will therefore include people who work in the sector but who do not have agricultural qualifications. It also, by definition, includes hunting, fishing and forestry workers. Therefore, we assume that the number of intermediate and high skills workers with agricultural qualifications who work in the agriculture, hunting, fishing and forestry industries will be less than the total number working in this sector who earns more than R2 500 per month.

Table 3: Workers by main industry and monthly income in 2004 (000 workers)

		None	R2500 or less	R2501- R8000	R8001 or more	Total
LFS 2004 Mar	**Total employment**	277	6 968	2 943	1 004	11 984
	Agriculture hunting forestry and fishing	184	992	47	20	1 271
		23.1%	58.1%	24.7%	8.4%	100%
	Total employment	14.5%	78.1%	3.7%	1.6%	100%
	Agriculture hunting forestry and fishing					

- Total includes "Don't know" "Refused" or "Unspecified Income"
- Figures in 000

Source: LFS 2004 March p.29

7.2.4 The presence of agricultural qualifications in the South African labour force

Having established that the number of agricultural workers with intermediate to high-level skills is probably higher than 29 000 but lower than 67 000, it is possible to utilize another variable available from the Labour Force Survey to test this assumption. The Labour Force Survey collected data on the number of "workers with degrees diplomas and certificates by field of study". The reference to 'degrees, diplomas and certificates' corresponds fairly closely with qualifications in the FET and HET levels as defined for the purpose of this work:

- diploma/certificate with less than Grade 12/Std 10 (this group will include people below intermediate skills level)
- diploma/certificate with Grade 12/Std 10
- degree
- postgraduate degree or diploma

The number of workers who have degrees in the disciplinary field of "agriculture and nature conservation" was cross-tabulated with monthly income. According to this method, there are 33 000 (19 000 plus 14 000) workers in the economy within the salary ranges that we have taken to equate to intermediate and high skills levels in the 'agriculture and nature conservation' field (Table 4). However, the data suggests that the actual number of workers with "degrees, diplomas and certificates" in agriculture is 42 000. This implies that a number of workers with these qualifications – about 21.4% - earn below R2 500, but because this number is under 10 000, it cannot be reliably specified.

Table 4: Workers with degrees diplomas and certificates by field of study and monthly income

	Field of study	None	R2500 or less	R2501- R8000	R8001 or more	Total
LFS 2004 Mar	Total employment	*	221	925	594	2006
	Agriculture and nature conservation	-	*	19	14	42
	Total employment	-	0.11%	46.1%	29.6%	100%
	Agriculture and nature conservation	-	*	45.2%	33.4%	100%

- Total includes "Don't know" "Refused" or "Unspecified Income"
- For all values of 10 000 or lower (see *) the sample size is too small for reliable estimates
- Figures in 000

Source: LFS 2004 March p.28

7.2.5 Summary of macro economic data on employment of agriculture qualifications

In summary, the Labour Force Survey of 2004 suggests that there are between 33 000 and 42 000 workers in the labour force who hold degrees, diplomas and certificates in Agriculture and who work in the sector. This data provides the best estimate available for establishing the total size of the agricultural workforce with intermediate to high skills. While this estimation of the overall size of the intermediate to high-level skilled workforce is useful, we need to understand more about how skilled workers are distributed within this workforce and what the current skills needs are. The following section addresses these issues by examining data obtained at the enterprise level that reveals the skills needs associated with particular agricultural activities.

7.3 Broad overview of the structure of the South African agricultural sector

In order to picture the variety of skills required to support the South African agricultural sector at the meso and micro levels, as well as develop an understanding of the absorption of workers with intermediate to high-level agricultural qualifications into the sector, it is necessary to understand the basic structure of the agricultural industry. Table 5
As with any attempt to simplify a large system that is characterised by multiple relationships and inter-relationships between the various role-players, this schematic representation is a simplified model of the agricultural sector.

Although it presents all major links adequately, it cannot capture all possible relationships: For example while seeds are a direct input into the Plant Production group of activities, seed production is in itself a plant production activity, with 'Seeds' being the output of this activity. Additionally, while the focus of animal production may be for a specific purpose, dual outputs often result: e.g. meat and feathers in the case of Ostriches; and meat, wool and leather in the case of sheep. Finally, a by-product of 'Animal Production' – manure – may be sold as a fertiliser input into Plant Production activities, while the by-products of sugar-milling go into animal feed production. Despite these problems, this representation of the broader agricultural sector provides some way of qualitatively tackling an analysis of the requirements for skills within the sector. below provides a schematic representation of the sources of demand for such skills in relation to the various areas of activity within the agricultural sector.

Table 5: A Schematic Representation of the Agricultural Sector

D. NON SECTOR-SPECIFIC INPUTS	C. SECTOR SPECIFIC INPUTS		
		A. PRIMARY AGRICULTURE	
• Specialist equipment, machinery & engineering services • Water and Electricity • Specialist packaging and labelling suppliers	Seeds Fertilizers Crop-Protection Feeds Veterinary-Services Animal Health Products	Plant Production	Fruit & Nuts Grains and Oilseeds Vegetables & Herbs Tea & Coffee Ornamental Plants & Flowers
		Animal Production incl. Aquiculture	Tobacco Commercial Forestry For Carcass For By-Product (feathers, eggs, milk, honey, wool etc) For Conservation & Tourism
		B.	Fish Hatcheries/Farms
			B. SECONDARY AGRICULTURE
• Specialist transportation, logistics & storage services • Specialist software and technology	Chemical preservatives, supplements, detergents	Basic Food & Beverage Processing	Fruit & Nuts Vegetables & Herbs Grains and Oilseeds Red Meat, Poultry & Fish Dairy Tea & Coffee
		Fibre Processing	Wool Cotton & Flax Leather Wood
		Feed & Supplement Production	For Animal Production & Pets

E. GOVERNANCE AND SUPPORT SERVICES

- National & Provincial Government Departments & Institutions
- Training & Skills Development
- R&D
- Specialist Financial Services
- Agricultural Product Sales and Marketing Organisations
- Retail Sector
- Private Consulting Companies
- Product & Industry Regulatory Boards and Quality Assurance Organisations
  Professional, Consumer and Producer Associations and Societies

*4 As with any attempt to simplify a large system that is characterised by multiple relationships and inter-relationships between the various role-players, this schematic representation is a simplified model of the agricultural sector. Although it presents all major links adequately, it cannot capture all possible relationships: For example while seeds are a direct input into the Plant Production group of activities, seed

Thus the activities requiring formal skills may be associated with:

A. Primary Agricultural Activities - production of plants and animals
B. Secondary Agricultural Activities – basic processing of primary agricultural products
C. Generating, Producing and Supplying Sector-Specific Inputs
D. Generating, Producing and Supplying Non Sector-Specific Inputs
E. Participation in Governance and Support Services

In Table 5 agricultural activities are presented in the large column on the right, under the headings 'A. Primary Agriculture' and 'B. Secondary Agriculture'. Primary agricultural activities can broadly be sub-divided into the categories of 'Plant Production' and 'Animal Production', with activities within each of these broad categories e.g. grain production. Secondary agricultural or basic processing activities, which feed directly off the primary agricultural activities, can broadly be grouped into 'Basic Food and Beverage Processing', 'Fibre Processing' and 'Feed and Supplement Production'.

All forms of primary and secondary agriculture will require sector-specific inputs (presented in Column C.). For instance, in the primary agricultural sector, plant production requires seeds, fertilizers and crop protection agents while animal production requires feeds, supplements, veterinary services (including vaccines) and animal health products. Within the secondary agricultural sector, specific inputs include chemical preservatives, supplements and detergents.

Each agricultural activity also requires a set of other inputs, which while not necessarily specific to the industry, often have developed specialised fields to support the agricultural sector (Column D). Such inputs include:

- Water and electricity services
- Specialist equipment, machinery and engineering services
- Specialist packaging and labelling services
- Specialist transportation, logistics and storage services
- Specialist information and communication technology service

Numerous institutions provide the governance and support services to the sector (Column E). While this group consists of a large number of institutions often with overlapping functions, these can roughly be classified as:

- National and Provincial Government Departments and Institutions
- Training and Skills Development
- R&D
- Specialist Financial Services
- Agricultural Product Sales and Marketing Organisations
- Retail Sector entities
- Private Consulting Companies
- Product and Industry Regulatory Boards and Quality Assurance Organisations
- Professional, Consumer and Producer Associations and Societies

production is in itself a plant production activity, with 'Seeds' being the output of this activity. Additionally, while the focus of animal production may be for a specific purpose, dual outputs often result: e.g. meat and feathers in the case of Ostriches; and meat, wool and leather in the case of sheep. Finally, a by-product of 'Animal Production' – manure – may be sold as a fertiliser input into Plant Production activities, while the by-products of sugar-milling go into animal feed production. Despite these problems, this representation of the broader agricultural sector provides some way of qualitatively tackling an analysis of the requirements for skills within the sector.

7.4 Formal skills distribution within the agricultural sector

Table 5 above provides a schematic representation of the agricultural sector including the main forms of interaction between the various segments. Table 6 below provides an overview of the range of formal skills requirements based on the categories and relationships identified in Table 5.

As skills tend to be 'packaged' within qualifications, the table below draws attention not only to the range of qualifications but also to the knowledge areas associated with particular qualifications. As can be seen, while there is certainly some overlap, each area of activity – 'Primary Agriculture' and 'Secondary Agriculture', 'Sector Specific Inputs' and 'Non-Specific Inputs', as well as the activities around 'Governance, Regulation and Support' – tends to have its own 'group' of knowledge field requirements.

The outline presented below reveals, first, that the intermediate and high-level skills required to support the agricultural sector are not limited to those classified as 'Agricultural'. Second, related qualifications such Zoology, Botany, Entomology, Microbiology etc. are also required in the primary agricultural production group of activities. Notably, these skills are also necessary to conduct activities within other parts of the agriculture sector. Third, non-agricultural qualifications ranging from Engineering, Food Processing and Chemistry, to Finance and Management are equally critical to the sector.

Table 6: Overview of the Qualifications Required to Support the Broad Agricultural Sector		
	Base and Additional Qualifications	
A. Primary Agriculture Activities	**Qualification**	**Knowledge Fields*** * Note not all 'Knowledge Fields' are offered at all qualification levels
Plant Production Forestry Animal Production Fish Farming	Certificates Diplomas B.Tech B. Agric B.Inst.Agrar B.Sc General B.Sc Agric B.Sc (Hons) Masters Ph.D.	General, Agricultural/Game Ranch Management, Agricultural Education, Agricultural Administration, Agricultural Extension, Agricultural Economics, Rural Development, Agronomy, Animal Health, Crop Science, Horticulture, Pasture Science, Weed Science, Plant Production, Agribusiness, Soil Science, Forestry, Wine Production, Aquaculture, Fisheries Resource Management, Botany, Biology, Zoology, Genetics, Ecology, Nature Conservation, Field Guiding & Hospitality
B. Secondary Agriculture Activities		
Food & Beverage Processing Feed & Supplement Production Fibre Processing Logging	Certificates Diplomas B.Tech B.Sc Masters Ph.D.	Dietetics, Human Nutrition, Food Science, Food Technology, Public Health, Environmental Health, Forestry, Chemistry, Microbiology,
C. Sector Specific Input Activities		
Seeds Fertilisers Plant Pest control Animal Pest Control Feeds & Supplements Chemical Preservatives Chemical Supplements Chemical Detergents Veterinary Services	Certificates Diplomas B.Tech B.Sc General B. Agric B.Sc Agric B.Eng B.Sc (Hons) Masters Ph.D.	Inorganic Chemistry, Organic Chemistry, Biochemistry, Biology, Microbiology, Genetics, Horticulture, Plant Pathology, Entomology, Virology, Animal Nutrition, Animal Health, Seed Science, Veterinary Sciences
D. Non-Sector Specific Input Activities		
Specialist Machinery & Engineering Specialist Packaging and Labelling Specialist Transportation, Logistics & Storage	Diplomas B.Tech B.Eng Masters Ph.D. Certificates Diplomas B.Tech	Agricultural, Resource, Civil and Mechanical Engineering Industrial Engineering, Logistics, Supply Chain Management
E. Governance, Regulation & Support		
Activities Government Departments Training & Skills and R&D Specialist Financial Services Sales and Marketing Services Retail Sector Private Consulting Companies Product & Industry Regulatory Boards Associations and Societies	Certificates Diplomas B/B.Sc Agric B.Com/Econ C.A Honours Masters MBA Ph.D.	Representation of a wide range of qualifications, often with a combination of Agriculture and Economics, Business, Administration, Commerce, Sales & Marketing etc. There also tends to be a higher concentration of the higher-level qualifications

Fourth, there are multiple sites of application of skills and qualifications in the sector. Individuals with necessary qualifications have the ability to move about relatively freely between the various activities within the sector and even the ability to move between the agricultural and other sectors within the South African economy.

Based on the foregoing analysis and the frameworks represented in Table 5 and Table 6, a more detailed discussion of the range of skills requirements needed to support various agricultural activities will now be presented. This is based an intensive phase of data gathering in which documentary information and interviews with representatives of a large number of selected enterprises were undertaken. Please refer to the section on Methodology for further background on the methodology utilised in this chapter.

The information obtained from the various telephonic interviews served to confirm and refine the schematic map (Table 5) of the various areas of skill-requirements within the industry. Exploratory micro- and meso-level qualitative and quantitative demand-side findings obtained from the individual interviews are presented below as examples or case-studies of skills demands within the various areas of the domestic agricultural industry.

7.5 Current employment and demand for agricultural skills

This discussion regarding the demand for agricultural qualifications within the labour market will follow the outline below (as presented in Table 5):

A. Primary Agricultural Activities
B. Secondary Agricultural Activities
C. Sector-Specific Inputs
D. Non Sector-Specific Inputs
E. Governance and Support Activities

Each sub-section will briefly describe the extent of the activities which are included, and where possible refer to examples of requirements for agricultural qualifications.

A. PRIMARY AGRICULTURE ACTIVITIES

In line with its diverse climate, South Africa has a diverse primary agricultural sector, which includes both intensive as well as extensive farming, and large commercial as well as small subsistence farming operations. Table 7 below provides a broad overview of the main areas of primary agricultural production:

Table 7: Overview of South African Primary Agricultural Outputs

Animal Production	Plant Production	
General Livestock	Maize	Herbs
Alpacas	Wheat	Fodder Crops
Goats	Oats	Forestry and Timber
Sheep – Mutton	Barley	General Horticulture
Sheep – Wool	Sorghum	Cut Flowers & Ornamental Plants
Beef	Dry Beans	Fynbos
Dairy	Sunflowers	Indigenous Medicinal Plants
Pork	Canola	Deciduous Fruit
Poultry	Groundnuts	Bananas
Horses	Sugarcane	Mangoes
Donkeys	Tobacco	Avocados
Ostriches	Hemp	Citrus Fruit
Game	Flax and Sisal	Olives
Beekeeping	Cotton	General Vegetables
Snails	Chicory	Potatoes
Rabbits	Coffee	Tomatoes
Rabbits - Wool	Tea	Onions
Aquaculture	Wine	Paprika
Crocodiles	Nuts	Garlic

Source: National Agricultural Directory 2004/5

Primary production of plants and animals takes place mainly on farms. The people who manage these facilities may either be farm owners, managers or foremen. The Census of Commercial Agriculture (2002) reveals that within the nine provinces of South Africa there were 35 538 farm-owners who farm themselves, as well as a further 23 747 farm managers and foremen. Thus the total number of owners and managers employed within the primary production of agricultural products was 59 285. This number excludes all family members involved in farming operations, full-time farm workers and casual and seasonal workers, a portion of whom may also have formal agricultural skills.

The distribution of formal agricultural qualifications within the groups of farm-owners and farm-managers is difficult to ascertain. Various respondents suggested that the distribution of formal qualifications is likely to be higher in the group of managers and foremen than in the group of farm-owners. Although farming specific work-experience remains key, the formalized nature of the employment of farm managers and foremen is generally associated with a requirement for some form a qualification. On the other hand, farm-owners who have often inherited the land are more likely to have acquired the necessary skills from a parent mentor.

The proportion of formal qualifications appears likely to increase within both groups into the future. Educators within the Agricultural Colleges suggest that due to uncertainty over the long-term prospects of the sector as a stable and desirable working environment as well as increasing demands on the efficiency of production, more farmers are insisting that their inheriting children receive some form of agricultural qualification.

As a result of increased competition due to market deregulation as well as the tendency towards mechanisation, large commercial farming operations are also indicating that their recruitment strategies have recently changed to employ the minimum qualification of N.Dip.Agric into their manager and foremen positions.

In order to gain some understanding of the requirements for agricultural qualifications among large-scale commercial producers, three case-studies were undertaken (see below). From these, it seems that there is an increasing tendency for large agricultural enterprises to become vertically integrated as quality and productivity improvements in the supply-chain are pursued. As such they are involved in both the production as well as the primary processing of agricultural products (i.e. primary and secondary agricultural activities). However, even though these enterprises engage in secondary agricultural activities, it is important to observe that the agricultural qualification requirements within these enterprises are almost exclusively required for the primary agricultural portion of their activities.

Case Study: Rainbow Chickens

Rainbow Chickens has three main areas of production: Pietermartizburg/Durban (50 farms); Worcester (37 farms) and the Highveld (40 farms) i.e. 127 in total. Each of these farms requires a 'Farmer' as well as a 'Senior Poultryman' and a 'Poultryman'. In addition to this, one 'Senior Farmer' will oversee around 5-6 'Farmers', and will in turn report to one company 'Breeding Manager' and one company 'Agricultural Manager'. While all employees from 'Senior Farmer' upward have agricultural qualifications, the firm estimates that currently around 60% of 'Farmers', 40% of 'Senior Poultrymen' and 20% of 'Poultrymen' have got agricultural qualifications. Yet the firm is struggling to find suitably qualified and experienced 'Farmers', particularly in the Western Cape and KZN, with 10 vacancies at present. The Highveld region appears less affected due to the proximity of other large Poultry Producers in the area (Early Bird, Sangiro, Chubby-Chick, Henwell and Daybreak). In attempt to ensure more effective succession, the firm's future strategy is for all people recruited into the 'Poultryman' position to have a minimum of a N.Dip.Agric (Animal Production), so that with experience and additional courses, these people may be developed into 'Farmers'. Thus without taking the firm's potential growth into account – the demand for formal agricultural qualifications will increase from the current 175 to a figure of 404 over the short to medium term future.

Case Study: Bull Brand Foods and Karan Beef

Both these firms have large feedlots with activities that span Animal Procurement, Animal Production, Animal Health, Abattoir, Meat Processing, Marketing and Logistics. At Karan Beef only one of the six feedlot managers has an agricultural qualification, while a similar picture emerges for the five middle managers at Bull Brand Foods. Bull Brand Foods reports that its strategy is to replace these positions only with people who have agricultural qualifications (Animal Production), and that it is increasing its involvement in skills development through offering students practical holiday experience. Furthermore the firm reports that it is attempting to form recruitment relationships with Universities for direct acquisition of the skills they require in future. Karan Beef on the other hand, is more concerned about the lack of Abattoir managers and those with meat processing skills, with a focus on internal Learnerships taking place at present. Recruitment for additional key skills will apparently continue to be via the local newspaper, with experience rather qualifications the main requirement.

Case Study: McCains Vegetables

The South African portion of this multi-national organisation sources the produce that it processes both from its own farms as well as from privately owned farms. The McCains Agricultural Team consists of over 40 people with agricultural qualifications, predominantly with a focus on Plant Production and Horticulture. The team is divided into a Farming Section (farm managers and assistant managers +/- 20) and a Procurement Section (agricultural extension officers +/- 15, procurement and supply-chain managers +/- 5). Assistant managers may be promoted up from the ranks within the organisation and will be assisted in gaining the minimum N.Dip.Agric (Plant Production) that is required. Recruitment for positions is generally via national newspapers, although very high-level agricultural skills are recruited via a private recruitment agent (Marianne van der Laarse from SA Veg). The firm reports to having problems in meeting EE requirements in respect of its agricultural appointments, particularly at the higher levels.

Summary

There is clearly a high demand for agricultural qualifications at the level of primary agriculture, although exact levels of high skills, particularly among the group of farm-owners who farm themselves, is very difficult to determine due to the fragmented nature of this group. Among commercial farms, our case studies suggest an increasing demand for formal agricultural qualifications to a minimum level of N.Dip.Agric. Agribusiness employers see the speciality within an agriculture qualification (i.e. Animal Production versus Plant Production) as increasingly important.

B. SECONDARY AGRICULTURE ACTIVITIES

Secondary agriculture is defined as the primary stage of processing of agricultural products and while these activities can be distinguished from manufacturing, the line is often not precise. Thus taking a broader view of what might be included as secondary agriculture, a number of companies were contacted to obtain their input regarding the needs for agricultural qualifications.

Leather

Refined leather manufacturing firms such as Automotive Leather Company, Hannitan Leathers, Gringo Leathers and Seton source raw material from tanneries such as Bader SA, EAC Tannery and Hidskin. These firms process the leather from the wet-blue stage, which they obtain from abattoirs. Neither of these levels of leather-manufacturing firms require any agricultural qualifications. The 'International School of Tanning Technology' based in Grahamstown in the Eastern Cape, supplies the tanning industry's important skills requirements. This institution offers the Higher National Certificate in Leather Technology, which covers all aspects of leather-making.

Qualifications are awarded through PE Technikon with external examination obtained from University College Northampton in the UK. The abattoirs, which in essence provide the primary stage of leather processing - harvest to wet-blue - also do not require any agricultural qualifications. This is the case for all forms of leather: bovine, sheep and ostrich. Skills shortages in this sector were however noted in respect of abattoir managers as well as graduates from the Grahamstown based 'Tanning School'.

Wool Processing

Firms such at the Stucken Group and Cape of Good Hope Wool Combers both report that they have no agricultural qualifications requirements. New employees require a mix of basic skills and on-the-job training in order to develop specific wool and mohair knowledge. Employers argue that the problem in terms of skills for the industry does not relate to a lack of specific qualifications, but rather that the poor image of the industry – as non-dynamic and contracting – is preventing young people with vision and motivation from entering the industry at all.

Cotton Processing

Clark Cotton, which has the capacity to process around 50% of South Africa's raw cotton, reports that it has no need for agricultural qualifications. Skills are acquired on-the-job, with formal Learnerships not in place yet. The most urgent formal skills requirements relate to mechanical and process engineering.

Tea Processing

The South African Honeybush Tea Association (SAHTA) reports that while the farmers who own 50% of the association may indeed have agricultural qualifications, there is no need for such qualifications among the employees at the tea-processing factory. This production facility requires Food Technology qualifications as well as production management skills. All necessary research is outsourced to large specialist agricultural research organisations.

Fruit and Vegetable Processing

SAD Foods, which specialises in dried fruit and vacuum-packed fresh salads, employs around 680 people with only nine of these involved in research and development activities. The vast majority of these have Food Technology qualifications rather than a formal agricultural qualification. Ceres, the producer of fresh fruit juices, reports a similar lack of need for agricultural qualifications within its processing facility.

Herb Processing

Ina Paarman Kitchens employs Food Technology and not agricultural qualifications within their Cape Town based operation of over 100 people. Similarly Robertson's Herbs and Spices, a division of Unilever, does not employ any specific agricultural skills.

Milk Processing

Clover and Parmalat both report that milk processing requires only Food Technology qualifications for both production as well as quality assurance. While Clover admits that it does indeed have a few employees with formal agricultural qualifications who are working as Field Officers in managing the productivity of collection routes, these qualifications are incidental, with B.Com graduates generally filling these positions. Neither of these companies provides direct farmer support; however they do refer farmers to private consulting firms who are able to assist with problems.

Sugar Milling

Tongaat Hulett Sugar reported that the sugar milling process does not require any employees with agricultural qualifications, being instead a highly industrial process dominated by engineering skills requirements. As milled sugar cane is sold on to sugar refineries, the demand for Food Technologists resides at these firms rather than at the mills. Interestingly, Tongaat Hulett Sugar is a vertically integrated company. In addition to its milling operations, it owns a number of sugar-producing farms as well as an animal feed production division (Voermol Feeds), both of which do require the input of agricultural graduates.

Animal Feed and Supplement Production

The feed manufacturing companies contacted indicated that they did have a requirement for people with agricultural qualifications, a finding which is unsurprising given that the output from this activity is a major input into the primary agricultural sector. The skills requirements of the Animal Feed and Supplement Production sub-sector will be discussed in the section on sector-specific inputs below.

Wine

The production of wine is in many instances vertically integrated with or closely related to, the production of wine-grapes. Formal qualifications in Viticulture provide the specialised agricultural qualifications required for both activities, with this only offered at a few selected tertiary institutions in the Western Cape rather than as part of the general agricultural qualifications presented through the majority of agriculturally focussed institutions.

Summary

Clearly the demand for agricultural qualifications within the basic food and beverage processing and fibre processing portions of the secondary agricultural sector is small, with the single exception of the production of wine. The skills required by the secondary agricultural sector involved in basic food and beverage processing are predominantly Food Technology and Process/Industrial Engineering. Only the latter group of skills are required in the sub-sector involved in fibre processing, with the evidence suggesting that at the moment more of their specific skills requirements are being developed through in-house training or through attendance at specialised niche training institutions.

C. SECTOR-SPECIFIC INPUTS

In trying to understand the formal skills requirements of the various players who provide sector-specific inputs into the primary and secondary agricultural sectors, large and well-established companies operating within the main groups of activities were contacted and the findings generated from this research are presented below.

Seeds

The South African National Seed Organisation (SANOR) represents 66 seed manufacturing companies who in total employ around 3 000 employees. The National Agricultural Directory 2004/5 lists a further 40 companies who are involved in seed and seedling production, bringing the total number of firms in this sub-sector to over one hundred.

The qualification needs of two of the larger companies involved in these activities, Pannar Seed and Syngenta, are presented in Table 8 below. Pannar Seed is a locally owned company that has a large global export focus while Syngenta is a multi-national company focussed mainly on crop protection, but which also has a seed division. The ownership and primary market focus of these two companies determines to a large extent their skill requirements within South Africa: Panner has a large locally based R&D division and is producing locally for export (large local skills demand), while Syngeta SA draws to a large extent from R&D done internationally and is focussed mainly on production for the local market (smaller local skills demand).

Table 8: Overview of the Distribution of Agricultural Qualifications within Pannar Seed Ltd. and Syngenta Seed Division				
Division	**Positions Requiring Agricultural Qualifications**		**Range of Agricultural Qualifications**	**Comments**
	Pannar	**Syngenta**		
Board of Directors	5	0	N.Dip Agric to Ph.D.	With recruitment focused on Graduates, the qualifications at the top level will also gradually increase over time
R&D	60	3	M.Sc to Ph.D.	Difficult to find experienced Seed Scientists
Marketing & Sales Agents	16	10	B.Sc / B.Tech / B.Agric	While only 25% of the Pannar sales team are currently agricultural graduates the strategy is to only recruit Graduates in future
	33	0	N.Dip.Agric	
	(16)	0	Matric only at present	
Export	10/20	2	Agricultural Economics	Other 10/20 are B.Com graduates
Production	10	3	N.Dip.Agric to M.Sc. Also B.Eng (Agric)	
Processing	6		N.Dip.Agric	
Factory	4		N.Dip.Agric	
TOTAL	**160**	**18**		Total Demand Figure

What is clear is that the agricultural skills requirement of these companies is generally high and with Pannar's new recruitment policy of only bringing agricultural graduates into its sales positions, the requirements are going to increase over time. While the company reported that they did not generally struggle to find the relevant qualifications (outside of Seed Scientists), adequate competencies, which they defined as the combination of qualification, skills and the ability to get the job done, were however in short supply.

Fertilizers

Five of the largest fertiliser companies within the 14-member Fertiliser Society of South Africa (FSSA) were contacted to determine their requirements for agriculturally qualified personnel (See Table 9 below). This exercise revealed that only firms within the fertilizer industry that deal directly with end-user clients (i.e. farmers), require people with agricultural qualifications.

Requirements generally fall into three categories: Marketing Managers, Agronomists and Sales Agents, with qualifications mainly at the level of N.Dip/B.Tech/B.ScAgric with a focus on Plant Production or Soil Science. While not all people currently employed as Sales Agents have these qualifications, all four firms noted their intentions to only recruit people in future who have the minimum N.Dip.Agric. It is clear that the focus is on moving towards recruitment of formal qualifications as a baseline with subsequent upgrading the average level of skill within these organisations. However, it is notable that all companies mentioned the importance of employees within their organisations passing the 'Fertilizer Advisor's Training Course' which the FSSA has developed in co-operation with the Tshwane University of Technology (TUT).

Table 9: Requirements for Agricultural Qualifications in Four Large Local Fertilizer Companies						
Company	**Marketing Managers**	**Agronomy**	**Sales Agents**		**Total**	**Comments**
			With Qualifications	**Without Qualifications**		
Foskor	0	0	0	0	**0**	Does not deal with 'end-users' but sells chemicals to other companies
Sasol Nitro	6	6	180	0	**172**	Suspect that all sales agents have qualifications, but not sure
Omnia	5	8	39	10	**62**	
Kynnoch	2	18	15	65	**100**	
Profert	1	2	16	44	**63**	
TOTAL	**12**	**36**	**368**			

Crop Protection

An overview of the requirements for agricultural qualifications within the plant health divisions of two of the large companies operating in the sector, Syngenta and Beyer, (see Table 10) reveals that the demand in this area of the market is large as well as diverse. At sales agent level, which through an informal national network appears to serve the majority of producer firms within the agrochemicals industry, the entry-level qualification is now a B.Tech.Agric, while for management, R&D, technical or production positions within the agrochemical producer firms themselves, the minimum entry requirement is even higher.

Table 10: Distribution of Agricultural Qualifications in the Plant Pest Control Divisions of Beyer and Syngenta

Division	Agricultural Qualifications		Comments
	Syngenta	Beyer Crop Sciences	
Directors	6	-	Does not deal with 'end-users' but sells chemicals to
R&D		15	other companies
Technical	13	20	Suspect that all sales agents have qualifications, but
Marketing	9	6	not sure
Export	0	3	
Production	0	5	
Sales Mangers	10	8	
TOTAL	**38**	**57**	
Sales Agents at agrochemicals dealer network	750		While the older employees among this group do not have formal qualifications, minimum entry level is currently B.Tech. Agric

Animal Health

The South African Animal Health Association (SAAHA) has 15 member organisations, although a further 11 companies are also involved in this business in South Africa. While the most important qualification required by these organisations is Veterinary Science, a number of people with agricultural qualifications do find employment as sales agents. Agricultural qualifications with Animal Health specialisation are however part of a basket of qualifications accepted for this position by these firms, as all SAAHA members are required to have their sales gents pass the Association of Veterinary and Crop Associations of South Africa (AVCASA) Animal Health course developed in co-operation with, and presented by, the Tshwane University of Technology (TUT).

The administrators of the AVCASA Animal Health course at TUT report that a total of 320 people have received the certificate and are now working as sales agents within the Animal Health sector. TUT do not unfortunately collect information on graduates' previous qualifications and were thus unable to indicate the numbers of those who enrolled who held agricultural qualifications. Afrivet, one of the companies operating in the sector, however estimated that around 20% of their Sales Agents had agricultural qualifications, while Beyer Animal Health estimated the figure to be around 35%. As these qualifications are incidental rather than required, this number would not necessarily contribute to the overall demand for agricultural qualifications within the South African labour market.

Animal Feed and Supplement Production

The Animal Feeds Manufacturing Association (AFMA) has 22 full members and a further 19 associate members. A number of non-member companies are also involved in the Animal Feeds sector in South Africa. Figures from three of the full-member companies, Epol, Meadow Feeds and Bokomo Feeds provide some indication of the requirements for agricultural qualifications within the sector. Most notably, people with B.Sc.Agric in Animal Nutrition are required to fulfil three key functions within these firms: sales agents; feed formulators; and technical managers.

In respect of the availability of suitable people within the labour market, all three companies reported recruitment difficulties due to a number of factors. Many people apply for advertised vacancies, however lack of working experience (especially among EE candidates), lack qualifications in the specific subject 'Animal Nutrition', as well as the alleged 'generally poor standard' of graduates emerging from certain institutions, severely limit the pool of possible candidates.

Table 11: Demand for Agricultural Qualifications at Three Feed Production Companies

Division	Agricultural Qualifications			Range of Agricultural Qualifications
	Epol	Bokomo Feeds	Meadow Feeds	
Technical Managers	12	1	13	B.Sc. Agric (Animal Nutrition)
Feed Formulators	2	1	9	
Sales Agents	18	9	8	
Trainees	2	-	-	
Procurement	-	2	-	
TOTAL	**34**	**13**	**30**	

Veterinary Services

The qualifications required to provide the inputs and services that fall within this category make up a very specialised portion of the total group of agricultural qualifications.

Veterinarians in South Africa can either be employed within the areas of direct animal health services (providing animal production support and quality control, or domestic animal health services), or within R&D activities. Both the state as well as the private sector has demands for qualified veterinarians as well as veterinary nurses and technicians. However, the focus within these two sectors appears to be slightly different. While veterinary skills are utilised mainly within the public sector for quality and disease control and R&D activities, the private sector requirements focus predominantly on the provision of animal production support and domestic animal health services, and the development and production of animal health products.

The South African Veterinary Council provided figures for the total numbers of people with qualifications relevant to this group. They stressed however that the figures were indicative only, as the SAVC relies predominantly on personal feedback (regarding deaths, retirements, changed residency status etc) in keeping the figures current. In respect of the last, the SAVC indicated that they were broadly aware that a large number of qualified veterinarians were practicing abroad, without providing any formal notification to the Council of either temporary or permanent changes in residency status. The figures presented in Table 12 below, are thus likely to be an over-estimation of the availability of such skills with the South African labour market.

Table 12: SA Veterinary Council figures for Individuals in the Various Animal Health Professions

Animal Health Professions	Registered	Unregistered	Total
Veterinarians	2712*	-	**2712**
Veterinary Nurses	383	-	**383**
Animal Health Technicians	594	+/- 400	**994**
Laboratory Animal Technologists	31	-	**31**
Animal Welfare Assistants	267	unknown	**267**

*Of this total, 127 are pensioners and may or may not be active, while a further 50 are registered as living abroad
Source: South African Veterinary Council, 2005

Demand-side data for the private sector was not possible to obtain, however the data from a recent study (April 2005) commissioned by the Department of Agriculture on the demand for veterinary qualifications within the government system (see Table 13 below) reveals that the supply of suitable skills is substantially below demand within the various government departments. For example, of all the government veterinary posts (at National, Provincial and Laboratory Level) only 59% are currently filled (185 out of 314). Similarly only 74% of government posts for Animal Health Technicians (1,055 out of 1,423) are currently filled. Total government demand, including veterinary, administrative, technical and auxiliary animal health staff, is reported to be 2 358 positions with a large number (564) of unfilled positions.

Table 13: Government Demand for Animal Health Personnel

	Veterinary Posts			Administrative Posts			Technical Posts			Border & Redline Posts		
Service	Filled	Vacant	Total	Filled	Vacant	Total	Filled	Vacant	Total	Filled	Vacant	Total
National	17	32	49	25	9	34	23	22	45	0	0	0
Provincial	148	80	228	243	45	288	951	308	1259	248	0	248
Laboratory	20	17	37	38	13	51	81	38	119	0	0	0
Total	185	129	314	306	67	373	1055	368	1423	248	0	248
Percentage	59%	41%	100%	82%	18%	100%	74%	26%	100%	100%	0%	100%

As veterinary and related qualifications are required to support the agricultural sector not only through the government system, but also via their R&D inputs into animal health product development and the teaching of Animal Health as a subject at both Colleges and Universities, a shortage of these skills is likely to have substantial negative impacts on the domestic agricultural sector as a whole.

Chemical Preservatives, Supplements and Detergents

There does not appear to be any requirement for agricultural qualifications within the firms that supply the sector with input products such as chemical preservatives, supplements and detergents. Qualifications required here however include Organic-, Inorganic- and Bio-Chemistry, Chemical Engineering, Bio-Technology and Food Technology.

Summary

The analysis reveals that there is a relatively high demand for formal agricultural qualifications among the firms that produce and provide primary agriculture sector-specific input products and services. While some of these firms are very explicit in their requirements (e.g. B.Sc.Agric (Animal Nutrition) for Feed Producing firms), other firms such as those in seed production require a large basket of skills within the wider grouping of natural sciences, of which agricultural skills form only a part. Enterprises involved in producing specific inputs required for the secondary agricultural sector (eg: chemical preservatives, supplements and detergent manufacturers) have no apparent requirements for agricultural skills.

D. NON SECTOR-SPECIFIC INPUTS

Non sector-specific inputs into agriculture can be classified into three key groups:

- Equipment, services and information that relate to resource use and management
- Machinery and vehicles; and
- Infrastructure, tools and technology.

Table 14 provides a summary of the input types that fall under each of the three main categories, as well as the numbers of enterprises involved in the provision of each (as outlined within the National Agricultural Directory 2004/2005).

Table 14: SA Veterinary Council figures for Individuals in the Various Animal Health Professions					
Equipment Services & Info Related to Resource Use and Management		**Machinery and Vehicles**		**Infrastructure tools and Technology**	
Solar Energy	17	Tractors, Combines and Balers	35	Packaging	25
Electricity	1	Implements and Trailers	56	Fencing	13
Bio-Energy	5	Motor Cars, Bakkies and 4x4's	15	Structure & Building Supply	22
Water Storage	10	Trucks and Heavy Machinery	17	Covered Growing	27
Boreholes & Windmills	12	Tyres	15	Livestock Related	25
Irrigation	55	Fuels and Lubricants	8	Tools & Power Tools	19
Hydroponics	3	Fleet Maintenance & Spares	36	Pumps & Generators	33
Fertigation	5			Miscellaneous	35
Water Management	8			Agric Software Technology	17
Soil	11			GIS	12
Biodiversity	5			Precision Farming Management Systems	10
Weather and Climate	3				

The diversity and scope of the firms that fall into this group is large. A full survey of the skills needs of these enterprises would have been necessary to understand the overall demand within this portion of the sector and was not within the scope of this study. However, certain deductions regarding their agricultural skills requirements were made:

- Companies that are involved in direct end-user sales or services across the three categories are likely to require a certain number of agricultural qualifications to provide a professional and knowledgeable interface with farmer clients.
- The requirement for Engineering qualifications is likely to be high, particularly in companies that design and produce equipment locally rather than merely import and distribute equipment. The extent to which the need for engineering skills is restricted to Agricultural Engineering as opposed to Mechanical or Civil Engineering is uncertain.
- The very generalized market focus of some of these inputs (cars, bakkies, tyres and lubricants), as well as the level of specialization within others (solar and bio-energy, weather and climate, and software technology), suggests that for certain areas there is relatively small need for any agricultural qualifications despite the importance of these inputs to the sector.
- While certain jobs within this range of activities may not specifically require formal agricultural qualifications, it is likely that interest in agriculture (referred to in job advertisements as either attendance at an Agricultural High School, or previous agricultural experience) may give certain applicants an advantage over others for positions (see Appendix 5).

E. GOVERNANCE AND SUPPORT ACTIVITIES

NATIONAL & PROVINCIAL GOVERNMENT DEPARTMENTS AND INSTITUTIONS

National and Provincial government demand

Department of Agriculture (DoA) as well as the nine Provincial Departments of Agriculture (PDA) are collectively large employers of people with agricultural qualifications. Data on employment and demand for such qualifications in 2005 is presented in Table 15 and 16 below.

The largest requirement for agricultural qualifications is within the line function directorates, which provide direct support to the agricultural sector (see job descriptions in Table 16). Agricultural qualifications also reside within the various management structures of Departments. As people are promoted into more senior management positions, this fuels demand through the creation of vacancies at lower levels which then need to be filled by employees with the necessary qualifications.

Table 15: Demand for Agricultural Qualifications in the National Department of Agriculture					
National Department of Agriculture					
All Staff			Staff with Agricultural Qualifications		
Employed	Funded Vacancies	Un-funded Vacancies	Employed	Funded Vacancies	Un-funded Vacancies
2476	575	300			
			Information not available in aggregated from		

Table 16: Demand for Agricultural Qualifications in the Provincial Departments of Agriculture					
Provincial Departments of Agriculture					
Province	All Staff Employed	Staff with Agricultural Qualifications Employed	Funded Vacancies	Un-funded Vacancies	Job Descriptions
Gauteng	83	20	25	0	Agricultural Scientists Agricultural Technicians Industrial Technicians Animal Health Technicians State Veterinarians Veterinary Technologists Agricultural Economists Soil Scientists Farm Managers Environmentalists Biometricians Laboratory Managers Rural Development Practitioners
Western Cape	812	92	43	*	
Eastern Cape	*	*	*	*	
Northern Cape	315	13	*	*	
Mpumalanga	1861	184	37	*	
Free State	1260	96	13	0	
KwaZulu-Natal	3798	(738)**	*	*	
North West	2019	312	78	*	
Limpopo	5614	824	159	0	

* Information not available

**The total number of people with intermediate to high-level qualifications as defined by the Skills Plan, including all agricultural qualifications

Scarcity of skills within the provincial Departments of Agriculture presents in two key ways: Firstly, there appears to be scarcity of certain knowledge specialists, and secondly, there appears to be greater scarcity among the higher-level qualifications within each type. First, scarcity was noted for the following qualification types: agricultural economics; agricultural engineering; hydrology; aqua-culture; horticulture; soil science; agronomy; animal science; veterinarians; and crop protection (Miti, 2005). Second, the proportion of vacancies to overall posts is much lower for positions requiring the N.Dip.Agric qualification as compared to those requiring a B.Sc.Agric qualification.

Parastatal Demand

Aside from the employment within the various government Departments, there are six parastatal organisations associated with the agricultural sector. These include:

1. South African Veterinary Council (SAVC)
2. Onderstepoort Biological Products (OBP)
3. Agricultural Research Council (ARC)
4. National Agricultural Marketing Council (NAMC)
5. Perishable Products Export Control Board (PPECB)
6. South African Land Bank (SALB)

Onderstepoort Biological Products notes that while it currently does employ a number of people with agricultural qualifications with an Animal Health speciality, the employment of these skills is incidental and would not be accepted if sufficient people with veterinary technician qualifications could be sourced. Thus despite the fact that the institution is employing people with agricultural qualifications as a second best option, in the absence of sufficient veterinary technicians, this is contributing to a form of substitution demand for agricultural qualifications in the labour market demand, which will last for as long as the first-choice skills are in short supply.

The South African Veterinary Council employs only six people, all performing administrative functions. None of these have agricultural qualifications. Specific demand for agricultural qualifications exists at all the remaining parastatal organisations. An overview of this demand is provided in Table 17 below, however further discussion of these organisations can be found below as they engaged in various service activities (e.g. for ARC see section on Demand for Qualifications at R&D Institutions).

Table 17: Requirements for Agricultural Qualifications within the Parastatal Organisations

Parastatal Organisation	Total Permanent Employment	Employees with Agricultural Qualifications	Vacancies for Agricultural Qualifications	
			Funded	Un-funded
ARC	2670	734	20	0
Land Bank	650	35	3	0
NAMC	21	5	0	0
PPEBC	332	257	2	0
OPB	206			
SA Vet Council	6			
TOTALS	**3885**	**1031**	**35**	**0**

EDUCATION & SKILLS DEVELOPMENT

While these institutions and organisations are key to the supply-side of any skills analysis, the organisations themselves, in terms of their staffing requirements, are an important source of demand for high-level skills. Included in this group are:

- Schools offering the subjects Agricultural Science, Animal Husbandry, Field Husbandry, and/or Farm Mechanics
- FET Colleges offering Agricultural Courses
- Agricultural Colleges
- Universities and Universities of Technology offering Agricultural Qualifications
- Private Enterprises or NGO's Offering Training for the Agricultural Sector

Demand for agricultural qualifications among teachers at schools

As discussed in the supply-side section of this report, there are a large number of general high schools that offer Agricultural Science as a subject in addition to the 42 specialised Agricultural High Schools across South Africa. In 2003 a total of approximately 60 660 pupils took Agricultural Science as a subject in Grade 12 in 2 645 high schools offering the subject.

Based on the ideal assumption that every high school offering Agricultural Science will have at least one qualified teacher providing instruction in this subject, the minimum demand for Agriculturally qualified teaching staff would be 2 645. In respect of this rough estimation it is also well known that not all teachers of Agricultural Science in South African high schools are qualified to teach the subject and level that they do. Further analysis of the numbers of staff at High Schools who have agricultural qualifications and are teaching the subject may be worthwhile.

Demand for agricultural qualifications among staff at agricultural colleges

Due to the smaller number of Agricultural Colleges, it was possible to obtain exact data for the staffing requirements at these institutions. The findings are presented in Table 18 below, which reveals a current total figure of 271 people with agricultural qualifications employed within these institutions. There are currently 42 funded vacancies for permanent staff with agricultural qualifications.

Table 18: Demand for Agricultural Qualifications at Agricultural Colleges

College	Province	Staff with Agricultural Qualifications		Vacancies	
		Teaching	Management	Funded	Un-funded
Cedara	KwaZulu-Natal	16	2	3	0
Owen Sithole	KwaZulu-Natal	18	2	3	0
Fort Cox	E Cape	16	6	2	0
Glen	Free State	13	1	2	2
Elsenburg	W Cape	24	5	0	5
Grootfontein	N Cape	57	6	3	30
Lowveld	Mpumalanga	17	3	2	3
Madzivhandila	Limpopo	23	3	4	0
Tompi Seleka	Limpopo	20	1	17	0
Potechefstoom	North West	20	4	4	0
Taung	North West	11	3	2	1
TOTALS		**235**	**36**	**42**	**41**
		271		**83**	

Aside from overall skills demand within these institutions, information was also obtained on the spread of skills within and across the Colleges as well as the difficulty (or not) of obtaining suitably qualified staff. In respect of the staff involved in the practical teaching of students (referred to as Technicians), findings indicated that the general level of qualification was the N.Dip. Teaching staff qualifications ranged from N.Dip through to Ph.D level, however the *average* level of teaching staff qualification varied significantly between Colleges. For instance, Elsenburg stated that the majority of its teaching staff had M.Sc qualifications, while Taung reported a 50:50 split between N.Dip and B.Sc qualifications. Unsurprisingly the larger Colleges reported greater numbers of teaching staff at the Ph.D level, with this undoubtedly impacting on the range of specialisations that the individual Colleges are able to offer students.

In respect of staff acquisition and retention, a number of the more rurally based Colleges remarked that their location counted against them in attracting highly qualified staff and that this led to higher staff turnover. Respondents at many Colleges complained that higher salaries in the private sector and better perks in government employ detracted from their ability to attract suitably qualified staff. Finally, respondents referred to laxity in and uncertainty surrounding the process of advertising vacant posts as another issue contributing to the number of funded vacancies.

It is clear from these findings that schools and Colleges are themselves contributing substantially to the demand for agricultural qualifications within the labour market, and that for a number of reasons, demand is currently exceeding supply of suitably qualified and willing individuals.

Demand for agricultural qualifications among staff at Universities

There are four Universities of Technology and 11 academic universities that offer agricultural qualifications and require agriculturally qualified teaching and research staff. Some of these institutions have relatively small agriculture departments, while others have large departments. Employment of people with agricultural qualifications at these institutions would be 485 if all posts were filled (Table 19). There are 472 current staff members as well as 13 funded vacancies. Clearly, as a group, these institutions are notable contributors to the demand for agricultural qualifications within the labour market.

Three of the universities indicated that they had relatively large numbers of un-funded vacancies. It was not possible to determine whether these un-funded vacancies are as a result of the creation of new positions (post-restructuring) or whether these are vacancies frozen in anticipation of restructuring. It is possible that as the process of restructuring within the tertiary education institutions progresses, un-funded vacancies could disappear as posts are either funded or dissolved. However, the loss of these posts may have to be made good if growth in the agricultural sector drives the demand for skills.

Table 18: Demand for Agricultural Qualifications at Agricultural Colleges

University of Technology	Province	Staff with Agricultural Qualifications		Vacancies	
		Teaching	Management	Funded	Un-funded
Cape Peninsular University of Technology	W Cape	6	0	2	0
Central University of Technology	Free State	5	1	0	0
Tshwane University of Technology	Gauteng	44	1	0	0
Mangosuthu Technikon	KZN	10	1	1	0
Nelson Mandela Metropolitan Univ.	E Cape	9	0	0	0
North West University	North West	50	0	9	10
University of Fort Hare	E Cape	17	1	0	12
University of Free State	Free State	62	1	0	0
University of KwaZulu-Natal	KZN	60	0	1	2
University of Limpopo	Limpopo	37	1	0	0
University of Pretoria	Gauteng	48	0	0	0
University of South Africa	Gauteng	12	0	0	2
University of Stellenbosch	W Cape	54	0	0	0
University of Venda	Limpopo	42	0	0	0
University of Zululand	KZN	10	0	0	5
TOTALS		**466**	**6**	**13**	**31**
		472		**44**	

Similar to the Agricultural Colleges the Universities expressed concern about the acquisition and retention of suitably qualified staff. While the larger departments in urban areas did not complain of difficulties in obtaining staff, smaller and more rurally located departments mentioned that it was very difficult to get people to move permanently into their areas. The low salaries of academic positions against the earning potential within the private sector were also mentioned as a factor that deterred intelligent and motivated people from pursuing a career in academics. One department mentioned that its strategy was to pursue academics from foreign neighbouring countries to fill gaps. It also creates research positions with donor funding from which temporary lecturing expertise can be drawn.

In respect of the exact nature of the skills required by these institutions, technicians were indicated to have a mix of N.Dip, B.Tech and B.Sc qualifications, while academic teaching staff qualifications ranged from B.Sc to Ph.D with the majority around the level of M.Sc. Posts most difficult to fill were universally indicated to be Veterinarians for the subject Animal Health (with these often bought in on a part-time basis), and Agricultural Engineers (with these often permanently replaced by Civil Engineers).

The figures presented above include only the numbers of employees involved in practical and theoretical teaching for which the universities are themselves directly responsible for salaries. The numbers of agriculturally qualified researchers based within the universities who are independent research funders or industry associations could not be accounted for. Such researchers, whose work tends to be focussed on the specific requirements of the funding institution or organisation, make use of the facilities of the universities while some at the same time provide supervision to student research projects within specific topic areas.

Overall the various universities across the country are thus large users of the skills they assist in developing. Demand is however not being universally met, either within or between the various academic departments.

Demand for agricultural qualifications in private enterprises or NGO's offering training to the agricultural sector

Outside of the public education and training institutions already discussed, there exist a number of training service providers who are either: independent, NGO's focussed on new-farmer development, or are affiliated to member-funded industry associations. These providers fulfil training needs that are not adequately being addressed by the larger education institutions, either because of clients' geographical location, the costs involved or the specific nature of the training required. It is likely that many such private service providers will in future be registered with the newly formed AGRI-SETA. At this stage however, data of registered service providers obtained from the SETA does not provide an accurate overview of the numbers of private enterprises involved in training in the agricultural sector. A determination of the demand for qualifications within this segment of the labour market is therefore not possible at this stage.

There are also association-affiliated training enterprises and programmes, including the South African Sugar Association's Ushukela Training Centre, which offers practical training to growers and farm workers, and the National Emergent Red Meat Producers' Youth Agribusiness Entrepreneurial Development Programme. The requirements for agricultural qualifications at these associations in order to provide this training will be discussed in more detail under the section on industry associations below.

RESEARCH AND DEVELOPMENT (R&D)

There are a number of R&D institutions and organisations that support the domestic agricultural sector. These organisations assist in the development of technologies and processes that impact on the activities of the industry (e.g. farms and firms) as well as those providing the industry with various inputs and service (e.g. universities, and providers of products and services). They are themselves large sources of demand for high-level agricultural qualifications.

R&D institutions are located in the public and the private sector. Within the public sector R&D occurs at three key levels: the National Department of Agriculture; Provincial Departments of Agriculture; and the parastatal organisation, the Agricultural Research Council (ARC). While neither the National, nor any of the Provincial Departments of Agriculture were able to provide figures for the numbers of people they employed in respect of R&D specifically, the data obtained from the ARC is instructive. Table 20 below provides a breakdown of the ARC research programmes and the provincial distribution of affiliated research stations, while Table 21 outlines the profile of agricultural qualifications among employees at the organisation. Clearly this parastatal organisation contributes significantly to overall demand for high-level agricultural qualifications in the labour-market.

Table 20: ARC Research Institutes and Provincial Distribution of Affiliated Research Stations										
Research Programmes	Affiliated research stations in provinces									
	Total number	Gauteng	Limpopo	Mpumalanga	North West	Free State	KZN	E Cape	N Cape	W Cape
Institute for Tropical & Subtropical Crops	11		x	x			x	x		x
Vegetable & Ornamental Plant Institute	2	x								x
Infuitec-Nietvoorbij	9					x				x
Range & Forage Institute	12	x		x		x	x	x	x	x
Animal Nutrition & Animal Products Institute	2	x								x
Animal Improvement Institute	10	x			x	x	x	x		x
Onderstepoort Veterinary Institute	4	x					x		x	
Small Grain Institute	6					x			x	x
Institute for Industrial Crops	10		x				x		x	x
Institute for Soil, Climate & Water	7	x		x	x		x	x	x	x
Plant Protection Research Institute	6	x					x	x		x
Institute for Agricultural Engineering	2	x								x

Table 21: Employment of Agricultural Qualifications at the Agricultural Research Council		
Positions Requiring Agricultural Qualifications	**Numbers Employed**	**Qualification Range**
Research Technicians	244	N.Dip (Agric)
	129	B. Agric/B.Sc (Agric)
	79	B.Sc (Hons) (Agric)
Researcher	137	M.Sc Agric
Senior Researcher and Specialists	145	Ph.D
Total Agric skills employed	**734**	
Total ARC employment	**2670**	

From within the ARC there are concerns that capabilities within the institution are being eroded. Certain of the twelve research institutes within the organisation are struggling to source high level skills required within their areas of speciality. Increased pressure for self-funding of the organisation has resulted in increased workloads and stresses on individual researchers, with concomitant migration into private sector R&D institutions. The private sector, however, only funds research that is in its own interests. There is thus a need to continue public good research that is critical to the sector and this implies that the appropriate skills base within the ARC needs to be sustained.

Within the private sector, research and development tends either to be undertaken by: R&D divisions within large organisations; institutions supported by member-funded industry-associations; or NGO's. In all instances the R&D activities are specific to the interests of the organisation, association or NGO.

In respect of R&D within large organisations, examples discussed earlier include Syngenta SA (Seeds and Crop Protection), Beyer Crop Science and Pannar Seeds. These firms have relatively large numbers of employees with agricultural qualifications in their R&D divisions at figures of 16, 15 and 60 respectively.

Industry-associations with R&D interests include the South African Sugar Association's SASRI (South African Sugarcane Research Institute); Capespan's Experico; the Citrus Growers Association of Southern Africa's CRI (Citrus Research International); and the Deciduous Fruit Producers Trust's DFPT R&D Division (Table 22). While most of these entities have their own research facilities, there is also a trend where they outsource these needs by employing researchers who use the facilities of other R&D organisations such as the universities. For example, the CRI has its own research facilities but also has researchers based at the Universities of Stellenbosch and Pretoria, while the DFPT focuses all its R&D activity at university facilities.

Table 22: Employment of persons with high-level agricultural qualifications at R&D entities affiliated to industry associations or NGO's		
Research Body	**Numbers of People with Agricultural Qualifications**	**Range of Qualifications**
SASRI	59	While research technicians might have qualifications in the B.Sc/B.Tech range the majority of researchers are at M.Sc, Ph.D or post-doctoral levels
Experico	15	
CRI	21	
DFPT R&D	9	
ASNAPP	5	

Finally, R&D is undertaken by NGOs such as ASNAPP (Agribusiness in Sustainable Natural African Plant Products). This internationally funded NGO, which operates throughout Southern African, has a core team of employees with agriculture qualifications undertaking research in support of the development of sustainable agribusinesses with the aim of providing economic development and sustainable livelihoods to individuals within various local communities.

SPECIALIST FINANCIAL SERVICES:

Aside from the Land Bank, whose mandate it is to support the entire agricultural sector, specialist agricultural financial services reside within commercial banks, co-operatives, development financing institutions and NGO's. The Land Bank as well as three of the large commercial banks were contacted to establish their requirements for agricultural qualifications (Table 23).

Table 23: Numbers of Agricultural Economists in Four Large Banking Institutions			
Banking Institution	**Total Number of Agricultural Qualifications**	**Positions Occupied**	**Range of Qualifications**
Land Bank	35	Agricultural Advisors, Trainees, Relationship Managers, Provincial Managers, Head Office	Agricultural Economic plus range from N.Dip. Agric to M.Sc. Agric with additional finance/ commerce qualifications
First National Bank	31		
Standard Bank	52		
ABSA	37		

Discussion with respondents in these institutions revealed that if a candidate had a qualification in Agricultural Economics (or a base Agricultural plus Economics or Commerce qualification) this was not necessarily sufficient to be employed within the organisation. Thus recruitment is focussed on people with industry experience and on the 'cream of the crop' coming out of universities, who have achieved not only high quality passes, but also have good communication skills and the ability to speak both English as well as Afrikaans. This latter requirement (necessary due to the very mixed and often conservative nature of the client-base) presents some challenges in respect of EE candidates, although ABSA reported that they had managed to achieve figure of 47% equity within their Agri-Business department despite these difficulties.

In contrast, the South African Sugar Organisation (SASA) also employees Agricultural Economists, with this organisation particularly searching for and struggling to find Agricultural Economists who are fluent in Zulu. Economists with Zulu language skills are required to support SASA's growing group of 'Small Scale Growers', who are almost exclusively Zulu-speaking. These requirements are likely to increase over time as government policies for land redistribution and BEE in general impact on the demographics of agricultural client populations.

Among the organisations providing financial services are the SAFEX (South African Futures Exchanges) Agricultural Derivatives Division (part of the JSE), which assists the industry in setting commodity prices on the open market and managing risks through futures trading. SAFEX employs a total of one person with an agricultural qualification among its group of five traders, arguing that the skills required for trading do not include product specific knowledge.

It was generally argued, that the poor image of agriculture as a career option is compounding the issue of skills shortages. This is seen to be deterring really bright, ambitious and determined young people from entering the profession, and has negative effects on responsiveness and dynamism within the profession.

AGRICULTURAL PRODUCT SALES AND MARKETING ORGANISATIONS:

Firms involved in agricultural sales and marketing range from small to large, and operate across a range of product services. The smaller organisations focus on direct sales and could not be investigated, but their existence and potential qualifications needs are noted as contributing to the overall demand for formal skills within the sector.

Among the organisations the larger organisations is the National Agricultural Marketing Council (NAMC), which is mandated to provide advice on agricultural marketing issues to both government and stakeholder groups. This orgnaisation employs 5 employees with agricultural qualifications out of a total of 21. Some of the large industry associations also perform primarily a marketing and exporting function. An example here is Capespan, a citrus exporting association who market the brands 'Cape', 'Outspan', Bella Nova' and 'Goldland' internationally. Out of a total employment figure of 315, around 95 employees have agricultural qualifications. Some of these employees are involved in the control of fruit quality from planting to harvesting, which involves providing technical support. Others are required to manage the control of fruit quality through the logistical supply chain by means of auditing, and providing advice and assistance at various points en-route such as depots, pack-houses and ports. Finally, agriculturally qualified employees are also involved in the finance and direct marketing divisions due to their product specific knowledge.

THE RETAIL SECTOR:

The skills of agricultural graduates and diplomats are required by the large retail organisations. This is because these corporations establish preferred or sole-provider agreements with their suppliers of fresh produce as a means of improving and standardising product quality. Agricultural qualifications are required within the retail organisations to provide farmer support around issues of crop production, the use of fertilizers and international best-practice benchmarking, as well as for general fresh produce procurement. Table 24 below outlines the requirements among the four largest South African retailers.

Table 24: Employment of Agricultural and Horticultural Qualifications at Four Large Retailers

Retail Organisation	Total Employment	Qualifications Required
Woolworths	19	B.Tech/ B.Sc Agric/Agrar (Plant Production) B.Sc Horticulture
Pick 'n Pay	5	
Shoprite-Checkers	10	
Spar	7	
TOTAL	**41**	

Of four retailers listed, the requirements demand by Woolworths are most comprehensive, with this company stating that it requires 10 years of experience for recruits into positions that provide farmer support. In an effort to overcome the problems that this poses for EE, Woolworths have developed trainee positions for two individuals, with recruitment into these positions critically dependent on the individual's ability to integrate information.

Of the 56 positions Woolworths has for Food Technologists, only eight are currently being filled by Agricultural Food Technologists, with the remainder being filled by general Food Technologists, due the difficulty in obtaining graduates with the former qualification. This example suggests that there is a shortage of Agricultural Food Technologists; however only in this instance did the respondent distinguish between agricultual and general food technology skills. This possibly deserves more attention.

PRIVATE CONSULTING COMPANIES:

Due to the diversity within the range of companies providing private consultation into the agricultural sector (e.g. financial, management, legal, labour relations, resource use, inputs, production methods etc) it was not possible to provide an overview of the number of companies offering these services, or the total number of agriculturally qualified individuals they employ. Their existence as contributing towards the total demand for agricultural qualifications within the labour market is noted.

PRODUCT AND INDUSTRY QUALITY ASSURANCE REGULATORY BOARDS AND ORGANISATIONS

As a large proportion of agricultural products become food for humans, quality assurance in support of public health is critical to the success of the industry. International markets often have very specific quality standards that must be met by any potential supplier of agricultural products. Quality standards currently applicable to the agricultural sector in South Africa include:

- ISO 9000: An international standard in quality management for manufacturing and services
- ISO 14001: An international environmental management system standard
- OHSAS 18000: An international standard for occupational health and safety
- HACCP: (Hazard Analysis and Critical Control Point) An internationally recognised food safety management system
- EUROGAP: The European Good Agricultural Practices standard
- SABS Mark Scheme: a domestically recognised general standard of quality

The South African Bureau of Standards (SABS) undertakes accreditation for these nationally and internationally recognised quality standards in South Africa. SABS currently employs 10 people with agricultural qualifications to perform auditing in support of these standards. As part of the accreditation process, agri-trials are undertaken by the organisation on various products. Here the expertise of entomologists and horticulturalists, rather than agriculturalists, is required.

The Perishable Products Export Control Board (discussed above under parastatal demand) also falls under this group of organisations in terms of its industry support focus. Of the total staff of 332 people, the PPECB employs roughly 250 people with agricultural qualifications as quality inspectors based throughout the country.

The end-stage quality assurance testing, as undertaken by SABS and the PPECB, is often preceded by testing that individual organisations or producers undertake in order to provide early warning of potential problems. This allows time for rectification of problems prior to SABS or PPECB tests. The various divisions of the ARC as well as a number of association-affiliated and private laboratories provide such pre-final quality assurance testing. The skills requirements of the ARC were discussed in detail above. Other than a general indication by industry stakeholders that the level of qualification demanded by the private laboratories is high (and is often made up of ex-ARC employees), it is not possible to get any clear idea of the volume of demand.

PROFESSIONAL, CONSUMER & PRODUCER ASSOCIATIONS & SOCIETIES

There are a large number of industry organisations, associations and societies that bring together various groups of stakeholders within the agricultural sector. The driving force behind the formation of these organisations has generally been the pursuit of improved sustainability of the industry or activity, with this mission being met through a variety of mechanisms. The range of these activities also determines the skills requirements of the particular group.

These groups work in specific interest areas such as: professional (e.g. Soil Science Society of South Africa), producer (South African Avocado Growers Association), service (Field Guides Association) or consumer bodies (South African Meat Industry Company). (For a full list of these organisations, see Appendix 5).

The activities undertaken by the various groups are in many ways overlapping. Most are oriented to improving the influence or sustainability of their particular industry or stakeholder group by: networking; marketing; R&D or human resources development. Producer associations will undertake activities such as: the organisation of agricultural shows, auctions and conferences; the undertaking and dissemination of market and scientific research; and the provision and/or support of technical and strategic training. (Case Study: South African Sugar Association is presented in the box below as an example of a highly active and influential industry association).

Professional societies generally (although not exclusively) are member-run, with workforces thus largely made up of volunteers (outside of possibly one or two administrators). Societies thus generally do not of themselves contribute to the demand for agricultural qualifications within the market place, despite being made up of large groups of people who have such qualifications.

Industry organisations and associations on the other hand, who generally do have employees with agricultural qualifications, are extremely mixed in terms of their demand (Table 25). The requirement for specific agricultural qualifications among industry associations is dependent on three key factors:

- The level of member voluntary involvement
- The scope of activities undertaken by the organisation or association, with direct marketing and R&D being most demanding of specific agricultural skills; and

The level of fees paid by members and whether these are in the form of an industry-wide product levy or individual membership fees.

Case Study: South African Sugar Association

One of the most highly organised and widely focussed associations within the agricultural sector is the South African Sugar Association (SASA). This association manages on paper, all transactions of sugarcane in South Africa, with core funding being obtained from the levies generated per ton of produce sold. In addition to this, funding is obtained from the various user-pay services offered by the association. SASA provides its sub-sector with industry production and marketing statistics; markets the nutritional and health benefits of the product to general consumers; undertakes and publishes scientific research through its R&D division, SASRI (South African Sugarcane Research Institute); organises industry-specific networking events; provides quality assurance testing services; and promotes the development of human resources within the industry through extension services, the provision of bursaries for education at tertiary training institutions, and via the development and provision of industry-specific short-courses and Learnerships.

In respect specifically of the skills development focus of the association, training and development is provided through two key divisions: SASRI and the uShukela Training Centre. While all forms of training fall under the category of user-pay services at SASA, this is subsidised by the association's core-funding, with the training divisions additionally accessing funding through the SETA.

SASRI is the primary overseer of extension services provided to the sugar-growing industry, a system that leads to a close and self-sustaining feedback mechanism between R&D, practical growing techniques in the field and the content of the courses offered. SASRI offers two predominantly technical and management focussed theoretical courses, which are aimed at farm managers, farm foreman, PDA extension officers, graduates from the Cedara and Owen Sithole Colleges of Agriculture who are intending to specialise in sugar growing, as well as individuals from within the whole of the SADC region. These courses are well respected within the industry and are currently in the process of being aligned to SAQA's NQF system.

Outside of the formal courses offered, SASRI has experimented with different means of supporting its extension services through disseminating knowledge and information to its members. One such project involves the dissemination of very specific irrigation advice via SMS to all 'Small-Scale Growers'. Preliminary findings have been very positive, revealing improved productivity, reduction in the waste of scarce water resources as well as improved quality of soil through a reduction in leaching.

The uShukela Training Centre provides predominantly practical skills-based courses that are presented on farms within the various sugar growing regions at the appropriate times within the sugarcane growing cycle. The Centre has developed 18 unit standards (aligned to NQF Levels 2 & 3), presented as short courses, which all count towards a sugar-focussed Plant Production Learnership qualification. The training offered by uShukela is aimed at farm workers, small scale growers, new emerging farmers and free-hold growers.

Source: Personal communication & www.sasa.org.za

Table 25: Demand for agricultural qualifications in industry associations and organisations		
Organisation or Association	**Total Permanent Employment**	**Agricultural Qualifications**
Deciduous Fruit Producers Trust	22	6
National Emergent Red Meat Producers Organisation	10	4
National Wool Growers Association of SA	32	25
Cape Wools	6	2
Feed Manufacturers Association of SA	2	0
Grain SA	25	9
Dry Bean Producers Organisation	6	1
SA Plant Breeders Association	0	0
Capespan	315	95
South African Sugar Association	1000	82
South African Cane Growers Association	42	14

Although the skill requirements of associations are moderate, and influenced by the range and depth of services offered, the growth in activity - including training activities - of industry associations reflects an increase in the levels of organisation of sub-sectors in the agricultural sector. In the future, industry associations may become critical players in gathering and communicating information about skills needs and skills supply, as well as becoming training providers in their own right.

7.6 General skills demand characteristics of the agriculture sector

The broad characterises of demand for agricultural qualifications are visible from the findings presented. These are listed, and then each is discussed in more detail below:

- Relative demand for agricultural qualifications is higher in the primary agriculture sector than in the secondary agriculture sector
- Demand for agricultural qualifications is not restricted to primary and secondary agricultural activities, but is also evident among firms that provide various inputs to agricultural producers
- There is strong demand for agricultural qualifications among the organisations and institutions that provide governance and support to the agricultural sector
- Demand for agricultural qualifications within government remains critical
- Demand is evident for highly specialised agricultural qualifications as well as for general agricultural qualifications
- Demand for agricultural qualifications displays geographical variability due to the impact of climate and spatial factors
- Demand for agricultural qualifications across the agricultural sector is dynamic and is affected by sectoral and sub-sectoral factors

Demand for agricultural qualifications is relatively higher in the primary agriculture sector that in the secondary agriculture sector: The findings reveal that while the demand for agricultural qualifications within the secondary agricultural sector is relatively low in comparison, a clear demand for agricultural qualifications is expressed within the group of activities that make up primary agricultural production. This is with the exception of a few producer sectors that are strongly vertically integrated such as the case of grape and wine production.

Demand for agricultural qualifications is not restricted to primary and secondary agricultural activities, but is also evident among firms that provide various inputs to the agricultural producers: Demand is highest in firms providing direct sector-specific inputs into the primary agricultural sector (e.g. seeds) and virtually absent in firms providing direct sector specific inputs into the secondary agricultural sector (e.g. producers of chemical preservatives). Demand within the diverse group of firms providing non-sector specific inputs into the agricultural sector is also highly variable, depending to a large extent on the nature of the input provided (e.g. relatively strong demand may be expected firms specialising in fertigation equipment and advice, and insignificant demand may be expected from firms manufacturing tractor tyres).

There is strong demand for agricultural qualifications among the organisations and institutions that provide governance, regulation and support to the agricultural sector: Activities such as education and training, R&D, quality assurance, technical support, marketing and regulation present strong demand for specific, generally higher-level, agricultural qualifications.

Demand for agricultural qualifications within government is critical: Despite the fact that the importance of the private sector is increasing in respect of its requirements for formal agricultural skills, the demand from the public sector including government departments, research institutions, parastatal organisations and higher education remains key. This is not only because of the sheer numbers employed within this group, but also because of the foundational role they play in the long-term sustainability of the sector.

Demand in the sector applies to highly specialised agricultural qualifications as well as to general agricultural qualifications: Certain employment positions within the agricultural sector require very specific qualifications (e.g. veterinary science in order to practice as a vet). Simultaneously, other employment positions within the sector are substantially more flexible in terms of the level and specialisation of their agricultural skills requirements (e.g. farm managers, sales agents, research technologists). This means that in certain areas of the sector the specific nature of the agricultural qualifications are at times only loosely related to the area in which an individual may work and the activities they are ultimately involved in. Employers are also mindful of the fact that the skills required to work productively within the sector can be gained through a number of means: by acquiring formal qualifications, self-study, by attending additional short courses, by receiving appropriate mentoring, through networking or through on-the-job experience (Table 25).

Demand for agricultural qualifications displays geographical variability due to the impact of climate on certain agricultural activity: The fact that the physical geography and climate of the country impacts on the nature of productive activity within a particular region, means that the demand for specific agricultural skills is also spatially variable. For instance there is not likely to be any real demand for viticulture qualifications in KwaZulu-Natal while there is not likely to be any real demand for specialists in sugarcane production in the Western Cape. Thus it is no co-incidence that the two tertiary education institutions offering viticulture are based in the Western Cape where the vast majority of wine-grape and wine production takes place, and that the South African Sugar Institute and its respective training divisions, is based in KwaZulu-Natal, where the vast majority of sugarcane production and milling takes place.

Demand for agricultural qualifications is dynamic and is affected by sectoral and sub-sectoral conditions: The demand for agricultural qualifications within the agricultural sector (total demand as well as demand for specialisation) changes over time in response to a number of forces acting on and within the sector. The combination of these forces is driving an increase in the requirement for higher-level agricultural skills and thus also formal agricultural qualifications within certain sub-sectors.

- Increased global and local market demand for quality and productivity results in increased demand among primary producers for appropriately trained employees who have the capabilities to understand and can assist in responding appropriately to these pressures
- Pressures for improved quality and productivity result in increased mechanisation or the adoption of new technologies in different sub-sectors. This shifts the balance in requirements towards skilled and away from unskilled workers. Thus, where it was possible for an employer to develop employee skills through on-the-job training, this is no longer the case and minimum qualification requirements are introduced
- Increasing skills within one sub-sector have a direct impact on the need to increase skills within another sub-sector: When increasing numbers of primary producers expect their employees to have agricultural qualifications, enterprises providing services must be able to offer their clients a higher level of service - necessitating increases in skills requirements among agricultural product sales agents and extension officers for example
- A reduction of the perceived value of a particular qualification may also lead to requirements for higher-level qualifications. Regardless of the validity of perceptions, if an employer believes that the standard of a particular qualification has dropped, she is likely to increase her minimum employment requirement to a higher level of a degree, thus fuelling the demand for higher level skills

- The increasing sophistication of the work environment within the agriculture sector in general produces requirements for employees to have a set of personal and life-skills beyond the expected knowledge, technical skills and qualifications. These would include knowledge and experience of areas such as finance, administration, project management, networking and communication.

Table 26: Means of Skills Acquisition within a Sector or Economic Environment

Primary Qualification, and/or	Experience, and/or	Additional Qualifications & Courses, and/or	Personal Reading & Research, and/or	Knowledge Sharing Through Informal Networking, and/or	Knowledge Sharing Through Formal Networking
• Schools • Colleges • Technikons • Universities • Certificates • Diplomas • Degrees	• Full-time or part-time work within a particular field/environment • Total time worked in the particular field • Variety of activities undertaken during the work experience • Quality of mentorship & on-the-job training received • Level of responsibility given and accepted	Personal or sponsored at Private of Public Service Provider: • Attendance short courses • Examination short courses • Certificates • Diplomas • Degrees	• Books (personal or library) • Specialist journals printing the outputs of both local and international R&D institutions • Internet research • Specialist magazine • Specialist service/ product/technology knowledge dissemination • Notification of formal events & activities	• Family involved in particularly activities • Friends involved in similar activities • Geographical clustering of activities increases chances of friends and acquaintances in similar activities	Formal Membership of Societies and Associations • Personal networking • Specialist service/ product/technology knowledge dissemination • Access to expert skills • Access to R&D outputs of these societies and associations • Notification of formal events & activities both by society as well as other interest groups

7.7 References:

Agricultural Digest, www.nda.agric.za/docs/Digest2000/intro.htm

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Groewaldt, S. (2004), *Careers in Agriculture*, National Department of Agriculture, www.nda.agric.za/docs/ET/ET.htm

Mail & Guardian Online Career Junction, 15 July 2005, http://mg.careerjunction.co.za/car/job/jobfrm.aspNational Department of Agriculture, 2000,

Miti, I. (2005) Speech delivered by Mr Isaac Miti, Senior Manager: Human Resource Management (Department of Agriculture) at a workshop on the final report on a national survey on the status of unemployed agricultural graduates in South Africa. Unpublished manuscript

Primary Agriculture Education Training Authority (PAETA) www.paeta.co.za

Rainbow SA, 2004, *National Agricultural Directory South Africa 2004/5*, www.eAgri.co.za

Sector Education Training Authority for Secondary Agriculture (SETASA), www.setasa.co.za/overview/index.asp

Organisations (not included in Appendix 5):

International School of Tanning Technology, www.tanschool.co.za

Agribusiness in Sustainable Natural Plant Products, www.asnapp.org

Please Note: For a comprehensive list of all individuals contacted telephoncally for the purposes of this research, please see Appendix 5

CHAPTER 8

Interaction between the demand for, and supply of, agricultural graduates with intermediate to high-level skills

8.1 Introduction

This chapter brings together the preceding analysis regarding the supply of intermediate to high-level agricultural skills with the analysis regarding the demand for such skills in the South African labour market.

The chapter begins with a brief overview of the supply of agricultural skills into the South African labour market, as discussed in Chapter 3 which established the numbers of graduates emerging from the various national institutions with intermediate to high-level agricultural qualifications. This is followed by a short recapitulation of the best estimates of the size of the workforce with intermediate to high-level agricultural qualifications, as determined in Chapter 7. It is then possible to generate an estimate of annual skill replacement needs.

Having looked at the annual supply of agricultural skills, as well as the broad shape of current demand, the following section looks more closely at the intersection of supply and demand of agricultural qualifications. First, it examines the available quantitative data on the absorption of agricultural skills into the labour market. Second, it discusses the key trends in respect of the intersection between micro-level demand for agricultural skills and ground-level perceptions of available supply, providing insights as to the possible reasons for disequilibrium between the supply and demand of agricultural qualifications.

8.2 An overview of agricultural skills supply

This section provides an overview of the supply of agricultural skills into the labour market, looking at the annual output from General and Agricultural High Schools, general FET and Agricultural Colleges, and Higher Education Institutions.

8.2.1 Agricultural Science as a subject at Senior Certificate level and at Agricultural High Schools

We observed in Chapter 2 that even though a large number of learners (60 112 in 2003) passed the subject Agricultural Science at Matric this is not a strong indicator of whether a student will qualify to study further in higher education or even whether the student will be able to pursue her/his agricultural studies further. Furthermore, the character of the Senior Certificate qualification is generalist and formative rather than vocational. Therefore, cohorts of school leavers who complete Agricultural Science can be assumed to contribute in as yet unknown ways to the subsequent accumulation of higher agricultural skills levels.

The 42 Agricultural High Schools offer a learning programme up to Senior Certificate level which includes the same Agricultural Science (HG)/(SG) subject offered in ordinary high schools as well as five other Agricultural subjects from which students may select. An estimated number of 548 learners enrolled with at least one agricultural subject in these schools in 2003. However, not all Agricultural High Schools offer the full range of Agricultural subjects and some students may take only one or no agricultural subjects. These schools do not all offer a standardized vocationally focused agricultural qualification. The graduates from these schools will therefore not be taken into account in the analysis of direct flows of graduates into the labour market.

8.2.2 Further Education and Training Colleges

The 50 Further Education and Training (FET) Colleges provide a vocationally oriented curriculum ranging from N1 to N6 which extends from the FET band and into the HET band. The numbers of graduates with N1-N3 and with N4-N6 qualifications in 2004 was 161 (see Table 1), a figure that, for a number of reasons, does not relate directly to the number of qualified persons entering the labour market.

Table 1: Candidates who completed N-levels at the FET Colleges Examinations in Agriculture N3 and N6 in 2004	
	Number
Completed N1	5
Completed N2	16
Completed N3	15
Completed N4	33
Completed N5	32
Completed N6	50
Completed N Diploma	10
Total	161

The semester-based structure of instructional offerings provided by the FET Colleges lends itself to learners enrolling not for a whole qualification at one time, but on an irregular basis. In some instances, learners will enroll for a one semester instructional offering from the N4 to the N6 level on a once-off basis because this meets a particular need they have for specific skills (eg: employees in the wine industry may take a single course in viticulture in the N4 to N6 levels).

In other instances, learners who are full time or part time employed will enroll for courses on an intermittent basis over a period of several years before they complete all the requirements for a particular qualification. This means that there is no direct link between enrolments and graduates in the FET College sector. As such, to measure the flow of qualified personnel into the labour market from the FET Colleges through using information on completed qualifications is to underestimate the full contribution of the Colleges to skilling agricultural workers.

8.2.3 Colleges of Agriculture

The 11 Colleges of Agriculture are entitled to offer qualifications that are located in the HET band up to the BTech degree level. In 2004, 899 students passed the examinations in the Colleges (Table 2). For the purposes of this analysis, the number taken to have begun job-seeking will be based on those completing the Higher Certificate and the Diploma only, because the first Certificate year leads directly onto the Higher Certificate year. Thus the total number of graduates from the Colleges of Agriculture who are considered as labour market entrants was 572.

Table 2: Candidates who passed in the Agricultural Colleges Examinations in 2004			
		Enrolled	Entering Labour Market
Year 1	Certificate	376	-
Year 2	Higher Certificate	370	370
Year 3	Diploma	254	254
Total		1000	624

8.2.4 Higher education institutions

In 2003, 19 Technikons and Universities offered qualifications ranging throughout the HET band, from undergraduate degrees and certificates to Doctoral degrees. Cumulatively, graduates from these institutions in 2003 numbered 1 765 (Table 3).

Table 3: Students graduating in Agriculture and Renewable Natural Resources from Universities and Technikons in 2003		
Year	Technikons	Universities
2003	862	904

8.2.5 Summary of supply of intermediate to high-level skills in agriculture

Table 4 summarises the analysis presented above, showing in the unshaded blocks the total number of graduates with vocationally specific agricultural training in intermediate to high skills who were in a position to enter the labour market. This number of 2 550 qualified people is the maximum number of people who theoretically would need to be absorbed in the labour market.

Table 4: Output of intermediate to high-level skills graduates from agricultural education institutions in 2003/04

	Curriculum level and type	Institution	Year data was collected	Graduates	
E	Higher & Intermediate Education	Technikons and Universities	2003	1 765	High skills
D		Agricultural Colleges	2004	624	2550
C	Vocational Education	FET Colleges	2004	161	Intermediate skills
B	General & vocational	Agricultural High Schools	2003	548	
A	Subject choice in General education	Ordinary High Schools offering Agricultural Science	2003	60 112	

The actual number of people seeking jobs will be less than the total calculated. Firstly, further study often defers labour market participation. Some graduates will immediately re-enroll for a higher qualification either in the same type of institution (e.g. by registering for a Master's degree after completing an Honours) or in a different type of institution (e.g. registering in a Technikon after completing a College-based qualification). Secondly, not all graduates will necessarily seek to enter the labour market, with some voluntarily remaining outside the labour market for a range of reasons (family responsibilities, international travel etc). Nevertheless, for the sake of this analysis, we will use the total figure of 2 550 as an indicator of the annual size of the pool of new entrants into the South African labour market. This number was based on 2003 and 2004 data, whichever was most recent across the different institutional types. It will be taken as a guide to the output of high-level and intermediate skills in agriculture in 2004.

8.3 Comparison of the quantitative data on supply and demand for intermediate to high-level agricultural skills

In Chapter 6 we argued, based on our analysis of Labour Force Survey data that in 2004 there were probably between 33 000 and 42 000 workers in the labour force who held degrees, diplomas and certificates in Agriculture and who worked in the sector. This data provides the best estimate available of the total size of the agricultural workforce with intermediate to high-level skills.

Table 5: Workers with degrees diplomas and certificates by field of study and monthly income

	Field of study	None	R2500 or less	R2501- R8000	R8001 or more	Total
LFS 2004 Mar	Total employment	*	221	925	594	2006
	Agriculture and nature conservation	-	*	**19**	**14**	**42**
	Total employment	-	0.11%	46.1%	29.6%	100%
	Agriculture and nature conservation	-	*	45.2%	33.4%	100%

- Total includes "Don't know" "Refused" or "Unspecified Income"
- For all values of 10 000 or lower (see *) the sample size is too small for reliable estimates
- Figures in 000

Source: LFS 2004 March p.28

Using the above estimate of the total size of the agriculturally skilled labour-force, alongside the figure for the pool of new graduates in 2004, it is possible to generate an annual overall skills-replacement rate. If we express graduate outputs (shown above to be approximately 2 550 FET and HET graduates in 2004) as a percentage of the number of workers in agriculture who have intermediate and high-level skills in agriculture, we arrive at a figure of between 6.1% and 7.7% (2 550/42 000 = 6.1% or 2 550/33 000 = 7.7%). In other words, our rough estimates suggest that the current graduate output can compensate for annual losses of skilled individuals – or replacement demand - in the sector to the magnitude of between 6.1% and 7.7%.

Replacement demand is the term used to describe the demand for skills that arises from the need to compensate for losses of existing skilled workers within a sector i.e. the demand that will need to be met in order to keep all current jobs within the sector filled. Replacement demand at the sectoral level will result from the sum of replacement demand for all occupations that are represented in that sector.

Unfortunately, aggregated sectoral data – for intermediate to high-skilled workers - cannot tell us how work-seekers with particular qualifications enter specific occupations within the sector. Analysis of the replacement demand for skills must therefore be undertaken at the level of occupation, as occupational vacancies at the high skills level are usually linked to specific qualifications. For example an individual with a National Certificate in Agriculture cannot fill a vacated post demanding an individual with a degree in veterinary science, despite the former contributing to overall sectoral replacement supply and the latter contributing to overall sectoral replacement demand.

Replacement demand at the occupational level arises mainly as a consequence of the following occupation-specific factors:

- age and gender structure of incumbents
- rates of outflow from the group on account of:
  - Retirement
  - Net migration
  - Inter-occupational mobility, and
  - In-service mortality

To quantify replacement demand for occupations requiring intermediate and high skills qualifications in agriculture would therefore require information on all of the above factors, by occupation. This information is currently unavailable.

In summary, this analysis has demonstrated that in 2004 the supply of intermediate to high-level skills into the South African labour market could compensate for losses in the existing workforce up to the magnitudes of between 6.1% and 7.7%. Whether this level of supply was sufficient to meet the replacement demands of the sector is unknown. This is because overall sectoral replacement demand could not be disaggregated to the particular occupational groups within the sector. This does not however mean that we have no way of understanding the relationship between demand and supply in the agricultural sector. The following sections will provide analysis on the shape of demand within sub-sectors of the agricultural economy.

8.4 Key features of skills demand in the agriculture sector

The discussion that follows will set out the key current features of the demand landscape for intermediate to high-level agricultural skills in the agricultural sector. This section will also show that outside of the need to meet 'replacement' demand for intermediate to high-level skills, the dynamic nature of the sector and its potential to generate 'new' demand, needs to be taken into account.

8.4.1 Current skills demand characteristics of the agricultural sector

The micro-level analysis of the demand for agricultural qualifications undertaken for this research and presented in detail in Chapter 7 provides some insights into the demand for agricultural qualifications among the various groups of activities that make up the agricultural sector. These are given below:

- Relative demand for agricultural qualifications is higher in the primary agriculture sector that in the secondary agriculture sector

- Demand for agricultural qualifications is not restricted to primary and secondary agricultural activities, but is also evident among firms that provide various inputs to the agricultural producers
- There is strong demand for agricultural qualifications among the organisations and institutions that provide governance and support to agricultural activities
- Demand for agricultural qualifications within government remains critically important

Chapter 7 also revealed a number of cross-cutting issues in respect of the demand for agricultural qualifications within the various sub-sectors of the agricultural industry. These are that:

- Demand in the sector applies to highly specialised agricultural qualifications as well as to general agricultural qualifications
- Demand for specific agricultural qualifications displays geographical variability due to the impact of climate on the sector
- Demand for agricultural qualifications across the agricultural sector is dynamic and is affected by sectoral and sub-sectoral factors

The last of these points, that demand for agricultural qualifications is not static, but is affected by a number of external and internal driving forces, is supported by additional evidence to be discussed below.

8.4.2 Demand arising out of changing labour market conditions

All attempts to calculate demand figures for skilled workers, whether in the aggregate or by particular occupational categories, must take into account the potential impact of changing economic conditions. In respect of the agricultural sector, changing national, sectoral or sub-sectoral economic conditions may result in:

- Aggregate increases in labour demand
- Aggregate decreases in labour demand

Employment data reveals that the agricultural labour force is in long-term decline, a trend that has been attributed to a gradual general shift in economic activity away from primary activities towards manufacturing and services. Counter to this long-term trend, recent evidence suggests that there has been a slight increase in agriculture's share of employment, with a shift from 12% in 1995 to 13% in 2002. In real terms, employment within the sector grew by a substantial 24.7% over the same period. (Bhorat,2003,6). Simultaneously, there are clear signs of growth in certain agricultural sub-sectors, especially those which are servicing export markets (eg: wine & rooibos tea). Thus despite the long-term trend of declining employment within the sector, medium-term fluctuations in response to changing market conditions are likely to have notable impacts on the overall demand for agricultural qualifications within the agricultural sector.

8.4.3 Changing skills composition of the workforce

Within the overall pattern of increasing – or decreasing – aggregate demand for labour (as determined by the balance of the increases and decreases at the levels of individual sub-sectors) there may be shifts in the skill or occupational composition of the labour force. These sift may be on account of:

- shifts in the balance of skill needs (i.e. between high, medium and low) within a particular workforce
- absolute decline in the need for a particular skill or qualification
- emergence of demand for a new type of skill or qualification

Recent analyses have shown that even though the overall size of the agriculture labour force has been shrinking over the long-term, skills levels have shifted upwards. Data on the 'agriculture hunting, forestry and fishing' sector shows how unskilled workers' share of employment declined while the share of semi-skilled workers increased by almost the same margin between 1995 and 2002. In addition, the proportion of skilled workers doubled – though from a very small base.

Table 6: Skills breakdown of employment in the Agriculture, hunting, forestry and fishing sector for 1995 and 2002 in %			
	1995	2002	Change
Skilled	1.0	2.0	+1
Semi-skilled	22.0	46.0	+24
Unskilled	77.0	52.0	-25
Total	100	100	-

Note: 'Skilled' refers to ISOC 1-3, 'Semi-skilled' refers to ISOC 4-8, and 'unskilled' refers to ISOC 9.
Source: Bhorat and Oosthuizen (2005) Table 10 p.24

This shift towards a greater proportion of skilled and semi-skilled workers supports the qualitative findings of this research. The driving forces behind this change in workforce skills composition have been ascribed to increased investment in mechanical and technological upgrading in the production processes, itself a response to the increased pressures for quality and productivity associated with globalisation and open markets. South Africa is however not alone, with this trends of decline in the employment of un-skilled agricultural workers and increases in the employment of semi-skilled and skilled agricultural workers occurring to a smaller or larger degree in all globally-integrated economies.

8.5 The interaction of supply and demand for agricultural qualifications

Having looked at the annual supply of agricultural skills, as well as the broad shape of current demand, this section looks more closely at the intersection of supply and demand of agricultural qualifications. This is done in two ways: Firstly, we examine data from the Labour Force Survey to reveal characteristics of the absorption of agricultural skills into the labour market.

Second, key trends in respect of the intersection between micro-level demand for agricultural skills and perceptions of respondents regarding available supply are discussed, providing insights as to the possible reasons for disequilibrium between the supply and demand of agricultural qualifications.

8.5.1 Labour market absorption as an indicator of skills supply-demand co-ordination

An important indicator of the capacity of the labour market to absorb particular sets of skills is the level of unemployment among individuals with that particular skills set. High levels of unemployment in particular skills bands suggest that there is an over-supply of these skills.

It is well known that unemployment affects people with intermediate to high-level qualifications in South Africa across a range of fields. The existence of unemployed graduates constitutes a waste of resources expended on training people in skills that they cannot practice because they are – or may become – unemployed over a long period of time.

How large is this problem in the field of agriculture? Detailed information regarding unemployment among agricultural graduates is not readily available. Table 7 below presents the numbers of unemployed persons as given in the Labour Force Survey of 2004. The figure represents data according to the 'official' and the 'expanded' definitions of unemployment Statistics South Africa (Stats SA) uses the following definition of unemployment as its *official* definition. The *unemployed* are those people within the *economically active population* who: (a) did not work during the seven days prior to the interview, (b) want to work and are available to start work within two weeks of the interview, and (c) have taken active steps to look for work or to start some form of self-employment in the four weeks prior to the interview. The *expanded definition of unemployment* excludes criterion (c). Among those who are included in the expanded but not the official definition of unemployment will be discouraged job seekers (those who said they were unemployed but had not taken active steps to find work in the four weeks prior to the interview) (Statistics South Africa, 2004a, xiii; Statistics South Africa, 2004b, 66-67).

The national unemployment rate is 27.8% in terms of the official definition and 41.2% in terms of the expanded definition. As can be seen from the data provided, even under the expanded definition, unemployed persons with degrees, diplomas and certificates from within the agricultural field of study is less than 10 000.

Table 7: Unemployed persons (10 000) with degrees, diplomas and certificates by field of study, definition of unemployment and sex

Field of study for degree, diploma or certificate	Official definition			Expanded definition		
	Total	Male	Female	Total	Male	Female
Total	217	90	128	289	111	178
Communication studies and language	*	*	*	*	*	*
Education, training and development	45	16	29	58	19	39
Manufacturing, engineering and technology	25	16	*	34	22	13
Human and social studies	*	*	*	11	*	*
Law, military service and security	*	*	*	12	*	*
Health sciences and social services	17	*	14	21	*	18
Agriculture and nature conservation	*	*	*	*	*	*
Culture and arts	*	*	*	*	*	*
Business, commerce and management studies	62	26	35	85	33	52
Physical, mathematical, computer and life sciences	23	*	16	32	*	22
Services	*	*	*	*	*	*
Physical planning and construction	*	*	*	*	*	*
Don't know/unspecified	*	*	*	*	*	*

Source: Statistics South Africa, (2004a) p.57 "Unemployed persons with degrees, diplomas and certificates by field of study, definition of unemployment and sex"

* Statistics South Africa (Stats SA) uses the following definition of unemployment as its *official* definition. The *unemployed* are those people within the *economically active population* who: (a) did not work during the seven days prior to the interview, (b) want to work and are available to start work within two weeks of the interview, and (c) have taken active steps to look for work or to start some form of self-employment in the four weeks prior to the interview. The *expanded definition of unemployment* excludes criterion (c). Among those who are included in the expanded but not the official definition of unemployment will be discouraged job seekers (those who said they were unemployed but had not taken active steps to find work in the four weeks prior to the interview) (Statistics South Africa, 2004a, xiii; Statistics South Africa, 2004b, 66-67).

It is preferable to have controlled low levels of unemployment across the economy, and it is therefore useful to establish whether the level of unemployment among agricultural graduates is *proportionately* higher than levels of unemployment among graduates in other sectors. For instance, there is a very high number of unemployed persons (58 000 teachers) who have a degree, diploma or certificate in education. But as the teaching profession is much larger than the size of the intermediate to high-level skilled agriculture workforce, direct comparison of unemployment figures is not useful. It will therefore be more meaningful therefore to track changes in this indicator over time to observe trends in the equilibrium between supply and demand of particular qualifications, or for particular occupations.

Supplementary empirical evidence on the matter of graduate unemployment, and patterns of obtaining employment among graduates in South Africa, is provided by Moleke (2005). Moleke's work is valuable because it is reported on the basis of academic field of study and therefore affords comparison between the employment potential of graduates who have studied in different fields. Moleke's data was obtained via a survey in 1999/2000 of about 2500 former university students who graduated between 1994 and 1998, and shows that there was a relatively low proportion of agricultural graduates who experienced a period of unemployment in comparison with other fields of study (Table 8).

Table 8: Proportions of respondents who experienced a period of unemployment, by field of study	
Field of study	**%**
Natural sciences	9.9
Engineering	2.6
Agriculture	**1.5**
Medical sciences	4.4
Humanities and arts	48.2
Education	15.4
Law	8.1
EMS*	9.9
Total	100

Source: Moleke, 2005

*EMS: Economic and Management sciences

Moleke's (2005) data is reassuring in showing that 61,6% of agricultural graduates obtained employment immediately and a further 31,4% obtained employment within one to six months. Thus only 7% of agricultural graduates did not obtain employment within the first six months after graduation. In contrast, around 20% of graduates in 'humanities and arts' and 'law' did not find employment within six months (Table 9).

Table 9: Period before finding employment, by field of study for university graduates

Field of study	Immediately	Between 1 & 6 months	Between 7 & 12 months	Between 1 & 2 years	More than 2 years	Total
	%	%	%	%	%	%
Natural sciences	55,0	38,8	3,8	2,1	0,4	100
Engineering	77,2	18,3	3,0	1,0	0,5	100
Agriculture	**61,6**	**31,4**	**5,8**	**1,2**	**0,0**	**100**
Medical sciences	79,3	18,5	2,2	0,0	0,0	100
Humanities and Arts	46,8	33,1	8,5	7,3	4,2	100
Education	57,0	33,8	3,9	4,4	0,9	100
Law	49,6	30,2	8,6	7,2	4,1	100
EMS*	65,4	23,3	6,2	3,7	4,3	100
Average	59,5	28,4	5,9	4,2	2,0	100

Source: Moleke, 2005

Note: *EMS: Economic and Management sciences

The picture that emerges from this empirical data is that agricultural graduates from universities fare reasonably well in terms of their employment prospects as compared with those from other fields of study. However, this observation must be qualified by noting that the data refers only to higher education fields of study. As such it does not deal with the experience of graduates from the Colleges of Agriculture or of the FET Colleges. It is possible that the problem of unemployed Agricultural graduates is most evident at this level.

8.5.2 The intersection of supply and demand for agricultural skills: some key trends

Empirical data suggests that the rate of absorption of agricultural skills into the labour-market is not necessarily as poor as is sometimes assumed. But it is important to develop a more textured understanding of how demand and supply factors mutually interact to produce employment and unemployment trends in the agriculture sector. The trends discussed below represent the findings from a large number of telephonic interviews with respondents at the firm-level to assess demand for agricultural qualifications and the perceptions of respondents as to the availability and the quality of such agricultural skills.

These trends are listed below and each one in turn is then discussed extensively:

- The agricultural sector is characterised by intra-sector mobility of skilled workers
- The extent of labour market demand is hidden by qualification substitution
- Demand for skills in the marketplace is mediated by employers who provide forms of focused but informal in-service training
- Not all individuals with the same agricultural qualifications are perceived to be equally desirable candidates for employment
- BEE and Employment Equity (EE) requirements compound the problem of scarce skills
- The pattern of supply of agricultural qualifications shows rural-urban and socio-economic bias
- The presence of regional 'clusters' of agricultural activity impact on the supply and demand of specific agricultural qualifications
- Higher private sector wages draw skills away from the public sector
- The poor image of the sector is discouraging young and motivated individuals from pursuing a career in agriculture
- Lack of adequate labour-market information contributes to sector skills imbalances
- Increasing formalisation of the relationships between role-players within the agricultural sector appears to be driving demand for skills as well as an increased supply of formal training

***The agricultural sector is characterised by intra-sector mobility of skilled workers**:* Many skilled employment opportunities within the agricultural sector do not necessarily require a specific agricultural qualification. Individuals with agricultural qualifications thus have the ability to move between the various sub-sections of the industry relatively easily. This is particularly so for individuals with some work experience and higher levels of organisation, administration and management skills. Individuals who have dual qualifications, or are willing to undertake cross-disciplinary training can also move more freely between various sectors of the economy.

***The extent of labour market demand is hidden by qualification substitution**:* Qualification substitution refers to instances where in the absence of finding candidates with preferred agricultural qualifications, employers are willing to draw prospective candidates from a wider pool of possible qualifications. For example a firm wanting an Agricultural Engineer may eventually settle for a Civil Engineer, while a firm wanting an Agricultural Economist may eventually settle for a B.Com student with the intention of providing the necessary extra training. As substitution eliminates the original demand, true demand for a particular agricultural qualification is masked.

Demand for skills in the marketplace is mediated by employers who provide forms of focused but informal in-service training: Some employers argue that the specific nature of the formal qualification is irrelevant and that no theoretical learning will equip a candidate to be able to be immediately productive within a specific job environment. Thus to these employers, who consider on-the-job training and experience as critical, the base qualification is incidental and only useful in so far as it provides an indication of the individual's ability to learn, with other factors such as communication, inter-personal and organisational skills thus more important.

An example of this is provided by the unique occupational requirements of the processing of wool and mohair industry, where economies of scale do not justify the development of a formal high-level qualification, and skills and tacit knowledge are currently developed through hands-on training and individual mentoring. As it is not viable to develop formal courses for every niche area in which South African agriculture participates, providing support for local individuals to access internationally available formal training (e.g. in Australia or New Zealand in the case of wool) could provide the most cost-effect means of supporting the skills needs of the smaller areas of the local agricultural sector.

***Not all individuals with the same agricultural qualifications are perceived to be equally desirable candidates for employment**:* A number of respondents noted that job candidates with formal qualifications were not automatically perceived as being 'competent to perform the tasks required'. This issue was presented in two different ways: Firstly some employers regard with suspicion the quality of the qualifications available from certain tertiary institutions. This places individuals who have obtained qualifications from these particular institutions at a disadvantage.

Secondly, employers raised concerns regarding individuals' soft-skills. Increasingly, individual competencies such as a general understanding of the sector, as well as communication, presentation and language skills, are regarded as critical to succeed within the industry.

Thus while for certain agricultural qualifications and specialisation areas there appears to be a real shortage of skills (e.g. M.Sc in Seed Science), in respect of other qualifications and specialisation areas (e.g. N.Dip.Agric in Crop Production) the issue of scarcity appears to have more to do with lack of competencies among graduates than the actual number of job candidates available.

BEE and Employment Equity (EE) requirements further compound the problem of scarce skills: The requirement to meet BEE and employment equity targets compounds the problem of obtaining competently qualified skills. Respondents stressed that in respect of certain skills (most notably Agricultural Economics and Agricultural Engineering) it was difficult enough to find any suitably qualified candidate, let alone candidates from a previously disadvantaged background. As a consequence, negative cycles of 'skills poaching' often developed.

The supply of agricultural qualifications shows rural-urban and socio-economic bias: The socio-economic geography of the county appears to have an impact on the supply of agricultural qualifications. There appears to be a clear rural urban divide in terms of the availability of particular agricultural qualifications, with higher-level qualifications more accessible to firms and organisations within the urban areas than those in the rural areas. Respondents at rurally-based Colleges and Universities particularly, argued that their inability to attract suitable qualified high-level staff was because people did not want to accept the quality of life associated with rural areas. Thus, while organisations in urban areas may pick employees from a relatively large pool, organisations in rural areas will often be forced to take whomever they can get, with the impact of this pattern on rurally based teaching institutions a likely contributor to this cycle of inequality.

Regional 'clusters' of agricultural activity impact on the supply and demand landscape of specific agricultural qualifications: Clusters of agricultural activity develop within certain geographical regions. A cluster may create its own regionalised labour market of particular skills, leading to heightened demand for particular specialisations or sub-specialisations and these thus being offered at local education institutions. Firms falling outside of this regional cluster who are involved in this same activity will find it substantially more difficult to have their skills requirements met, than those falling within the geographical cluster. For instance, Rainbow Chickens farms the Worcester area of the Western Cape, where there are virtually no other poultry producers, finds it substantially more difficult to attract suitably qualified employees than do the firm's operations based on the Highveld, where a large number of poultry producing organisations (Rainbow Chickens, Early Bird, Sangrina, Chubby-Chick, Henwell and Daybreak) together form a geographical cluster. The impact that this cluster had on the course content at Potchefstoom College of Agriculture provides an example of the impact of clusters on the supply of skills: Since 1999 the College has included in their undergraduate N.Dip.Agric curriculum a course on poultry production which was first developed as a short-course in 1995 in response to local industry requests.

Higher private sector wages draw skills away from the public sector: Disparities in wages and perks between the public and the private sector heighten the scarcity of skills within the former. Public sector organisations in rural areas are most strongly affected in terms of their ability to obtain and retain highly qualified individuals. The public sector tends to bear a large part of the responsibility for generating the skills and knowledge required to sustain agriculture in the long-run. Furthermore, the practice of agriculture is still to a large extent based in rural areas where poverty is highest and livelihood creation most urgent, and the continuation of this trend has potentially detrimental effects both to public sector delivery (e.g. state veterinarian and technical extension services) as well as the national development objectives.

The poor image of the sector is discouraging young and motivated individuals from pursuing a career in agriculture: This particular concern was raised by a number of respondents in relation to all areas of the sector and has relevance not only to the number of people who choose to study agriculture, but also on the retention rate within the industry of people with such qualifications. This is also because other sectors within the economy provide opportunity for motivated and skilled individuals to enter, regardless of the specific nature of their formal qualification.

***Lack of adequate labour-market information among employers and work-seekers contributes to sector skills imbalances*:** The availability of information regarding the general as well as specific areas of demand for agricultural qualifications within the agricultural sector is critical to approaching an equilibrium between supply and demand.

This is because knowledge of where the demand is – by occupation or sector - would not only direct work-seekers to suitable employers, but also stimulate supply through encouraging individuals who want to be assured of future employment opportunities to study in particular fields. Lack of adequate information may be contributing to the existence of surplus skills in some agricultural qualification specialisations, when under-supply exists in other regions, sub-sectors or organisations.

Increasing formalisation of the relationships between sectoral role-players within the agricultural sector appears to be driving demand for skills: There is some evidence that where closer and more formalised relationships exist between the role-players within an agricultural sub-sector, there is also greater demand for agricultural qualifications. Examples are evident where there is vertical integration of operations within certain companies (e.g. McCains, Rainbow Chickens etc); in certain sub-sectors (e.g. wine-grape and wine production); and in certain formalised producer/buyer relationships (e.g. between Woolworths and Capespan, and their receptive suppliers).

Horizontal industry organisation also leads to formalisation of the relationships between various role-players. This is evidenced through the various large producer organisations and associations such as the Citrus Growers Association and the South African Sugar Association. Reasons for this include: improved cost-effectiveness of launching purpose-driven sub-sector specific high-level qualifications due to economies of scale; increased demand through increased productivity requirements; or simply increased information-sharing resulting in an increased general awareness of the availability and ability of individuals with the respective formal qualifications.

Increasing formalisation of the relationships between sectoral role-players appears to be contributing towards an increased supply of formal training: Organisation of role-players within the various sub-sectors of the industry into associations, societies and organisations appears to have positive effects on formal skills development in support of that particular sub-sector. This is evident by the number of associations and their related institutions that provide opportunities to individuals to obtain formal qualifications through the provision of various bursary and financial support schemes. Additionally, associations, societies and organisations have been key in the development of certain industry-specific training material. Such training is presented either through association-affiliated training institutions or in co-operation with public or private formal education and training institutions. Examples of this latter means of contribution to the development of formal industry-relevant skills as highlighted in this research include the South African Animal Health Association's 'AVCASA Animal Health Course' offered by the Tshwane University of Technology (TUT); the Fertilizer Society of South Africa's 'Fertiliser Advisor's Course' also offered through TUT; the South African Sugar Association's uShukela Training Centre and SASRI short-courses; and finally the National Higher Certificate in Tanning Technology offered by the International School of Tanning Technology in Grahamstown.

8.6 Conclusion

In this chapter we reiterated that the total number of agricultural graduates entering the labour force on an annual basis at the present time is in the region of 2 550. With a total pool of agriculturally qualified individuals within the labour force of between 33 000 and 42 000, this annual pool of graduates can compensate for annual losses of skilled workers within the sector to the magnitude of between 6.1% and 7.7%. Whether this supply is able to satisfy the demand arising from the need to replace skills within the sector combined with the need arising from 'new' demand associated with sub-sectoral growth and skills compositional changes is however uncertain due to the lack of information about the factors impacting on occupational replacement and new demand within the sector.

Further evidence from Moleke (2005) suggests that 93% of graduates from the higher education institutions are succeeding in finding employment within six months of graduation. As this study does not include information about graduates from the FET and Agricultural Colleges, this may however be presenting a somewhat skewed picture of the overall situation.

A large number of telephone interviews were undertaken with a industry representatives regarding their requirements and efforts to secure intermediate to high-level agricultural qualifications. Key findings included: many agricultural qualifications permit mobility between a wide array of occupational opportunities, employers are substituting needed skills with second best qualifications, or are providing in-service training to compensate for skills needs, spatial location and industry clustering creates localised labour markets outside of which sourcing skills is difficult, lack of adequate labour-market information exacerbates skills-jobs mismatches, and increasing formalisation of the relationships between role-players through vertical integration and industry associations is driving both demand for high-levels skills as formal training.

Based on the findings emerging from this and the previous chapters, the final chapter of this report presents the authors' recommendations as to how to facilitate a greater level of equilibrium between the supply and demand for agricultural qualifications in the South African labour market.

8.7 References

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CHAPTER 9

Recommendations

9.1 Improving the sourcing and use of HRD information in the agricultural sector

- Increase collection and use of information on mission critical agricultural skills needs in national and provincial departments of agriculture. Improve data collection on agricultural qualifications at national and provincial government level. The Department of Agriculture may encourage Human Resources (HR), Training and Finance departments to collaborate in making data on skills needs, skills gaps and training expenditure available to line managers. It may also encourage HR line managers to keep job descriptions and vacant posts as recent as possible and to capture and track data on the advertisement of posts in the national and provincial departments of agriculture.

- Improve the distribution of both supply and demand data to all role-players within the agricultural sector. The Department of Agriculture may consider organising an annual workshop/conference/event that brings together training practitioners, HR and Training managers from government, private enterprises, the professions, industry coordinating bodies with training activities, and education institutions. In this way cross-sectoral and inter-institutional collaboration can be facilitated.

- Information regarding the demand for and supply of agricultural skills must be disseminated systematically through public media available to the National Department of Agriculture. The Department may use its website to make information available to any person or enterprise with access to the internet. Such an information portal created for the sector will need to be marketed on a national level. This strategic option will not replace marketing and information dissemination aimed at improving the image of the sector to people who do not have access to the internet.

9.2 Generating greater interest in agricultural careers

- Market the agricultural sector's broad range of career possibilities to the general public. This must be done not only in schools. Marketing needs to transform the view that agriculture qualifications lead only to jobs as farmers, farm managers or farm workers. As a starting point, the excellent "Careers in Agriculture" booklet produced by the Directorate of Education and Training can be distributed widely. This publication can be updated on an annual basis.

9.3 Emphasising opportunities for career-pathing in agricultural fields

- The Department of Agriculture should discuss with the Department of Education how to make it possible for students who take agriculture as a subject at school to also take the key gateway subjects of Mathematics and Science. For instance, this may involve investigating which schools and how many schools offer Agricultural Science at the Higher Grade (even though this grading is being phased out), and of these schools how many also offer Mathematics and Science.This is especially important because learners from formerly disadvantaged groups have historically received limited opportunities and exposure in the domains of Mathematics and Science education.

- As part of a strategy designed to improve the flow of scarce skills into the agricultural sector, the Department of Agriculture should not depend only on graduates with Agriculture qualifications. For example, graduates with B.Sc qualifications will also possess key skill-sets which are critical to the sustainability of the agricultural sector. By recruiting B.Sc graduates into agricultural degree programmes at the Honours, Masters and PhD levels, the pool of agriculturally focussed post-graduate students can be enlarged. This approach can be driven through bursary allocations for example.

9.4 Sustaining the quality and focus of intermediate to higher education programmes

- It is necessary to investigate why students who obtain access to agricultural programmes are not equally successful in completing their courses and graduating. There are clear gender and race differentials in the extent to which enrolment, graduations and throughput are distributed. These patterns occur between institutions and between different study fields. The Department of Agriculture may consider monitoring these patterns more closely so as to identify and ameliorate the causes.

- In co-operation with the Department of Education, the Department of Agriculture needs to promote quality benchmarks that are applicable to equivalent agricultural qualifications across the institutions offering courses on the same NQF level. This can promote the equitable absorption - and success - of graduates from rurally-based and previously disadvantaged institutions into the labour-market. Graduates from rurally based and previously disadvantaged institutions are currently being negatively impacted by perceived as well as real quality differences between their education and those graduates from urban-based and historically white institutions.

- Over and above issues of 'quality' of programmes, it is important that students admitted at the entry-level are supported to deal with the content and pedagogical relationships that are very different at higher education institutions than at school or in the FET band. Higher education institutions should ensure that there is provision being made for alternative paths of entry for individuals who do not meet direct requirements in the first instance. One such alternative is the provision of bridging courses of which there are examples from which to absorb best practises.

- Institutions which aim to support access to particular programmes need to creatively seek alternative means of bringing students in, who might on first application not meet the set criteria. For example, it is possible to leverage successful completion of the first-year of a lower level agriculture related/relevant qualification as evidence of individual capability. The Agriculture Department at the University of the Free State, for instance, has an entry-policy in place where students who do not meet the direct entry requirements for a B.Sc.Agric are considered upon passing the first year of the B.Agric.

- The Department of Agriculture should investigate the possibility of supporting rural-based agricultural training institutions, such as Colleges and universities to obtain staff with the appropriate qualifications.

- In co-operation with the Department of Education, the Department of Agriculture needs to reinforce the importance of general life and workplace skills such as: communication and language skills; teamwork skills; ability to work independently; ability to use computers in the workplace etc. This is important for students of agriculture in high schools as well as in higher education to appreciate because these attributes increase employability over and above the actual qualification achieved. A small-scale investigation into how higher education agriculture curricula take account of the need for life skills could be undertaken.

- Areas of knowledge addressing 'Agriculture as Business' are becoming increasingly important within the industry i.e. finance, business skills and project management skills. Education institutions offering qualifications in agriculture must be encouraged to ensure these forms of knowledge are included in curricula.

- The Department of Agriculture has recently emphasised the importance of integrating education and training programmes to facilitate progression and career pathing. The NQF is an important mechanism or structure that supports such an aim. The complexity of relationships between programmes in different higher education institutions makes it unfeasible to attempt to bring about integration of all programmes, qualifications and levels. It is preferable to focus on facilitating particular career and study pathways leading either to specific qualifications or specific occupations. The Department of Agriculture may target particular career paths or study programmes and put in place a plan of action to facilitate the flow of cohorts of students towards the goal of obtaining employment in occupations that have scarce skills needs. This can be undertaken in collaboration with relevant education institutions, funders and employer role-players.

9.5 Strategically targeting scarce skills

- Shortage of particular skills sets creates bottlenecks in the productivity of both public and private sectors. The Department of Agriculture should select a set of key occupations that are known to be in short supply and conduct an analysis of the likely future demand for these occupations over a five to ten year period (eg: veterinarians, seed scientists etc.).

  The need for personnel in the agricultural R&D field is substantial and growing. The Department of Agriculture should encourage an increase in the number of graduates obtaining higher level agricultural and research qualifications at the M.Sc and PhD levels.

- The Department of Agriculture should consider setting aside funding for 'bursaries' to international institutions for particular qualifications, which are not offered locally and are not likely to be offered soon (eg: Wool industry qualifications not available in South Africa but offered in Australia). This will assist in sustaining the skills base of small agricultural sub-sectors. At the same time these opportunities could promote equality of access to financial support across different sub-sectors.

- The Department of Agriculture should investigate the possibility of implementing a scarce skills allowance and rural allowance that applies to particular scarce skills in the public service (eg: such as veterinarians). This strategy may assist in restoring the capacity of the Department of Agriculture to provide services in areas where there are large numbers of vacant posts.

9.6 Support for stronger cooperation between training providers and employers

- This research showed how various industry bodies are supporting training. The Department of Agriculture should consider ways of supporting industry organisations (eg: sub-sectoral bodies such as in the sugar industry or professional associations) which through their activities improve the training and skills development culture, act as networking hubs for skills related information, and sometimes themselves engage in training.

- The Department of Agriculture may consider contracting a research agency to conduct skills needs analysis for particular agricultural sub-sectors. Such studies have been undertaken by sub-sectors such as the Viticulture industry. Employers are generally reluctant to invest money in training but if a trustworthy empirical analysis were undertaken of the value system of a particular industry to show skills needs, employers would be more likely to invest in training.

- The importance of cooperation between public sector, private sector and higher education is strongly evident. The Department of Agriculture should seek ways of supporting higher education-industry linkages that involve the development of curricula and programmes to meet niche industry needs in either the public or the private sector. This research encountered several examples of valuable collaboration between institutions and enterprises in establishing sector specific programmes to meet particular skills needs.

- The Department of Labour has recently restructured the agriculture based SETAs to create the new AGRISETA. The former SETAs had already registered a number of industry-specific and generally oriented Learnerships. These initiatives should be taken forward with the support of the Department of Agriculture.

- Various bodies are involved in providing training at the intermediate to higher education level, but these training courses are not necessarily accredited. The Department of Agriculture may consider consolidating a stronger relationship with the new AGRISETA to support the accreditation of intermediate to high-level skills that are developed in the form of Learnerships and other Skills Programmes at the appropriate levels.

- The Department of Agriculture may consider commissioning case studies of organised sub-sectors within the agriculture sector which have established relationships with education providers (eg: higher education institutions, agricultural colleges etc.) to identify best practise models of curriculum development in key fields of agriculture.

9.7 Fostering inter-governmental collaboration

- The research suggests that Agricultural High Schools are becoming more strongly generalist and losing their original mission focus. The Department of Agriculture may open discussion with the Department of Education with the aim of assisting to shape the future of the Agricultural High Schools. Most importantly, those schools that have a campus where agricultural practices can be undertaken should be utilised specifically for the purpose of generating skills for the sector.

- The Minister of Education has been tasked with driving the South African Human Resources Development strategy. The Department of Agriculture may wish to engage with the Minister of Education with respect to defining the mission of the Agricultural Colleges. There is evidence that certain provinces aim to shift the higher education mandate of Colleges towards farmer support (e.g.: Mpumalanga province). The intention here is not to dispute the right of provinces to take such decisions. Rather, the generally important issue is to ensure that there is a sustainable infrastructure of institutions of higher education that can supply the agricultural sector with its skills needs. If it is considered that the Colleges of Agriculture are fulfilling an important higher education purpose, then a shift away from their intended mission will need to be compensated.

9.8 Using research to understand how young people make education – career path choices

- Conduct tracer studies to follow the career choices of young people: in the year of their first major career oriented subject choice in Grade 9, and in the critical periods when they make decisions regarding higher education studies and occupational choice. This will assist the Department in understanding the motives that drive learners to choose or not to choose an agriculture career.

- Monitor and track the development and career advancement of 'scarce skills' bursary recipients. This is important to ensure that investments in bursary recipients are contributing not only to the career advancement and productivity of the individuals, but also to the strengthening of the agricultural sector, which needs such skills and qualifications.

Appendices

APPENDIX 1

DEFINITIONS USED IN THIS PROJECT

- **'Qualification'** represents a planned combination of learning outcomes which has a defined purpose or purposes, and which is intended to provide qualifying learners with applied competence and a basis for further learning. It is characterised by the following: the qualification is achieved. (LMSDP, 2002)
- '**Qualification'** is the degree, diploma or certificate which an institution awards to a student on the successful completion of a programme of studies.
- '**Course'** is a component within a programme of study for a qualification. It has these characteristics: (a) It is an identifiable teaching/learning component that may be undertaken in more than a year, in a year or semester or shorter period.
  (b) Student performance in the component is assessed and recorded in the central record system.
  (c) The component has a unique identifying "course code" which is assigned to it in the institution's central record system.
  A course may be a component undertaken as coursework, or as a project, or as a thesis, or as a dissertation, or as a practicum, or as a mixture of such types.
- **'Course'** refers to the content of the short learning programme whereby learners may progressively attain the applied knowledge as described in unit standards and/or qualifications. An outcome is the demonstrable and assessable end products of a learning process. An exit-level outcome has the same meaning, but is expressed as the overall result of learning for a qualification. (SAQA, 2004)
- **'Curriculum'** defines how the teaching-learning opportunities and experiences of learners will take shape for a particular qualification, i.e. the content and process of learning. It integrates theory and practice. Curricula may differ from provider to provider for the same unit standard or qualification as long as the outcomes of the unit standard or qualification are met. (LMSDP, 2002)
- **'Programme'** means a coherent set of courses, leading to a certain qualification (SAQA, 2000:5). (SAQA, 2004)
- **'Learning programme'** details how learners should achieve the outcomes of particular unit standards and qualifications. A learning programme indicates how the standards will be combined and sequenced across different modules, and across workplace learning and institutional learning in order to achieve the outcomes of a qualification. ETQAs may issue criteria which learning programmes should meet, or further guidelines. (LMSDP, 2002)
- **'Senior Certificate'** means a school leaving certificate awarded by the South African Certification Council. (CTP, 2002)
- **'Unit standard'** is a nationally agreed and registered, and internationally comparable statement of specific outcomes and their associated assessment criteria, written in a standard format and registered on the NQF at a defined level. A unit standard is the building block of a unit standards-based qualification. (LMSDP, 2002)
- **'Unit standard'** is a description of the outcomes of learning for which the learner will receive credit. (SAQA, 2004)
- **National Qualifications Framework (NQF) -** The NQF was established in terms of the SAQA Act 58 of 1995. It is a framework on which national standards and qualifications offered at schools, institutions and in the workplace are registered. (LMSDP, 2002)
- **Further Education and Training (FET) -** FET is all learning and training programmes leading to qualifications from levels 2 to 4 on the National Qualifications Framework (known as the FET band). These levels are above general education and training but below higher education and training. (LMSDP, 2002)
- **Further Education and Training (FET) Institution** - A FET institution is any institution that provides further education and training on a full-time, part-time or distance basis and which is:
  - o established or regarded as having been established as a public further education and training institution under the Further Education and Training Act 98 of 1998
  - o declared as a public further education and training institution under this Act
  - o registered or conditionally registered as a private further education and training institution under this Act. (LMSDP, 2002)
- **Higher Education and Training (HET) -** HET is all learning and training programmes leading to qualifications from levels 5 to 8 of the National Qualifications Framework (known as the HET band). These levels are above further education and training. (LMSDP, 2002)

- **'Accreditation'** means the certification, usually for a particular period of time, of a person, a body or an institution as having the capacity to fulfil a particular function in the quality assurance system set up by SAQA in terms of the Act (No. 58 of 1995). (SAQA, 2004)

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APPENDIX 2: CHAPTER 2

NQF	HE Sub-levels	(Cumulative min totals) & min credits per qualification	General Vertical articulation		Articulation Horisontal & Diagonal articulation	Career-focused Vertical articulation	
8	PG 4	(1020) 360	Doctor of Philosophy (360 @ Pg4)			Doctor of philosophy, Professional Doctorate (360 @ Pg4)	
8	PG 3	(660) 180	Research Master's Degree (120 @ Pg3)	Structured Master's Degree (60 @Pg3)		Structured Master's Degree (120 @Pg3)	Structured Master's Degree (60 @Pg3)
8	PG 2	(600) 180/ 120		Master's Diploma (120 @ Pg2)	Master's Certificate (72 @Pg2) (articulation credits)	Master's Diploma (120@ Pg2)	Professional Master's Degree (180@ Pg2)
8	PG 1	(480) 480/ 120	Bachelor Honours degree (120 @ Pg1)	General Postgraduate Diploma (120 @ Pg1)	Master's Certificate (72 @Pg2) (articulation credits)	Advanced Career focused Bachelor's Degree (e.g. B. Tech) (120 @Pg1)	Career focused Postgraduate Diploma (120 @Pg1)
7		(360) 360/ 120	General Bacherlor's Degree (120 @ 7)		Graduate Certificate (72 @ 7) (articulation credits)	Career-focused Bachelor's Degree (120 @ 7)	
6		(240) 240	General Diploma (90@ 6)		(articulation credits)	Career-focused Diploma (90 @ 6)	
5		(120) 120			Foundation Certificate (72 @ 5)	Career-focused Certificate (72 @ 5)	
4		(120) 120	FETC (72 @ 4)		Bridging Certificate (72 @ 4)	FETC (72 @ 4)	

Source: Council for Higher Education (2003)

APPENDIX 3: CHAPTER 3

Table A1: Headcount number of students graduated in ARNR (1st order CESM category) compared to total graduates in higher education, 1994 - 2003

Year	Universities			Technikons			Total		
	Agriculture Graduates	Total Graduates	% of Total	Agriculture Graduates	Total Graduates	% of Total	Agriculture Graduates	Total Graduates	% of Total
1994	612	58 561	1.05	355	15 576	2.28	967	74 137	1.30
1995	556	65 494	0.85	584	16 189	3.61	1 140	81 684	1.40
1996	582	66 826	0.87	630	19 388	3.25	1 213	86 214	1.41
1997	669	66 935	1.00	598	21 289	2.81	1 267	88 224	1.44
1998	778	66 054	1.18	679	20 571	3.30	1 457	86 625	1.68
1999	762	67 361	1.13	624	25 138	2.48	1 386	92 499	1.50
2000	907	69 403	1.31	627	22 922	2.73	1 534	92 325	1.66
2001	745	73 406	1.01	703	24 659	2.85	1 448	98 065	1.48
2002	802	75 665	1.06	811	26 015	3.12	1 614	101 680	1.59
2003	904	81 286	1.11	862	28 372	3.04	1 765	109 658	1.61

Table A2: Enrolment in ARNR by race in universities, 1994 - 2003

Year	Population group				Total
	African	Coloured	Indian	White	
1994	-	-	-	-	-
1995	-	-	-	-	-
1996	1212	21	18	1495	2746
1997	1308	37	7	1547	2899
1998	1383	49	25	1507	2963
1999	1740	40	20	1213	3013
2000	1917	44	31	1426	3417
2001	2699	41	37	1467	4244
2002	2556	44	40	1584	4223
2003	2816	50	65	1626	4557

Table A3: Enrolment in ARNR at Technikons by race, 1994 - 2003

Year	Population group				Total
	African	Coloured	Indian	White	
1994	-	-	-	-	-
1995	-	-	-	-	-
1996	1726	130	67	2359	4281
1997	2274	159	39	2197	4670
1998	2492	160	31	2095	4778
1999	2567	140	37	1939	4683
2000	2993	127	46	2090	5257
2001	3908	179	43	2215	6345
2002	3735	198	71	2114	6118
2003	4172	211	87	2169	6638

Table A4: Total ARNR enrolment in universities and Technikons by race, 1994 - 2003

Year	Population group				Total
	African	Coloured	Indian	White	
1994	-	-	-	-	-
1995	-	-	-	-	-
1996	2937	152	84	3854	7027
1997	3582	196	47	3744	7569
1998	3875	209	56	3601	7741
1999	4307	180	57	3152	7696
2000	4910	171	78	3516	8675
2001	6607	221	80	3682	10589
2002	6291	242	110	3699	10341
2003	6988	261	152	3795	11195

Table A5: Graduates in ARNR by race in universities, 1994 - 2003

Year	Population group				Total
	African	Coloured	Indian	White	
1994	-	-	-	-	-
1995	-	-	-	-	-
1996	215	5	2	360	582
1997	267	7	5	391	669
1998	315	19	7	437	778
1999	424	13	3	323	762
2000	473	13	9	412	907
2001	364	4	5	371	745
2002	375	11	10	406	802
2003	529	10	5	360	904

Table A6: Graduates in ARNR from technikons by race, 1994 - 2003

Year	Population group				Total
	African	Coloured	Indian	White	
1994	-	-	-	-	-
1995	-	-	-	-	-
1996	141	24	1	465	630
1997	152	16	8	422	598
1998	299	19	2	359	679
1999	261	22	3	339	624
2000	289	13	2	323	627
2001	344	18	5	337	703
2002	417	22	8	364	810
2003	512	23	2	325	862

Table A7: Graduations in ARNR by race in universities and Technikons, 1994 - 2003

Year	Population group				Total
	African	Coloured	Indian	White	
1994	-	-	-	-	-
1995	-	-	-	-	-
1996	356	30	3	825	1213
1997	419	22	13	813	1267
1998	614	37	9	796	1457
1999	685	34	6	662	1386
2000	762	26	11	736	1534
2001	707	22	10	708	1448
2002	792	33	18	770	1613
2003	1041	32	7	685	1765

Table A8: Graduates in ARNR by race at universities in percentage, 1994 - 2003

Year	Population group				Total
	African	Coloured	Indian	White	
1994	-	-	-	-	-
1995	-	-	-	-	-
1996	37	1	0	62	100
1997	40	1	1	58	100
1998	41	2	1	56	100
1999	56	2	0	42	100
2000	52	1	1	45	100
2001	49	1	1	50	100
2002	47	1	1	51	100
2003	59	1	1	40	100

Table A9: Graduates in ARNR by race at Technikons in percentage, 1994 - 2003

Year	Population group				Total
	African	Coloured	Indian	White	
1994	-	-	-	-	-
1995	-	-	-	-	-
1996	22	4	0	74	100
1997	25	3	1	71	100
1998	44	3	0	53	100
1999	42	3	0	54	100
2000	46	2	0	52	100
2001	49	3	1	48	100
2002	51	3	1	45	100
2003	59	3	0	38	100

Table A10: Total ARNR graduation by race from universities and Technikons in percentage, 1994 - 2003					
	Population group				
Year	African	Coloured	Indian	White	Total
1994	-	-	-	-	-
1995	-	-	-	-	-
1996	12	20	3	21	17
1997	12	11	28	22	17
1998	16	18	17	22	19
1999	16	19	10	21	18
2000	16	15	14	21	18
2001	11	10	12	19	14
2002	13	14	16	21	16
2003	15	12	4	18	16

Table A11: Enrolment in ARNR at universities by gender, 1994 - 2003			
	Gender		
Year	Female	Male	Total
1994	-	-	-
1995	-	-	-
1996	786	1959	2746
1997	878	2020	2899
1998	972	1991	2963
1999	1231	1782	3013
2000	1330	2087	3417
2001	1830	2414	4244
2002	1759	2464	4223
2003	1918	2640	4558

Table A12: Enrolment in ARNR at universities by gender, 1994 - 2003			
	Gender		
Year	Female	Male	Total
1994	-	-	-
1995	-	-	-
1996	1422	2859	4281
1997	1666	3004	4670
1998	1771	3007	4778
1999	1673	3009	4682
2000	1877	3381	5258
2001	2403	3944	6346
2002	2266	3859	6125
2003	2471	4167	6638

Table A13: Total enrolment at universities and Technikons by gender, 1994 – 2003			
	Gender		
Year	Female	Male	Total
1994	-	-	-
1995	-	-	-
1996	2208	4819	7027
1997	2544	5024	7569
1998	2744	4998	7741
1999	2904	4791	7695
2000	3207	5468	8676
2001	4233	6358	10590
2002	4025	6323	10348
2003	4388	6807	11196

Table A14: Graduates in ARNR at university by gender, 1994 - 2003			
	Gender		
Year	Female	Male	Total
1994	-	-	-
1995	-	-	-
1996	162	420	582
1997	185	484	669
1998	266	512	778
1999	326	436	762
2000	359	548	907
2001	314	430	745
2002	367	435	802
2003	400	504	904

Table A15: Graduates in ARNR from Technikons by gender, 1994 - 2003			
	Gender		
Year	Female	Male	Total
1994	-	-	-
1995	-	-	-
1996	178	453	630
1997	171	427	598
1998	218	461	679
1999	211	414	624
2000	191	436	627
2001	227	476	703
2002	284	527	811
2003	339	523	862

Table A16: Total ARNR graduates at universities and Technikons by gender, 1994 - 2003			
	Gender		
Year	Female	Male	Total
1994	-	-	-
1995	-	-	-
1996	340	873	1213
1997	356	911	1267
1998	484	973	1457
1999	536	850	1386
2000	550	984	1534
2001	542	906	1448
2002	651	963	1614
2003	739	1027	1765

Table A17: Graduates in ARNR from university by gender in percentage, 1994 - 2003			
	Gender		
Year	Female	Male	Total
1994	-	-	-
1995	-	-	-
1996	28	72	100
1997	28	72	100
1998	34	66	100
1999	43	57	100
2000	40	60	100
2001	42	58	100
2002	46	54	100
2003	44	56	100

Table A18: Graduates in ARNR from Technikons by gender in percentage, 1994 - 2003			
	Gender		
Year	Female	Male	Total
1994	-	-	-
1995	-	-	-
1996	28	72	100
1997	29	71	100
1998	32	68	100
1999	34	66	100
2000	30	70	100
2001	32	68	100
2002	35	65	100
2003	39	61	100

Table A19: Graduation rates in ARNR at university by gender in percentage, 1994 - 2003			
	Gender		
Year	Female	Male	Total
1994	-	-	-
1995	-	-	-
1996	21	21	21
1997	21	24	23
1998	27	26	26
1999	26	24	25
2000	27	26	27
2001	17	18	18
2002	21	18	19
2003	21	19	20

Table A20: Graduation rates in ARNR at Technikon by gender in percentage, 1994 - 2003			
	Gender		
Year	Female	Male	Total
1994	-	-	-
1995	-	-	-
1996	12	16	15
1997	10	14	13
1998	12	15	14
1999	13	14	13
2000	10	13	12
2001	9	12	11
2002	13	14	13
2003	14	13	13

Table A21: Enrolment in ARNR in 2nd order CESM category in Universities, 1994 - 2003										
2nd order CESM category	Enrolment by year									
	1994	1995	1996	1997	1997	1999	2000	2001	2002	2003
0101 Agricultural Economics						557	802	860	830	1 142
0102 Agricultural Extension						140	297	533	396	486
0103 Agricultural Food Technology						169	182	189	207	195
0104 Animal Sciences						500	686	1 199	1 005	840
0105 Horticulture						140	150	143	146	160
0106 Plant Sciences						500	651	640	693	648
0107 Soil Sciences						201	317	294	321	314
0108 Fisheries						0	0	0	2	4
0109 Forestry						60	63	79	66	57
0110 Outdoor Recreation						0	14	0	0	0
0111 Wildlife						89	79	97	111	106
0112 Land Reclamation						0	0	0	0	0
0113 Renewable Natural Resources						128	2	11	206	311
0199 Other Ag. and Renewable Resources						529	169	197	238	295
Total	2 581	2 686	2 746	2 914	2 963	3 013	3 411	4 242	4 223	4 558

Table A22: Enrolment in ARNR in 2nd order CESM category in Technikons, 1994 - 2003

2nd order CESM category	Enrolment by year									
	1994	1995	1996	1997	1997	1999	2000	2001	2002	2003
0101 Agricultural Economics						111	203	515	314	394
0102 Agricultural Extension						210	58	148	252	192
0103 Agricultural Food Technology						0	0	0	0	0
0104 Animal Sciences						1 089	1 402	1 809	1 677	1 955
0105 Horticulture						630	576	985	900	919
0106 Plant Sciences						598	493	786	807	799
0107 Soil Sciences						194	140	13	128	139
0108 Fisheries						0	0	0	0	10
0109 Forestry						140	207	152	182	146
0110 Outdoor Recreation						79	299	492	553	558
0111 Wildlife						340	376	449	119	224
0112 Land Reclamation						0	0	0	0	0
0113 Renewable Natural Resources						224	385	282	350	298
0199 Other Ag. and Renewable Resources						1 069	1 121	717	844	1 004
Total	3 946	4 535	4 281	4 775	4 778	4 684	5 258	6 346	6 125	6 638

Table A23: Enrolment in ARNR in 2nd order CESM category in Universities and Technikons, 1994 - 2003

2nd order CESM category	Enrolment by year									
	1994	1995	1996	1997	1997	1999	2000	2001	2002	2003
0101 Agricultural Economics						667	1 005	1 375	1 144	1 536
0102 Agricultural Extension						350	354	681	648	678
0103 Agricultural Food Technology						169	182	189	207	195
0104 Animal Sciences						1 589	2 088	3 008	2 682	2 795
0105 Horticulture						771	726	1 128	1 046	1 079
0106 Plant Sciences						1 098	1 143	1 426	1 501	1 447
0107 Soil Sciences						395	457	306	449	453
0108 Fisheries						0	0	0	2	14
0109 Forestry						199	270	230	248	203
0110 Outdoor Recreation						79	313	492	553	558
0111 Wildlife						429	455	546	230	330
0112 Land Reclamation						0	0	0	0	0
0113 Renewable Natural Resources						353	387	293	556	609
0199 Other Ag. and Renewable Resources						1 598	1 290	914	1 082	1 299
Total	6 528	7 221	7 027	7 689	7 741	7 696	8 670	10 588	10 348	11 196

Table A24: Graduates in ARNR in 2nd order CESM category in Universities, 1994 - 2003

2nd order CESM category	Enrolment by year									
	1994	1995	1996	1997	1997	1999	2000	2001	2002	2003
0101 Agricultural Economics	151	103	126	141	195	121	200	185	143	186
0102 Agricultural Extension	30	40	53	44	50	44	34	50	79	55
0103 Agricultural Food Technology	39	31	16	24	34	36	50	41	67	54
0104 Animal Sciences	117	100	100	92	98	110	185	161	165	229
0105 Horticulture	55	60	41	48	45	43	46	36	31	37
0106 Plant Sciences	80	84	81	97	91	135	201	135	175	180
0107 Soil Sciences	18	28	22	30	29	30	80	50	56	77
0108 Fisheries	0	0	0	0	0	0	0	0	0	4
0109 Forestry	20	17	23	23	29	13	18	20	14	9
0110 Outdoor Recreation	0	0	0	0	0	0	0	0	0	0
0111 Wildlife	42	36	41	48	48	31	36	42	40	35
0112 Land Reclamation	0	0	0	0	0	0	0	0	0	0
0113 Renewable Natural Resources	0	0	0	0	0	16	0	0	0	25
0199 Other Ag. and Renewable Resources	59	58	80	121	157	184	56	24	31	13
Total	612	556	582	669	778	762	907	745	802	904

Table A25: Graduates in ARNR in 2nd order CESM category in Technikons, 1994 - 2003

2nd order CESM category	Enrolment by year									
	1994	1995	1996	1997	1997	1999	2000	2001	2002	2003
0101 Agricultural Economics	0	1	1	1	9	11	37	26	80	45
0102 Agricultural Extension	0	9	11	7	6	22	14	45	33	29
0103 Agricultural Food Technology	0	7	0	0	1	0	0	0	0	0
0104 Animal Sciences	98	139	162	126	168	197	190	212	223	305
0105 Horticulture	71	44	132	125	73	67	48	67	121	60
0106 Plant Sciences	23	89	78	79	120	71	61	52	67	106
0107 Soil Sciences	10	26	9	2	0	3	0	1	4	1
0108 Fisheries	0	0	0	0	0	0	0	0	0	2
0109 Forestry	56	53	38	36	37	35	35	34	56	25
0110 Outdoor Recreation	0	0	0	0	1	12	30	41	42	55
0111 Wildlife	0	9	8	0	67	54	53	59	39	76
0112 Land Reclamation	0	0	0	0	4	0	0	0	0	0
0113 Renewable Natural Resources	49	89	92	96	88	61	53	73	67	39
0199 Other Ag. and Renewable Resources	49	119	98	126	106	92	106	93	79	120
Total	355	584	630	598	679	624	627	703	811	862

Table A26: Graduates in ARNR in 2nd order CESM category in Universities and Technikons, 1994 - 2003

2nd order CESM category	Enrolment by year									
	1994	1995	1996	1997	1997	1999	2000	2001	2002	2003
0101 Agricultural Economics	151	105	127	142	204	133	237	211	223	231
0102 Agricultural Extension	30	49	65	51	56	66	48	94	112	84
0103 Agricultural Food Technology	39	37	16	24	35	36	50	41	67	54
0104 Animal Sciences	214	239	262	218	266	307	376	373	387	534
0105 Horticulture	126	104	172	173	118	110	94	104	152	96
0106 Plant Sciences	103	173	160	176	211	205	263	188	242	286
0107 Soil Sciences	28	53	31	31	29	33	80	51	60	77
0108 Fisheries	0	0	0	0	0	0	0	0	0	6
0109 Forestry	76	69	61	59	66	48	53	53	70	34
0110 Outdoor Recreation	0	0	0	0	1	12	30	41	42	55
0111 Wildlife	42	45	48	48	115	85	89	101	79	111
0112 Land Reclamation	0	0	0	0	4	0	0	0	0	0
0113 Renewable Natural Resources	49	90	92	96	88	77	53	73	67	64
0199 Other Ag. and Renewable Resources	108	177	178	247	264	276	162	117	110	133
Total	967	1 140	1 213	1 267	1 457	1 386	1 534	1 448	1 614	1 765

Table A27: Graduates in ARNR in 2nd order CESM category graduates in Universities by percentage, 1994 - 2003

2nd order CESM category	Enrolment by year									
	1994	1995	1996	1997	1997	1999	2000	2001	2002	2003
0101 Agricultural Economics	25	19	22	21	25	16	22	25	18	21
0102 Agricultural Extension	5	7	9	7	6	6	4	7	10	6
0103 Agricultural Food Technology	6	6	3	4	4	5	6	6	8	6
0104 Animal Sciences	19	18	17	14	13	14	20	22	21	25
0105 Horticulture	9	11	7	7	6	6	5	5	4	4
0106 Plant Sciences	13	15	14	15	12	18	22	18	22	20
0107 Soil Sciences	3	5	4	4	4	4	9	7	7	8
0108 Fisheries	0	0	0	0	0	0	0	0	0	0
0109 Forestry	3	3	4	3	4	2	2	3	2	1
0110 Outdoor Recreation	0	0	0	0	0	0	0	0	0	0
0111 Wildlife	7	7	7	7	6	4	4	6	5	4
0112 Land Reclamation	0	0	0	0	0	0	0	0	0	0
0113 Renewable Natural Resources	0	0	0	0	0	2	0	0	0	3
0199 Other Ag. and Renewable Resources	10	10	14	18	20	24	6	3	4	1
Total	100	100	100	100	100	100	100	100	100	100

Table A28: Graduates in ARNR in 2nd order CESM category in Technikons by percentage, 1994 - 2003

2nd order CESM category	Enrolment by year									
	1994	1995	1996	1997	1997	1999	2000	2001	2002	2003
0101 Agricultural Economics	0	0	0	0	1	2	6	4	10	5
0102 Agricultural Extension	0	2	2	1	1	4	2	6	4	3
0103 Agricultural Food Technology	0	1	0	0	0	0	0	0	0	0
0104 Animal Sciences	27	24	26	21	25	31	30	30	27	35
0105 Horticulture	20	8	21	21	11	11	8	10	15	7
0106 Plant Sciences	6	15	12	13	18	11	10	7	8	12
0107 Soil Sciences	3	4	1	0	0	0	0	0	0	0
0108 Fisheries	0	0	0	0	0	0	0	0	0	0
0109 Forestry	16	9	6	6	5	6	6	5	7	3
0110 Outdoor Recreation	0	0	0	0	0	2	5	6	5	6
0111 Wildlife	0	1	1	0	10	9	8	8	5	9
0112 Land Reclamation	0	0	0	0	1	0	0	0	0	0
0113 Renewable Natural Resources	14	15	15	16	13	10	8	10	8	4
0199 Other Ag. and Renewable Resources	14	20	16	21	16	15	17	13	10	14
Total	100	100	100	100	100	100	100	100	100	100

Table A29: Throughput rate in ARNR by 2nd order CESM category in Universities, 1994 - 2003

2nd order CESM category	Enrolment by year									
	1994	1995	1996	1997	1997	1999	2000	2001	2002	2003
0101 Agricultural Economics	-	-	-	-	-	22	25	22	17	16
0102 Agricultural Extension	-	-	-	-	-	31	12	9	20	11
0103 Agricultural Food Technology	-	-	-	-	-	21	28	22	33	28
0104 Animal Sciences	-	-	-	-	-	22	27	13	16	27
0105 Horticulture	-	-	-	-	-	30	31	25	21	23
0106 Plant Sciences	-	-	-	-	-	27	31	21	25	28
0107 Soil Sciences	-	-	-	-	-	15	25	17	18	24
0108 Fisheries	-	-	-	-	-	-	-	-	-	-
0109 Forestry	-	-	-	-	-	22	28	25	22	15
0110 Outdoor Recreation	-	-	-	-	-	-	0	-	-	-
0111 Wildlife	-	-	-	-	-	34	46	44	36	33
0112 Land Reclamation	-	-	-	-	-	-	-	-	-	-
0113 Renewable Natural Resources	-	-	-	-	-	13	0	0	0	8
0199 Other Ag. and Renewable Resources	-	-	-	-	-	35	33	12	13	4
Total	24	21	21	23	26	25	27	18	19	20

Table A30: Throughput rate in ARNR by 2nd order CESM category in Technikons, 1994 - 2003

2nd order CESM category	Enrolment by year									
	1994	1995	1996	1997	1997	1999	2000	2001	2002	2003
0101 Agricultural Economics	-	-	-	-	-	10	18	5	26	11
0102 Agricultural Extension	-	-	-	-	-	11	24	30	13	15
0103 Agricultural Food Technology	-	-	-	-	-	-	-	-	-	-
0104 Animal Sciences	-	-	-	-	-	18	14	12	13	16
0105 Horticulture	-	-	-	-	-	11	8	7	13	7
0106 Plant Sciences	-	-	-	-	-	12	12	7	8	13
0107 Soil Sciences	-	-	-	-	-	2	0	8	3	1
0108 Fisheries	-	-	-	-	-	-	-	-	-	23
0109 Forestry	-	-	-	-	-	25	17	22	31	17
0110 Outdoor Recreation	-	-	-	-	-	15	10	8	8	10
0111 Wildlife	-	-	-	-	-	16	14	13	33	34
0112 Land Reclamation	-	-	-	-	-	-	-	-	-	-
0113 Renewable Natural Resources	-	-	-	-	-	27	14	26	19	13
0199 Other Ag. and Renewable Resources	-	-	-	-	-	9	9	13	9	12
Total	9	13	15	13	14	13	12	11	13	13

Table A31: Enrolment in ARNR by qualification type in universities, 1994 - 2003

Qualification Type	NQF level	Enrolment by year									
		1994	1995	1996	1997	1997	1999	2000	2001	2002	2003
A: Certificate/ Diploma	5	36	92	95	73	77	339	35	433	366	293
B: Degree	6	1 646	1 601	1 631	1 737	1 778	1 506	1 934	2 352	2 164	2 483
A + B	-	1 683	1 693	1 726	1 810	1 855	1 845	1 969	2 785	2 529	2 775
Post-graduate up to Honours	7	315	319	378	359	331	325	347	266	398	355
Masters Degrees	7	436	453	437	543	595	649	796	899	955	1 029
Doctoral Degrees	8	132	145	153	168	161	160	238	271	308	335
Total		2 566	2 610	2 694	2 880	2 942	2 978	3 350	4 220	4 190	4 494

Table A32: Enrolment in ARNR by qualification type in Technikons, 1994 - 2003

Qualification Type	NQF level	Enrolment by year									
		1994	1995	1996	1997	1997	1999	2000	2001	2002	2003
A: Certificate/ Diploma	5	3 731	4 321	4 020	4 363	4 329	4 044	3 402	3 512	3 799	3 947
B: Degree	6	0	39	165	350	409	596	1 785	2 711	2 211	2 530
A + B	-	3 731	4 360	4 184	4 713	4 738	4 640	5 186	6 223	6 010	6 477
Post-graduate up to Honours	7	208	160	79	37	8	4	2	11	4	10
Masters Degrees	7	8	14	16	21	28	34	62	103	100	118
Doctoral Degrees	8	0	1	2	4	3	5	7	9	11	10
Total		3 946	4 535	4 281	4 775	4 776	4 683	5 257	6 346	6 125	6 614

Table A33: Enrolment in ARNR by qualification type in Technikons, 1994 - 2003

Qualification Type	NQF level	Enrolment by year									
		1994	1995	1996	1997	1997	1999	2000	2001	2002	2003
A: Certificate/ Diploma	5	3 767	3 767	4 115	4 436	4 406	4 383	3 437	3 945	4 165	4 239
B: Degree	6	1 646	1 646	1 796	2 087	2 187	2 102	3 719	5 063	4 374	5 012
A + B	-	5 414	5 414	5 911	6 523	6 593	6 485	7 156	9 008	8 539	9 252
Post-graduate up to Honours	7	523	523	457	396	338	329	348	277	402	365
Masters Degrees	7	444	444	453	564	623	683	858	1 002	1 055	1 147
Doctoral Degrees	8	132	132	155	172	164	165	245	280	319	345
Total		6 513	6 513	6 975	7 655	7 718	7 662	8 607	10 567	10 315	11 108

Table A34: Enrolment in ARNR by qualification type in Universities and Technikons in percentage, 1994 - 2003

Qualification Type	NQF level	Enrolment by year									
		1994	1995	1996	1997	1997	1999	2000	2001	2002	2003
A: Certificate/ Diploma	5	58	62	59	58	57	57	40	37	40	38
B: Degree	6	25	23	26	27	28	27	43	48	42	45
A + B	-	83	85	85	85	85	85	83	85	83	83
Post-graduate up to Honours	7	8	7	7	5	4	4	4	3	4	3
Masters Degrees	7	7	7	6	7	8	9	10	9	10	10
Doctoral Degrees	8	2	2	2	2	2	2	3	3	3	3
Total		100	100	100	100	100	100	100	100	100	100

Table A35: Graduates in ARNR by qualification type in Universities, 1994 - 2003

Qualification Type	NQF level	Enrolment by year									
		1994	1995	1996	1997	1997	1999	2000	2001	2002	2003
A: Certificate/ Diploma	5	0	1	19	31	21	119	16	34	66	109
B: Degree	6	343	327	284	356	458	338	531	411	375	397
A + B	-	343	328	303	387	479	457	546	445	441	506
Post-graduate up to Honours	7	168	136	202	177	167	173	204	136	152	193
Masters Degrees	7	77	78	62	83	106	115	136	134	174	145
Doctoral Degrees	8	24	14	16	22	25	17	21	30	36	59
Total		612	556	582	669	778	762	907	745	802	903

Table A36: Graduates in ARNR by qualification type in universities, 1994 - 2003

Qualification Type	NQF level	Enrolment by year									
		1994	1995	1996	1997	1997	1999	2000	2001	2002	2003
A: Certificate/ Diploma	5	0	0	3	5	3	16	2	5	8	12
B: Degree	6	56	59	49	53	59	44	59	55	47	44
A + B	-	56	59	52	58	62	60	60	60	55	56
Post-graduate up to Honours	7	28	24	35	26	22	23	22	18	19	21
Masters Degrees	7	13	14	11	12	14	15	15	18	22	16
Doctoral Degrees	8	4	3	3	3	3	2	2	4	4	7
Total		100	100	100	100	100	100	100	100	100	100

A37: Graduates in ARNR by qualification type in Technikons, 1994 - 2003

Qualification Type	NQF level	Enrolment by year									
		1994	1995	1996	1997	1997	1999	2000	2001	2002	2003
A: Certificate/ Diploma	5	318	516	554	534	575	470	453	501	652	665
B: Degree	6		12	20	54	96	145	166	178	143	164
A + B	-	318	528	574	589	670	615	619	678	795	830
Post-graduate up to Honours	7	38	57	54	7	5	6	0	9	3	8
Masters Degrees	7	0	0	2	2	4	2	8	16	11	21
Doctoral Degrees	8	0	0	0	0	0	1	0	0	2	3
Total		355	584	630	598	679	624	627	703	811	862

A38: Graduates in ARNR by qualification type in Technikons, 1994 - 2003

Qualification Type	NQF level	Enrolment by year									
		1994	1995	1996	1997	1997	1999	2000	2001	2002	2003
A: Certificate/ Diploma	5	89	88	88	89	85	75	72	71	80	77
B: Degree	6	0	2	3	9	14	23	26	25	18	19
A + B	-	89	90	91	98	99	99	99	96	98	96
Post-graduate up to Honours	7	11	10	9	1	1	1	0	1	0	1
Masters Degrees	7	0	0	0	0	1	0	1	2	1	2
Doctoral Degrees	8	0	0	0	0	0	0	0	0	0	0
Total		100	100	100	100	100	100	100	100	100	100

Table A39: Graduates in ARNR by qualification type in Universities and Technikons, 1994 - 2003

Qualification Type	NQF level	Enrolment by year									
		1994	1995	1996	1997	1997	1999	2000	2001	2002	2003
A: Certificate/ Diploma	5	318	517	573	565	595	589	468	535	718	774
B: Degree	6	343	339	304	411	553	483	696	588	518	561
A + B	-	661	856	878	976	1 149	1 072	1 165	1 123	1 236	1 335
Post-graduate up to Honours	7	206	192	256	185	172	179	204	145	155	201
Masters Degrees	7	77	78	64	85	110	117	144	150	185	166
Doctoral Degrees	8	24	14	16	22	25	18	21	30	38	62
Total		967	1 140	1 213	1 267	1 457	1 386	1 534	1 448	1 614	1 764

Table A40: Throughput rate in ARNR by qualification type in Universities, 1994 - 2003

Qualification Type	NQF level	Enrolment by year									
		1994	1995	1996	1997	1997	1999	2000	2001	2002	2003
A: Certificate/ Diploma	5	0	1	20	42	27	35	44	8	18	37
B: Degree	6	21	20	17	21	26	22	27	17	17	16
A + B	-	20	19	18	21	26	25	28	16	17	18
Post-graduate up to Honours	7	53	43	53	49	51	53	59	51	38	54
Masters Degrees	7	18	17	14	15	18	18	17	15	18	14
Doctoral Degrees	8	18	10	10	13	16	11	9	11	12	18
Total		24	21	22	23	26	26	27	18	19	20

Table A41: Throughput rate in ARNR by qualification type in Technikons, 1994 - 2003

Qualification Type	NQF level	Enrolment by year									
		1994	1995	1996	1997	1997	1999	2000	2001	2002	2003
A: Certificate/ Diploma	5	9	12	14	12	13	12	13	14	17	17
B: Degree	6	-	31	12	16	23	24	9	7	6	6
A + B	-	9	12	14	12	14	13	12	11	13	13
Post-graduate up to Honours	7	18	35	68	20	67	150	0	82	75	80
Masters Degrees	7	0	0	13	10	14	6	13	16	11	18
Doctoral Degrees	8	-	0	0	0	0	20	0	0	18	30
Total		9	13	15	13	14	13	12	11	13	13

Table A43: Enrolments in Agricultural Colleges 2000 to 2004												
		Male					Female					Total
		African	Coloured	Indian	White	Total	African	Coloured	Indian	White	Total	
2004	Certificate	108	1	0	13	122	90	0	0	4	94	216
	Higher Cert	88	1	0	65	154	58	0	0	16	74	228
	Diploma	80	0	0	26	106	67	0	0	3	70	176
	Total	276	2	0	104	382	215	0	0	23	238	620
2003	Certificate	217	12	1	249	479	118	2	0	34	154	633
	Higher Cert	217	4	1	248	470	114	1	0	37	152	622
	Diploma	105	4	0	119	228	110	0	0	14	124	352
	Total	539	20	2	616	1177	342	3	0	85	430	1607
2002	Certificate	252	4	1	279	536	138	2	1	20	161	697
	Higher Cert	129	21	1	261	412	119	1	0	29	149	561
	Diploma	85	4	0	128	217	71	0	0	16	87	304
	Total	466	29	2	668	1165	328	3	1	65	397	1562
2001	Certificate	188	7	0	268	463	117	2	0	33	152	615
	Higher Cert	140	12	0	253	405	119	1	0	31	108	513
	Diploma	127	3	2	135	267	88	0	0	15	53	320
	Total	455	22	2	656	1135	324	3	0	79	313	1448
		0	0	0	0	0	0	0	0	0	0	
2000	Certificate	140	12	0	261	413	77	1	0	30	108	521
	Higher Cert	124	12	0	187	323	86	1	0	23	63	386
	Diploma	204	2	1	120	327	177	0	0	6	52	379
	Total	468	26	1	568	1063	340	2	0	59	223	1286
1999	Certificate	199	17	0	326	542	158	3	0	31	138	680
	Higher Cert	237	17	0	216	470	200	0	0	22	76	546
	Diploma	123	1	1	180	305	128	0	0	15	89	394
	Total	559	35	1	722	1317	486	3	0	68	303	1620

Please note: Data on enrolments for 2005 not complete

APPENDIX 4: CHAPTER 5

FET COLLEGE QUALIFICATIONS STRUCTURE AND ADMISSION REQUIREMENTS

INSTRUCTIONAL PROGRAMMES OFFERED AT FET COLLEGES

The National Certificates: NC(OR), N1, N2, N3, N4, N5, N6, National Intermediate Certificate (NIC), and National Senior Certificate (NSC) in the *General Field of Studies* and the Natural Sciences Field of Studies are national vocational qualifications applicable to specific trades in each field of studies, offered at Further Education and Training (FET) Colleges and examined by the Department of Education. NC(OR), N1, N2, N4, N5, N6 are certified by the Department of Education.

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All the instructional programmes are listed, from the lowest [NC(OR) and N1] level to the highest (N6) level, in the National Policy document, *Formal Technical College Instructional Programmes in the RSA, Report 191.* Each instructional programme consists of prescribed instructional offerings, which could either all be compulsory or some could be optional for the specific qualification.

Entry requirements

The entry requirements for the National Certificate NC(OR) and National Certificate N1 instructional programmes are Grade 8 and Grade 9 respectively, or equivalent qualifications.

The entry requirements for the National Certificate N2 and National Certificate N3 instructional programmes are the relevant National Certificate N1 or Grade 10 and the relevant National Certificate N2 or Grade 11 respectively, or equivalent qualifications.

The entry requirements for the National Certificate N4, National Certificate N5 and National Certificate N6 are the relevant N3, N4 and N5 National Certificates respectively or equivalent qualifications.

1.1 The duration of instructional programmes

The duration of instructional programmes is as follows:

- National Certificates NC(OR) Agriculture, N1, N4, N5 and N6 in the General Field of Studies instructional programmes are a semester;
- National Certificates NC(OR), N1, N2, N3, N4, N5 and N6 in the Natural Sciences Field of Studies instructional programmes are a trimester; and
- National Certificates NC(OR) Art and Music, National Certificates N2, National Intermediate Certificates (NIC) and National Senior Certificates (NSC) are one year.

1.2 FET College assessment regime

All the NC(OR), N1, N2, NIC, N4, N5 and N6 candidates may enrol for examinations in June and November. The N3 and NSC candidates may enrol for specified instructional offerings in June and for all instructional offerings in November. There is also a supplementary N3/NSC examination in March. All the Natural Sciences Studies candidates can enrol for examinations in April, August and November. However, there are identified Natural Sciences Studies instructional offerings that have a history of very low enrolment numbers. Therefore, for some instructional offerings candidates are enrolled only at request or other instructional offerings have a specified frequency of only one or two examinations per year.

1.3 Certification requirements

To qualify for a National Certificate: Orientation candidates must pass the instructional offerings as prescribed for the specific instructional programme, i.e. for NC(OR): Music four compulsory and one of seven optional practical instructional offerings and for both NC(OR): Engineering and NC(OR): Agriculture five compulsory instructional offerings.

In order to qualify for a National Certificate on the N1 to N6 levels General Studies candidates must pass four instructional offerings, according to the prescribed and/or compulsory offerings for the relevant course. Natural Sciences Studies candidates must pass at least three instructional offerings, according to the prescribed and/or compulsory offerings for the relevant course.

To qualify for a National Intermediate Certificate or National Senior Certificate candidates must pass the relevant N2 or N3 instructional programme and two languages, of which at least one must be on the First Language level and at least one must be a Business Language; or offer and sit for at least four optional/compulsory vocational instructional offerings and two languages, of which at least one must be on the First Language level, and at least one must be a Business Language; and pass both languages and at least three other instructional offerings, as prescribed for each specific instructional programmes.

DISTINCTIVE FEATURES OF INSTRUCTIONAL PROGRAMMES OFFERED AT FET COLLEGES

This sector exhibits some unique characteristics that define the nature of the National Certificate qualifications.

1.1 General

Each National Certificate qualification is an instructional programme in its own right. The term 'instructional programme' has the same meaning as the term 'course'. The term 'instructional offering' has the same meaning as the term 'subject'.

Candidates can enrol for any number of instructional offerings of an instructional programme in a sitting per semester/year and as such the enrolment rates vary, depending both on the instructional programme and the specific needs of the candidates. As such the reporting will be affected.

Currently the enrolments for the majority of instructional programmes are conducted twice a year depending on the duration of the specific instructional programme.

1.2 National Certificates N1-N3

While candidates need to obtain a minimum aggregate to pass Grade 10, Grade 11 and Grade 12/Senior Certificate, no aggregate is necessary for the National Certificates.
All the NC(OR), N1, N2 and the N3 instructional offerings (subjects) are equivalent to Standard 7/Grade 9, Standard 8/Grade 10 SG, the Standard 9/Grade 11 SG and the Standard 10/ Grade 12 SG school subjects respectively.

The NIC and NSC qualifications are just as applicable as Grade 11 or Grade 12/Senior Certificate qualifications respectively. Candidates have to fulfil the same basic requirements, i.e. number of subjects (2 languages and 4 optional/compulsory subjects) and language requirements (2 languages of which at least one as First Language). To obtain Grade 11 and Grade 12/Senior Certificates at a high school, candidates also offer two languages and 4 other optional and usually academic subjects of which they must pass three.

The National Intermediate Certificate is thus equivalent to a Grade 11 qualification with all the instructional offerings on the Standard Grade level.Umalusi issues the National Certificate N3, National Senior Certificate as well as the Grade 12/Senior Certificate. The National Senior Certificate is thus equivalent to a Senior Certificate with all the instructional offerings on the Standard Grade level. The National Senior Certificate therefore does not allow a candidate to study at a university for a degree since to obtain matriculation endorsement a specific number of instructional offerings must be passed on Higher Grade level. The N3 and NSC qualifications allow candidates entry to tertiary studies.

1.3 National Certificates N4-N6

The National Certificates N4, N5 and N6 are tertiary qualifications, which form part of the National N Diploma. The duration of the National N Diploma is a minimum of three years, including applicable experiential training (two years in the Natural Sciences Field of Studies and 18 months in the General Field of Studies), after the candidate has entered the tertiary level.

According to the evaluation scale used in the civil service to evaluate qualifications of persons who do not have an educator's qualification, the National N Diploma is evaluated as RQV 13, i.e. Matric + 3 years. (DoE, 2004, 14-17)

TECHNIKON RULES FOR ADMISSION

1.2 MINIMUM ADMISSION REQUIREMENTS BASED ON SOUTH AFRICAN SCHOOL, TECHNICAL AND OTHER EXAMINATIONS

Approved by CTP November 2002

1.2.1 Basic requirements as determined by section 26 (1) of the Act

No person shall be registered as a student at a technikon to follow an instructional programme or subdivision of an instructional programme contemplated in section 31 (1) of the Act, unless he/she has –

(1) (a) obtained a Senior Certificate; or

(b) obtained a certificate which has been endorsed in accordance with section 9B(3) of the South African Certification Council Act, 1986 (Act No. 85 of 1986), to the effect that he/she has complied with the minimum requirements for admission to study at a technikon; or

(2) fulfilled the requirements for admission to study at a technikon as determined by the Committee of Technikon Principals in the joint statutes in terms of section 5(e) of the Act; or

(3) fulfilled the requirements for a certificate of exemption issued by the Committee of Technikon Principals in terms of section 5(f) of the Act; or

(4) any other qualification which the Committee of Technikon Principals may accept for the admission of a student for study at a technikon: Provided that the Council of a technikon shall be satisfied that the standard of communication skills of the person, his ability to study successfully and/or his/her work experience are such that he/she, in the opinion of the Council, shall be able to complete the proposed instructional programme successfully.

1.2.2 Specified elements of the basic requirements

(1) No person may be registered as a student at a technikon for an instructional programme referred to in section 31 (1) of the Act unless -

(a) He/she has obtained a certificate contemplated in section 26 (1) of the Act, provided:

(i) Provided that the subjects passed (minimum of 5) in obtaining the Senior Certificate or a certificate contemplated in the said section of the Act, are subjects passed on the Higher Grade or the Standard Grade or a combination of subjects on the Higher Grade and the Standard Grade; or that the a person has obtained the Senior Certificate with a minimum of four subjects (which may not include more than two of the official languages) passed on the Higher Grade or the Standard Grade, and provided further that the remaining subject(s) passed on the Lower Grade subject shall not be a prerequisite for the proposed instructional programme; and

(ii) Provided he/she can prove communicative competence in the particular technikon's language of instruction; or

(b) (i) he/she has obtained the National Certificate N3 with passes of at least 40 percent or more in at least four subjects, and has passed one of the official languages on at least First language Standard Grade, and has passed another official language on at least Second Language Standard Grade in the Senior Certificate examination, or has passed any instructional offering in an official language as approved equivalent by the Committee in a manner prescribed in subparagraph (7) of the Joint Statutes: Provided he/she can prove communicative competence in the particular technikon's language of instruction; *or*

(ii) he/she obtained one of the following credit combinations of four different subjects:

- Three Senior Certificate subjects on at least Standard Grade level and one National Certificate N3 subject; or
- Two Senior Certificate subjects on at least Standard Grade level and two National Certificate N3 subjects; or
- One Senior Certificate subject on at least Standard Grade level and three National Certificate N3 subjects, as well as passes with 40 percent or more in two official languages as prescribed in the first paragraph of subparagraph (b) above: Provided he/she can prove communicative competence in the particular technikon's language of instruction: or

(c) he/she has obtained the National N4 Certificate with passes in at least four appropriate subjects, each attained with 50 percent or more: Provided that he/she can prove communicative competence in the technikon's language of instruction; or

(d) he/she has fulfilled the requirements for admission to a technikon as determined by the Committee as contemplated in section 26 (1) (b) and (c) of the Act: Provided that the council shall be satisfied that the standard of this person's communicative skills, his/her ability to study successfully and his/her work experience are such that he/she will, in the opinion of the council, be able to complete successfully the proposed instructional programme; and

(e) he/she meetssuch additionalrequirements as the council maydetermine for admission to a specific instructional programme as contemplated in section *26(2)*(a) of the Act.

(2) To comply with the minimum entrance requirements in (1)(a) or (b) above, candidates who desire entry on grounds of a combination of subjects must achieve a minimum total of 720. To calculate the total, the percentages for each of the subjects (including the required languages)must be converted to marks out of 300 for Standard Grade or N3 passes and out of 400 for Higher Grade or N4 passes. Thereafter the marks must be summated.

(3) In terms of the equivalency of N3 and SG subjects; N4 and HG subjects; N4, HG and A-level subjects, the following applies:

(a) It is accepted that N3-subjects are equivalent to or have the same status as Senior Certificate SG subjects.
(b) It is accepted that N3 < (less than) HG < (less than) "A-level".

1.3 PROVISIONAL ADMISSION

1.3.1 Provisional admission in respect of South African school and technical examinations:

(1) A person may, subject to subparagraph (1) (f) of Section 6 of the Joint Statutes, be provisionally admitted to a technikon for education and training if such person does not comply with all the requirements set out in subparagraph 6 (1) (a) of the Joint Statutes, and if

(a) such person lacks only one requirement: Provided that the subjects passed in the Senior Certificate examination or equivalent examination shall comply with the provisions of subparagraph 6 (1) (a) of the Joint Statutes: Provided further that the subjects passed shall include subjects required for the proposed instructional programme; and

(b) the council is satisfied that the standard of such person's communicative skills, his/her ability to study successfully and/or his/her work experience are such that he/she will, in the opinion of the council, be able to complete successfully the proposed instructional programme.

(2) A person who is granted provisional admission to a technikon in terms of subparagraph (2) of Section 6 of the Joint Statutes, may be admitted to the second semester or year of study only if he/she has -

(a) complied with the outstanding requirements of the Senior Certificate examination or an equivalent examination; or

(b) passed any equivalent instructional offering as approved by the Committee in a manner prescribed in subparagraph (7) of Section 6 of the Joint Statutes.

(3) A person who has met the requirement stipulated in subparagraph (3) (a) or (b) of Section 6 of the Joint Statutes shall be regarded as having met the requirements for admission to a technikon.

(4) (a) A person may, subject to subparagraph (1) (f) of Section 6 of the Joint Statutes, be provisionally admitted to a technikon for education and training if such person does not comply with the language requirements as determined in subparagraph 6 (1) (b) of the Joint Statutes: Provided that such person shall have passed at least four approved subjects towards obtaining the National Certificate N3: Provided further that such person shall not be admitted to the second semester or year of study unless he/she –

(i) has passed at least one of the official languages on at least First Language Standard Grade and another official language on at least Second Language Standard Grade in the Senior Certificate examination or an equivalent examination; or

(ii) has passed an examination in an official language as approved by the Committee.

(b) A person who has met the requirement stipulated in subparagraph (5) (a) (i) or (ii) of Section 6 of the Joint Statutes, shall be regarded as having met the requirements for admission to a technikon.

1.3.2 Provisional admission in respect of work experience, age and maturity

(1) (a) A person may, subject to subparagraph (1) (f) of Section 6 of the Joint Statutes, be provisionally admitted to a technikon for education and training if such person does not comply with the requirements set out in subparagraph (1) (a) of Section 6 of the Joint Statutes:

Provided that -

(i) such person shall have reached the age of 23 before the date of registration and shall have at least three years work experience and proven ability relating to the proposed instructional programme; and

(ii) the council is satisfied that the standard of such person's communicative skills, his/her ability to study successfully and his/her work experience are such that he/she will, in the opinion of the council, be able to complete successfully the proposed instructional programme.

(b) A person who has been admitted to a technikon in accordance with the provisions of subparagraph (6) (a) of Section 6 of the Joint Statutes, shall be admitted to the second semester or year of study only if his/her academic achievements during the first semester or year of study are to the satisfaction of the council.

(c) A person who is admitted to the second semester or year of study as contemplated in subparagraph (6) (b) of Section 6 of the Joint Statutes, shall be regarded as having met the minimum requirements for admission to a technikon.

APPENDIX 5: CHAPTER 4

NSFAS Loan recipients, 1994 - 2004							
		Agriculture Recipients			All NSFAS Recipients		
Loan Year	Qualification Level	Agr_ Students	Agr_ Award	Agr_ Bursary	All_ Students	All_ Award	All_ Bursary
1994	Degree	31	105661.22	0.00	18 357	54 513 541.83	0.00
1994	Diploma	3	8712.00	0.00	7 220	15 967 296.20	0.00
1995	Degree	183	783276.17	110360.70	29 843	126 784 244.28	33 767 374.13
1995	Diploma	114	262244.91	54151.99	10 165	27 538 321.61	5 963 697.05
1996	Degree	497	2901449.89	767249.86	44 668	241 065 412.32	64 068 878.58
1996	Diploma	255	946393.52	246901.53	22 978	92 292 607.58	24 446 433.84
1997	Degree	447	2863895.78	843627.97	39 954	253 223 395.64	72 468 657.84
1997	Diploma	309	1076181.50	336895.74	23 326	97 774 402.42	29 039 729.12
1998	Degree	661	4253991.74	1239550.74	39 872	266 710 942.84	79 166 791.25
1998	Diploma	344	1653100.83	532549.28	27 688	127 767 935.08	36 914 384.37
1998	Honours	-	-	-	1	7 000.00	2 100.00
1998	Masters	-	-	-	1	12 100.00	4 840.00
1999	Degree	701	5265318.35	1515119.02	36 966	268 749 564.49	79 071 869.51
1999	Diploma	404	2511034.07	724992.47	31 402	172 305 203.92	48 867 953.85
2000	Degree	872	6882113.12	1973293.69	38 362	309 400 740.34	89 880 180.10
2000	Diploma	491	3265058.59	1011187.24	33 681	201 418 577.97	60 067 107.86
2000	Masters	-	-	-	2	9 970.00	3 521.33
2001	Degree	821	7321779.24	2155955.02	41 680	376 999 460.04	108 387 942.14
2001	Diploma	599	4241269.63	1261493.30	38 782	257 599 156.84	75 218 069.65
2001	Doctorate	-	-	-	1	4 930.00	0.00
2001	Honours	-	-	-	37	284 458.00	93 980.00
2001	Masters	-	-	-	28	203 080.00	34 516.40
2002	Degree	770	6937646.19	2007749.20	44 733	429 510 882.27	122 011 386.08
2002	Diploma	620	4592303.13	1407106.20	41 345	303 361 290.89	88 158 749.85
2002	Doctorate	1	8650.00	3460.00	1	2 680.00	0.00
2002	Honours	-	-	-	36	289 240.00	72 697.14
2002	Masters	-	-	-	33	222 865.00	34 212.54
2002	Post Grad Diploma	-	-	-	13	87 601.00	20 283.07
2003	Degree	800	6325588.36	1750620.15	51 739	524 362 235.82	148 571 730.15
2003	Diploma	662	5291308.94	1550655.93	44 582	366 418 727.28	102 334 865.74
2003	Doctorate	-	-	-	1	6 160.00	0.00
2003	Honours	-	-	-	198	1 689 274.69	499 004.18
2003	Masters	-	-	-	58	582 922.71	141 566.66
2003	Post Grad Diploma	1	8380.00	3352.00	63	613 151.00	203 445.66
2004	Degree	704	5981666.11	-	49 251	503 911 600.60	-
2004	Diploma	658	6265243.00	-	45 357	408 932 953.10	-
2004	Doctorate		-	-	5	31 191.85	-
2004	Honours	7	70803.70	-	282	2 634 357.59	-
2004	Masters	3	31281.50	-	31	350 764.55	-
2004	Post Grad Dipl	-	-	-	148	1 864 629.00	-

Source: Personal Communication NSFAS (2005)

Study programmes that are identified by the Department of Agriculture for support in the Agricultural bursary scheme		
B.Sc. B.inst. Agrar. B.Agric.	**B-TECH**	**B-TECH**
Veterinary sciences	Animal production	Animal production
Agricultural economics v	Animal health	Animal health
Agricultural engineering	Plant production	Plant production
Agricultural statistics	Crop production	Nature conservation
Viticulture	Nature conservation	Extension
Virology	Food science and technology	
Agronomy		
Horticulture		
Plant pathology		
Entomology		
Pasture science		
Crop science		
Remote sensing		
Microbiology		
Genetics		
GIS		
Biochemistry		
Rural development and finance		
Agribusiness		
Agrotourism		
Agroforestry		
Aenology		
Post graduate study		
Natural resource management		
Animal husbandry		
Animal nutrition		

Source: Department of Agriculture (2003) Bursary application form: full-time post graduate studies Department of Agriculture (p.43)

APPENDIX 6: CHAPTER 7

Table 1: Contacts at Government Departments:

National Department of Agriculture	Nangomso Songelwa
Western Cape Department of Agriculture	Hannetjie Aggenbach
Northern Cape Department of Agriculture	Garreth van Schalkwyk
Eastern Cape Department of Agriculture	Buyiswa Manzi
Free State Department of Agriculture	Malusi Matlako
Limpopo Department of Agriculture	Kwena Lekgodi
KwaZulu-Natal Department of Agriculture and Environmental Affairs	Janet McGladdery
Gauteng Department of Agriculture, Conservation and Environmental Affairs	Dean Hing
North West Province Department of Agriculture, Conservation, Environment & Tourism	Bore Motshabi
Mpumalanga Department of Agriculture & Land Administration	Jeffrey Mubi

Table 2: Contacts at Parastatal Organisations:

South African Veterinary Council	Lynette Havenga
Onderstepoort Biological Products	Annetjie van Dyker
Agricultural Research Council	Loraine Molope
National Agricultural Marketing Council	Joyce Sethu
Perishable Products Export Control Board	Beatrix Marais
Land Bank	Lindy Carabott

Table 3: Contacts at Colleges of Agriculture:

Cedara	Louie Naidoo
Owen Sithole	Joseph Foli
Fort Cox	Awonke Sonandi
Glen	JR van Zyl
Elsenburg	Judi Gerdenbach
Grootfontein	Amanda van Rensburg
Lowveld	Jeanette Sprinkhuizen
Madzivhandila	M.C. Tshisikule
Tompi Seleka	N. Maloa
Potechefstoom	Coen Meyer
Taung	Abri van Heerden

Table 4: Contacts at Universities and Universities of Technology:

Cape Peninsular University of Technology	Irene van Dyk
Central University of Technology	Prof Frey
Tshwane University of Technology	Prof Selala
Mangosuthu Technikon	Lindi Madlala
Nelson Mandela Metropolitan University	Marie Voges
North West University	Prof Sunnah
University of Fort Hare	Prof Raats
University of Free State	Thea van Wyk
University of KwaZulu-Natal	Prof Cooke
University of Limpopo	Prof Mollel
University of Pretoria	Elmarie Cronje
University of South Africa	Maggie Linington
University of Stellenbosch	Prof Leopoldt van Huysteen (& Jos Liebenberg)
University of Venda	Prof Ole-Meiludie
University of Zululand	Prof Scogings

TABLE 5: CONTACTS AT PRIVATE COMPANIES AND INSTITUTIONS:

ABSA	www.absa.co.za	Ryan McMeeking
Beyer Animal Health	www.bayer.co.za	Ernie Roberste
Beyer Crop Protection	www.bayer.co.za	Toby Oosthuizen
Bokomo Feeds	www.pioneerfoods.co.za	Tania Botha
Bull Brand Foods	www.bullbrandfoods.com	Sandra Jooste
Cape of Good Hope Wool Combers	-	Lucy Bester
Ceres	www.ceres.co.za	Jan Rysbergen
Clark Cotton	www.clarkcotton.co.za	Mario le Roux
Clover	www.clover.co.za	Louwtjie Naude
Dew Crisp	-	Michael Kaplan
Epol	www.epol.co.za	Rheta Luddick
Eskom (Agrelek)	www.agrelek.co.za	
Finlaar Foods	-	Terry Miller
First National Bank	www.fnb.co.za	Hannes Chenaski
Foskor	www.foskor.co.za	Zinhle Msane
Gringo Leathers	-	Pierre van Niekerk
Karan Beef	www.karanbeef.co.za	Deon Loodts
Kynnoch	-	Jan Roux
McCains	www.mccain.co.za	Stuart Wortley
Meadow Feeds	www.meadowfeeds.co.za	Isabel Moolman
Omnia	www.omnia.co.za	Lelani Laager
Paarman Foods	www.paarman.co.za	Graham Paarman
Pannar Seed	www.pannarseed.co.za	George Nefdt
Parmalat	www.parmalat.co.za	Masika Khutsone
Pick n' Pay	www.picknpay.co.za	Cindy Jenks
Profert	-	Erina Steyn
Rainbow Chickens	www.rainbowchickens.co.za	Terry Taylor
SABS	www.sabs.co.za	Pieter Haasbroek
SAD Foods	www.sadfoods.co.za	Johan Marais
SAFEX: JSE Agricultural Derivatives Division	www.safex.co.za	Rod Gravelot-Blondin
Sasol Nitro	www.sasol.com	Andre Bosch
Seton	www.setonleather.com	John Henry
Shoprite Checkers	www.shoprite.co.za	Johan van Deventer
Spar	www.spar.co.za	Peter Gohl
Standard Bank	www.standardbank.co.za	Goosen Lombardt
Stucken Group	www.stucken.co.za	Howard Warneke
Syngenta	www.syngenta.com	Kate Tucker
Tiger Brands	www.tigerbrands.co.za	Santa Conradie
Tongaat Hulett Sugar	www.huletts.co.za	Pat Mogadi
Unilever	www.unilever.co.za	Clive Jardine
Woolworths	www.woolworths.co.za	John Ferreira

Marketing and Advocacy Focus	
Agri-SA	www.agriinfo.co.za
National Agricultural Marketing Council	
Agricultural Business Chamber	www.agriinfo.co.za
Inst of Market Agents of SA	
Inst. Of Market Masters of SA	
Perishable Products Export Control Board	www.ppecb.com
Prokon	

Agronomy Focus	
Grain SA	www.grainsa.co.za
South African Grain Information Services	www.sagis.org.za
National Association of Maize Millers	
National Chamber of Milling	www.grainmilling.org.za
Grain Silo Industry	www.graansilo.co.za
Cotton South Africa	www.cotton.org.za
Drybean Producers Organisation	www.beans.co.za
Sorgum Industry Forum	
Groundnuts Industry Forum	
Sunflower & Soyabean Industry Forum	
Maize Industry Forum	
Wheat Industry Forum	

Tea and Coffee Focus	
SA Honeybush Tea Association	www.rooibostea.co.za
Coffee Growers Secretariat of South Africa	
Southern African Coffee Producers Organisation	

General Agricultural Focus	www.upe.ac.za/botany/pssa.htm
Phycological Society of Southern Africa	www.saspp.co.za
Southern African Society for Plant Pathology	
Grassland Society of Southern Africa	www.sascp.org.za
South African Society of Crop Production	www.botanicalsociety.org.za
Botanical Society of South Africa	mikeh@nola.agric.za
NDA- Plant Protection	jan@avcasa.co.za
AVCASA/Croplife	genman@sansor.co.za
SA National Seed Organisation (SANSOR)	
SA Seedling Growers Association	
SA New Crop Research Association	
SA Refrigerated Distribution Association	www.sawise.org.za
Association of SA Women in Science & Engineering	www.aeasa.org.za
Agricultural Economics Association of South Africa	www.africabio.com
Research and Development for Biotechnology	
Parasitalogical Society of Southern Africa	
Entomological Society of South Africa	www.sasbmb.org.za
South African Society of Biochemistry & Molecular Biology	www.soils.org.za
Soil Science Society of South Africa	www.fssa.org.za
Fertilizer Society of South Africa	

Flower & Ornamental Plant Focus	
International Protea Association	www.ipa-protea.org
SA Protea Producers and Exporters' Association	www.sappex.org.za
SA Flower Growers' Association	www.saflower.co.za
Orchid Society of Northern Transvaal	www.ont.co.za
South African Palm Society	www.sapalm.co.za

Hunting & Conservation Focus	
South African Hunters & Game Conservation Association	www.sahunt.org.za
Field Guides Association of South Africa	www.fgasa.org.za
Endangered Wildlife Trust	www.ewt.org.za

Fruit and Vegetable Focus	
Fresh Produce Exporters Forum	
South African Fresh Produce Forum	
SA Society of Horticultural Sciences	
Southern African Plant Breeders Association	www.sapba.co.za
SA Subtropical Growers Association	
Capespan Group	www.capespan.com
Deciduous Fruit Producers Trust	www.dfpt.co.za
Fruit South Africa	www.fruitsa.co.za
Citrus Southern Africa	www.citrus.co.za
SA Citrus Growers Association	www.cga.co.za
SA Mango Growers Association	www.samga.co.za
SA Litchi Growers Association	
SA Cactus Pear Association	www.cactuspear.co.za
SA Avocado Growers Association	www.avocado.co.za
SA Macadamia Growers Association	
SA Banana Growers Association	
SA Tomato Producers Organisation	
SA Olive Growers Association	www.saoga.co.za
Potatoes South Africa	www.potatoes.co.za
Cherries SA	
Hluhluwe Pineapple Growers Association	
Vrystaat Groente Vrugte Kwekers	
SA Table Grape Industry	
Northern Province Table Grape Association	
Hex Valley Table Grape Assoc	www.grapeland.co.za
Bergriver Table Grape Association	www.tablegrapes.co.za
SA Garlic Growers Association	
Ceres Uie - Korkom	
Noordelike Uie Komitee	
Noord-Kaap Uie Vereniging	
5-a-Day for Better Health Trust	www.5-a-day.co.za
Ass of. Vegetables Grown Under Protection	
SA Vegetables	
Cape Organic Growers Association.	
Organic Agriculture Association of SA	www.oaasa.co.za
Orange River Producer Alliance	www.delecta.co.za

Animal Production Focus	
South African Milk Producers Organisation	www.mpo.co.za
Emerging Red Meat Producer's Organisation	www.nerpo.org.za
SA Meat Industry Company	www.samic.co.za
South African Meat Industry Company	www.samic.co.za
National Wool Growers' Association	www.nwga.co.za
Cape Wools	www.capewools.co.za
Mohair South Africa	www.mohair.co.za
Community of International Businesses Related to Animal Production	www.engormix.com
Protein Research Foundation	www.proteinresearch.net
South African Society for Animal Sciences	www.sasas.co.za
Natal Jersey Cattle Club	
Bonsmara Society	www.bonsmara.co.za
Gelbvieh Cattle Breeders' Society	www.galbvieh.co.za
Brahaman Cattle Breeders Society of SA	www.brahaman.co.za
Damara Breeders Society	www.studbook.co.za/society/damara
Afrino Sheep Breeders Society	www.studbook.co.za/society/afrino
Dorper Sheep Breeders Society	www.studbook.co.za/society/dorper
Nooitgedach Horse Breeders Society	www.sa-breeders.co.za
South Africa Milch-Goat Breeders Society	www.sa-breeders.co.za
Zoological Society of South Africa	
South African Feedlot Association	www.safeedlot.co.za
Beekeeping	www.beekeeping.co.za
South African Animal Health Association	www.saaha.co.za

Processed Products Focus	
The Grocery Manufacturers Association of SA	www.gma-sa.co.za
SA Fruit and Vegetable Canners Association	

Aquatic Focus	
Aquaculture Association of South Africa	www.aasa-aqua.co.za
South African Society of Aquatic Scientists	www.dwaf.gov.za/iwqs/sasaqs

Wine and Spirits Focus	
South African Wine and Brandy Company	www.sawb.co.za

Search of Mail & Guardian Online's Career Junction on Friday 15 July 2005

(Publishes recruitment advertisements from all major newspapers and recruitment agencies particularly on high-skilled jobs)

Key words searched: agriculture, agricultural, agriculturalist, agri, agronomy, agronomist, horticulture, animal, farm/ing, fish/ing/eries, flowers, forestry, plantation, fertilizer, husbandry, livestock, ostrich, cattle, pigs, sheep, beef, pork, crop, cane, sugar, grain, vegetable, citrus, fruit, wine, viticulture, nature conservation, game, hunt, reserve, serum, vaccine, soil, diary, cheese, milk, hides, tanning/ery, leather

Jobs were noted that either required a formal qualification in agriculture experience in the field of agriculture an interest in the field of agriculture; or were within the agricultural sector regardless of qualifications, experience or interests. In total 42 jobs were found. Interestingly, about 70-80% of these noted the requirement of additional skills and attributes not related to qualifications and formal skills. These include:

- People management and leadership skills
- Budgeting skills
- Project management and organisational skills
- Networking and facilitation skills
- Computer literacy
- Analytical and reasoning capabilities
- Ability to work in dependently and as part of a team
- Ability to speak at least 2 national languages fluently (most common request was for English and Afrikaans)
- Drivers licence

Aside from this us was also notable that the majority of the jobs advertised were for permanent rather and contract positions.

Jobs in the Agricultural Sector for which Agricultural Qualifications are a Prerequisite

Job Description	Geographical Region	Qualification	Sector	Experience	Employment Equity Pref.	Additional Skills/Interests of Attributes*
Senior Research Associate: Maize Development	Gauteng	BSc or equivalent in Agriculture	Agricultural	Experience	No	Crop husbandry in maize, farm engineering
Research Associate: Maize Development	Gauteng	3 year or equivalent degree in Agriculture	Agricultural	Experience	No	Crop husbandry in maize, farm engineering
Sales & Marketing	Gauteng	4 year BSc on Entomology, Week Science or Plant Pathology	Agricultural	3-5 yrs	No	Marketing/distribution/sales, R&D trials

Job Description	Geographical Region	Qualification	Sector	Experience	Employment Equity Pref.	Additional Skills/Interests of Attributes*
Chief Farm Manager	Gauteng	N.Dip or B in Agriculture	Agricultural	10 yrs	No	Agricultural construction and engineering experience
Technical Manager of Feed Manufacturing Co.	North West	BSc in Agriculture with preferential specialisation in monogastrics	Agricultural	-	No	

*Factors mentioned here are those other than the general required skills and attributes mentioned separately above

Jobs in the Agricultural Sector for which Agricultural Qualifications are Desirable

Job Description	Geographical Region	Qualification	Sector	Experience	Employment Equity Pref.	Additional Skills/Interests of Attributes*
Chief Engineer	Gauteng	4 year Degree/Diploma in Agricultural or Civil Engineering	Agricultural	6-8 yrs	Yes	Knowledge of Water and Irrigation Systems of Agriculture
Chief Engineer	Gauteng	4 year Degree/Diploma in Agricultural or Civil Engineering	Agricultural	8-10 yrs	Yes	Knowledge of Water and Irrigation Systems of Agriculture
Project Manager	Gauteng	Agricultural or Civil Engineering Qualification	Agricultural	6-8 yrs	Yes	Knowledge of Water and Irrigation Systems of Agriculture
Project Manager	Gauteng	Agricultural or Civil Engineering Qualification	Agricultural	8-10 yrs	Yes	Knowledge of Water and Irrigation Systems of Agriculture
Agricultural Development Manager	KZN	Relevant Degree or Diploma	Agricultural	-	No	SETA, Training and Development Experience in Agricultural Sector
General Manager of Genetics Technology Co.	Western Cape	Formal Agricultural or Business Qualifications	Agricultural	-	No	Executive Management Experience

*Factors mentioned here are those other than the general required skills and attributes mentioned separately above

Jobs in the Agricultural Sector for which Agricultural Qualifications are Desirable

Job Description	Geographical Region	Qualification	Sector	Experience	Employment Equity Pref.	Additional Skills/Interests of Attributes*
General Manager	Mpumalanga	None specified	Agricultural	3-5 yrs	No	-
Assistant Director	Western Cape	4 year BSc or equivalent	Agricultural	-	No	Research Experience and Knowledge of Fisheries
Production Clerk	Gauteng	Grade 12 Maths, Pivot Tables	Agricultural	-	No	Data Capturing, Accounting System Knowledge
Farm Manager	Eastern Cape	Matric with Maths & Science/Biology	Agricultural	-	No	Animal Husbandry and Stockmanship
Quality Controller	Western Cape	Dip/Degree in Natural Sciences or Food Technology	Agricultural	-	No	Laboratory Supervision, Intrinsic Product Knowledge
Secretary for Horticulture Company	Gauteng	B.Com or Secretarial Qualification	Agricultural	-	No	Accounting
General Manager	Gauteng	None Specified	Agricultural	-	No	-
HR Assistant	Gauteng	HR Degree/Diploma	Agricultural	-	No	Payroll, HR Admin
Agricultural Machinery After-Market Sales	Zambia	None Specified	Agricultural	3-5 yrs	No	Knowledge of Tractors and agricultural machinery
Sales Rep for Pump Manufacturing Co.	Gauteng	None Specified	Agricultural	3-5 yrs	No	Sound Knowledge of Agricultural and Industrial Pumps
Agricultural Sales Consultant for Diary Co	Gauteng	None Specified	Agricultural	-	No	Farming Industry Knowledge / background or attendance at Agricultural High School
Sales Manager	Gauteng	3 year B.Com/Diploma in Marketing	Agricultural	4-6 yrs	No	Agricultural Sales Knowledge
Assistant Manager at Winetech	Western Cape	Related Tertiary Qualification	Agricultural	4-5 yrs	No	Experience in Agriculture of Wine Industry
Book-keeper at Animal Nutrition Co	Gauteng	Related Qualification	Agricultural	-	No	-
IT Specialist at Animal Nutrition Co	Gauteng	Related Qualification	Agricultural	-	No	-
Mechanical Technician at Animal Nutrition Co	Gauteng	Related Qualification	Agricultural	-	No	-
Call-Centre Operator at Animal Nutrition Co	Gauteng	None Specified	Agricultural	-	No	Related Experience
Tele-Sales Operator at Animal Nutrition Co	Gauteng	None Specified	Agricultural	-	No	Related Experience
Book-keeper for Winefarm	Western Cape	Related Qualification	Agricultural	-	No	Related Experience
Financial Manager for Shrimp Farming Company	Mozambique	4-6 yrs	Agricultural	-	No	Fluency in Portuguese

*Factors mentioned here are those other than the general required skills and attributes mentioned separately above

Jobs outside the Agricultural Sector for which Agricultural Qualifications are Required

Job Description	Geographical Region	Qualification	Sector	Experience	Employment Equity Pref.	Additional Skills/Interests of Attributes*
Deal Administrator	Gauteng	Relevant Financial Qualification & Completion of SAFEX Agricultural Exam	Finance	- 5 yrs	No No	Relevant Financial Skills and Experience
Procurement Manager in Fruit Distribution	Gauteng	B.Com & Post Graduate Diploma in Agricultural Economics	Distribution, Warehousing & Freight			-

*Factors mentioned here are those other than the general required skills and attributes mentioned separately above

Jobs outside the Agricultural Sector for which Interest or Past Experience in the Agricultural Sector is Required

Job Description	Geographical Region	Qualification	Sector	Experience	Employment Equity Pref.	Additional Skills/Interests of Attributes*
Business Development Manager	Gauteng	Tertiary Qualificaiton in Finance	Financial	-	No	Experience in Agriculture and asset-based finance in farming community
Head of New Holland Finance	Gauteng	None Specified	Financial	-	No	Work experience in agricultural sector; knowledge of challenges of agricultural sector; knowledge of agricultural assets; assist in the development of agricultural products; financial analysis; risk and credit assessment skills
Divisional Manager of Agricultural Sector	Gauteng	3 year Degree/ Diploma in Finance	Financial	-	No	Knowledge of the Agricultural sector, risk and credit analysis, marketing, financial analysis
Commodity Trader	Gauteng	B.Com/MBA	Financial	-	Yes	Interest in Agriculture
Relationship Manager for Agri-Business Institutions	Gauteng	Chartered Accountant or MBA	Financial	-	No	Understanding of the Agricultural Sector
Project &Structural Trade Finance Manager	Gauteng	None Specified	Financial	3-5 yrs	Yes	Experience in marketing financial products to the Agriculture Sector
Manager: Business Banking	Western Cape	MBA	Financial	-	Yes	Knowledge of Western Cape Agricultural Environment
Long-Distance Driver	Western Cape	None Specified	Transport	-	No	Knowledge of the Transportation of Stock Animals and Pets

*Factors mentioned here are those other than the general required skills and attributes mentioned separately above