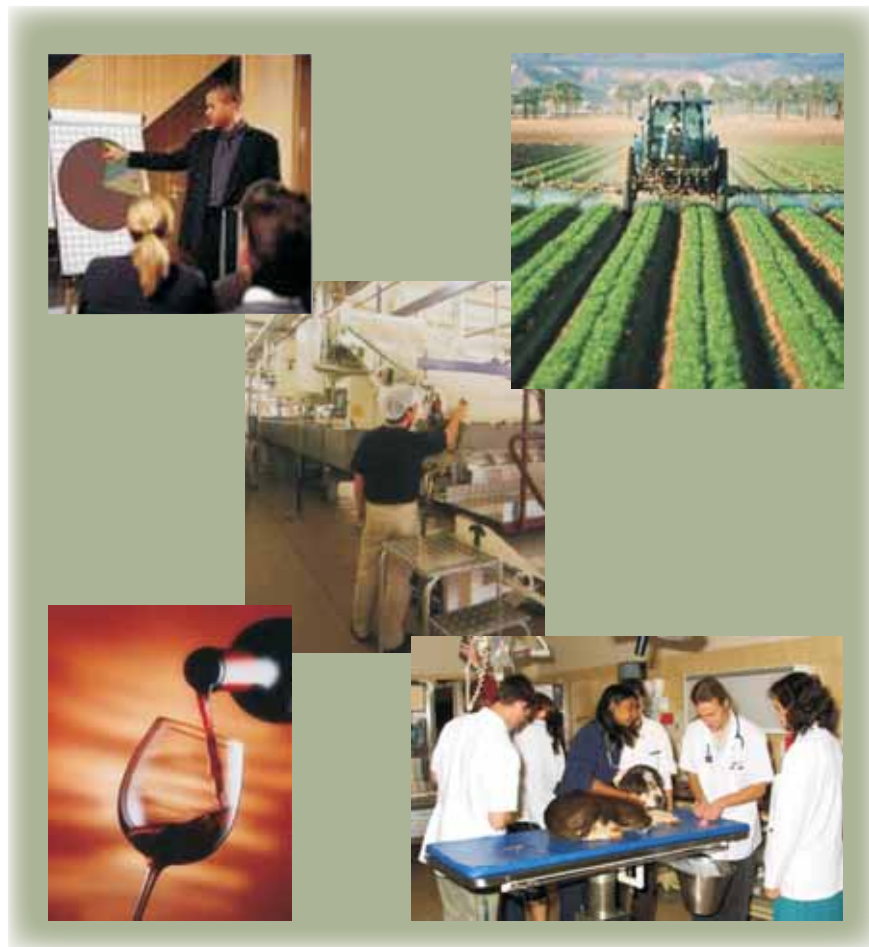


# Careers

## in the Agricultural Sector



agriculture

Department:  
Agriculture  
REPUBLIC OF SOUTH AFRICA





# Careers in the Agricultural Sector



CAREER AWARENESS PROGRAMME

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DEPARTMENT OF AGRICULTURE





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# Introduction

This document is developed to inspire and capture the interest and commitment of South African youth, particularly young Black people, to agriculture and agriculture-related opportunities that exist in the sector. Although the disadvantaged groups will be the primary focus of this initiative, other non-target groups such as the White male youth will also be included. The initiative also aims to develop support structures and incentive opportunities for its target where possible. The purpose of this document is more than just creating interest in pursuing agriculture as a career. It is also about encouraging everyone who has an interest to embark on agriculture-related activities.

Agricultural awareness, training and education are not adequately addressed in primary or secondary school curricula. The inadequacies of Mathematics and Science subjects in schools for black students have minimised these students' opportunities for acceptance into tertiary agricultural programmes. It is at this level that children should be made aware of careers in agriculture and that agriculture can be a career option worth taking. In order to achieve this the Directorate Education, Training and Extension Services developed a programme of agricultural career awareness to conscientise children about agriculture and to market careers in agriculture.

It is critical to understand that learners make two choices during the course of their high school career: subject choices and career choices. It is therefore very important that they make informed choices while they decide their career path. This will also help to change the attitude students have towards agriculture.

## Scope of information

The following issues will be addressed under each career:

- An explanation of the career
- School subjects required

- University entry requirements
- Qualifications acquired
- Career or job opportunities

## Scarce skills in agriculture

### AGRICULTURAL ECONOMICS

Agricultural economics and agribusiness management form part of the effective functioning of an organisation concerned with the agricultural and agribusiness sector. Agricultural economists analyse and advise on the optimal use of production factors for the environmentally sustainable production of food and fibre in an internationally competitive milieu. They have a broad knowledge of agriculture, commerce and social science and can solve problems of agricultural development, marketing and finance, agricultural policy and consumption affairs; agricultural sales and marketing; brokerage; market research; international trade and market development; finance; public relations; food manufacturing; processing; distribution and purchasing; and farm input industry. Students wishing to be considered for admission to the first year have to satisfy the following entry requirements (Table 1).

### Curriculum

Areas of study at the university level include economics, agricultural economics, agricultural development planning, agricultural marketing, agricultural policy, accounting, labour law, and business law and business management.

TABLE 1 Entry requirements for BSc/BCom Agricultural Economics

Career	Universities	Qualification	Duration	Entry requirements
Agricultural Economist	Stellenbosch Pretoria KwaZulu-Natal Free State	BSc Agricultural Economics	4 years	Mathematics HG—E or SG—B
		BCom Agricultural Economics	3 years	Physical Science HG—E or SG—B Biology/Agriculture (HG—E or SG—B)

## Role of agricultural economists

### *Agribusiness management*

- Developing, designing and managing supply chains and value systems for specific products, industries and subsectors.
- Examining resource demand by business and their supply response.
- Farm planning and control, farm information systems, data analysis and budgeting, organisation of capital, farm machinery management, land economics, labour economics and management, financial leverage, farm enterprises growth and liquidity and risk management.



### *Marketing*

- Production, processing and distribution of goods, thereby focusing on the flow of food and fibre to its final destination and the determination of prices at each stage.
- Commodity futures trading: trading commodities such as maize, wheat, citrus, etc., between farmers and the market.
- Market research, brand management, economic analysis (trend management), and surveys, import and export management therefore examining foreign trade relationships for food and fibre products.
- Agricultural statistics such as trend analysis in production, agricultural exports, prices; variations analysis, indices (CPI, PPI, Chain Index, etc.).
- Financial services (banks, financial institutions and agribusiness industries).
- Financial needs analysis, risk and valuation analysis, feasibility studies, cash flow planning and profit management.
- Financing and supply of capital to business.

*Resource economist (focuses on the use and preservation of natural resources)*

- The application of economic principles to issues such as air and water pollution, resource conservation, land-use policy, and the evaluation of environmental resources.
- Identifying and analysing policies and strategies for meeting the world food needs in ways that ensure sustainability of the natural resource base.

*Agriculture and rural development*

- Government programmes for specific commodities that will support incomes of farmers and provide food and fibre to low-income consumers.
- Business plan formulation, capacity building (training) and support for small-scale farmers and resource-poor farmers
- Identifying and overcoming constraints to development of agriculture in developing countries.

### **Potential employers**

Interesting and innovative careers and opportunities exist for agricultural economic graduates in: agricultural corporations, agribusiness firms, food and fibre organisations, government institutions, NGOs', rural development institutions, farming and ecotourism, financial institutions (commercial banks), futures and commodity trading, research and policy institutions, international economic development and donor institutions, universities and consultation services.

### **AGRICULTURAL BIOTECHNOLOGY**

Agricultural biotechnology is a range of tools, including traditional breeding techniques that alter living organisms or parts of organisms to make or modify products, improve plants or animals, or develop microorganisms for specific agricultural uses. Modern biotechnology includes genetic engineering.



## Role of biotechnologists

The biotechnologist applies biological processes to the production of a wide range of organic substances and to ways of recycling waste. Multi-disciplinary techniques, applied in a number of scientific areas are used.

The biotechnologist can be concerned with microorganisms, genetic engineering or cell culture and may do some work on the development of new organisms. A biotechnologist can also design and develop systems for industrial manufacture of materials such as fuel, animal foodstuffs or antibiotics.

## Requirements of biotechnologists

As a biomedical scientist you should:

- have a scientific approach
- have an inquiring mind
- be able to show initiative
- be able to give attention to detail
- be precise and methodical
- be able to work as part of a team.



TABLE 2 Entry requirements in BSc/ND Biotechnology

Career	Universities	Qualification	Duration	Entry requirements
Biotechnologist	Western Cape Free State Pretoria Most other universities	BSc Biotechnology	3 years (full time)	Matric exemption Mathematics HG— E or SG—D; Physical Science HG— E or SG—D Biology (recom- mended)
	Tshwane University of Technology Vaal University of Technology Durban Institute of Technology	ND Biotechnology	3 years (full time)	Senior certificate Mathematics Physical Science HG—E or SG—D Pass in English

## Curriculum

Different curriculum choices exist in the biotechnology field, therefore, students should ensure that they major in biotechnology in order to follow a career in agriculture. In some institutions this can only be done from second year, i.e. University of Stellenbosch offers BSc Molecular Biology and Biotechnology and students who wish to graduate in Biotechnology have to major on Biotechnology I and II from their second year of study. Rhodes University also offers Biotechnology at postgraduate level.

## Potential employers

ARC, CSIR, other research institutions, government departments (national and provincial), food fermentation and pharmaceutical industries, private pathologists, SABS, universities and universities of technologies.

## BIO-RESOURCE ENGINEERING (AGRICULTURAL ENGINEER)

Bio-resource engineering is the application of science and technology in agriculture, food and biological systems. The agricultural engineer's field of employment includes a wide spectrum of activities which are connected to nearly all other engineering disciplines. Students wishing to be considered for admission to the first year have to satisfy the following entry requirements (Table 3).

## Curriculum

The university curriculum consists of water resource management which includes drought and flood planning, water quality, irrigation and drainage, and dam design. Engineering for food fibre production includes design, development and the efficient utilisation of machinery. Environmental engineering incorporates animal-friendly building and devices, soil conservation and animal waste management.

## Role of agricultural engineers

Bio-resource engineers plan, design, develop and test the equipment or infrastructure needed for the production and processing of agricultural

TABLE 3 Entry requirements for Bachelor of Science in Agricultural Engineering

Career	Universities	Qualification	Duration	Entry requirements
Agricultural Engineer	KwaZulu-Natal	BSc Agricultural Engineering	4 years	Mathematics (HG—C) Physical Science (HG—C) Biology/Agri-culture (HG—C)

products. Within farm boundaries, agricultural engineers specialise in specific fields such as mechanisation, soil and water conservation, agricultural structures, irrigation and drainage, and technology for food processing.

Bioresources Engineering goes well beyond the farm boundaries, extending into areas such as water resources management, forestry, mining rehabilitation, food processing, peri-urban and rural development, machinery development and manufacture, waste management and ecology and agricultural vehicles and systems.

*Energy sources and mechanisation*

Through innovation, research and development sourcing/finding, agricultural engineers contribute to alternative sources of energy and machinery and improvement of the existing machinery. Agricultural engineers select appropriate materials and manufacturing processes to carry out construction and testing of basic devices.



*Farm structures*

Agricultural engineers contribute to environmental control for livestock such as structures for poultry, pigs and dairy animals, greenhouses and agricultural production systems. In addition, inten-



sive meat, milk and egg production, storing, drying, refrigeration, and processing of a large variety of other agricultural products are also designs of agricultural engineers. These structures are created in accordance with the animals' needs and product demands.

#### *Irrigation engineering*

Irrigation engineers' services involve the design of new and improvement of existing irrigation and pumping systems such as centre pivot, microjet, drip, sprinkler and flood irrigation systems.

#### *Engineering and environmental hydrologists*

Engineering hydrologists tasks encompass flood estimation, flow routing, dam design for agricultural and small catchments, spillway design, plunge and spray dip designs and water resource management.

#### *Food engineer*

Food engineers can make a meaningful contribution towards value adding and extension of the shelf-life of perishable products such as dairy products, meat, eggs, vegetables and fruit. This field of work includes the degree of cooling installations for milk products, long-term conservation of vegetables and fruit, milling and mixing processes as well as spray drying processes used in the production of powdered milk.

#### *Professional status*

BSc. Agricultural Engineering is recognised as a qualifying degree for registration as a professional engineer under the Professional Engineers Act, 1968. The degree is accredited by the Engineering Council of South Africa and the South African Institute of Agricultural Engineers.

### **Potential employers**

The profession offers exceptional opportunities in aspects such as research, development, project management, consulting services and the establishment of own business enterprises and farming systems to the individual with the necessary entrepreneurial abilities and initiative.

Interesting and innovative careers and opportunities open to agricultural engineering graduates are: Department of Agriculture, agriculture, agricultural research institutes, universities, consulting and engineering organisations, food processing companies and agricultural equipment and systems manufacturers.

## FOOD SCIENCE AND TECHNOLOGY

### Food Science

Food Science involves the application of scientific principles in the development and supply of healthy, safe, nutritious and affordable food for human consumption. Functions of the food scientist revolve around the following areas, firstly, food scientists have been involved in the development of many novel food products that are now freely available in shops, e.g. long-life milk, frozen and canned foods, snack foods and ready-to-eat meals. Secondly, food scientists are trained to meet the challenge of developing and supplying foods that comply with the ever changing demands of the modern consumer. Finally, food scientists lead the fight against hunger and malnutrition through the development of affordable, nutritious foods. Examples are instant weaning porridges, components of cereals and legumes, and vitamin and mineral fortified staple foods. A food scientist must be knowledgeable about the chemical composition, structure and nutritional value of food, food processing and preservation techniques, and the chemical, physical and biological changes that occur in food during processing, preservation and storage.

### Food Technology

Food Technology is the scientific study of the large-scale selection, production, processing and preservation of foods as well as the development and analysis of foodstuffs in industrial food-processing facilities. It further involves packaging, distribution and the use of safe, nutritious and wholesome food. Food technologists are also involved in the following areas of food manufacture: quality



TABLE 4 Entry requirements in BSc/BSc Agric Food Science and National Diploma Food Technology

Career	Universities	Qualification	Duration	Entry requirements
Food Science	Pretoria/ Stellenbosch	BSc/BSc Agric Food Science National Diploma in Food Technology	4 years	Mathematics (HG—D) Physical Science (HG--D) Biology/Agri- culture (HG—D) English (HG—D)
Food Technology	Cape Peninsula University of Technology		3 years	Mathematics (HG—E) Physical Science (HG—E) Biology (compul- sary)

assurance, processing technology, chemistry and microbiology. In addition, they are trained to ensure that both legal and industrial food standards are monitored and maintained prior to marketing.

Food technologists are also part of research teams and have to solve technical problems when raw materials are converted into preserved foods in factories. Food technologists are concerned with the production, preservation and development of high-quality foods. They manage processing plants and quality assurance laboratories. They are charged with monitoring of food quality standards by government bodies, namely the SABS. Students wishing to be considered for admission to the first year have to satisfy the following entry requirements in (Table 4).

### Potential employers

With population growth, new scientific and technological challenges presenting themselves daily in a career that can lead to rich rewards and excellent job opportunities for both men and women. The food industry is South Africa's largest manufacturing industry and a degree in Food Science is your stepping stone to various exciting and challenging careers. Job opportunities exist as food production manager or assistant, fresh foods manager or assistant, food buyer, cookery school consultant, food stylist,

consumer advisor, food promotion consultant, customer service manager and technical representative. Qualified food technologists are employed in industrial food manufacturing concerns, such as bakeries, beverage manufacturers (soft drinks, beer and wine), bottling plants, canning companies, dairies, fish and meat processors. They are involved in production, quality assurance, and product development. Research opportunities exist in companies, as well as in research institutions.

## VETERINARY SCIENCE



Veterinarians play an important role in the economy of South Africa. They contribute to the creation of wealth by controlling epidemic diseases of animals and increasing the profitability of commercial and small-scale farming enterprises. They also contribute to the production of sustainable sources of safe protein of

animal origin, the prevention of the transfer of diseases from animals to humans, and they certify the disease (or disease-free) status animals and the safety of products for local and international trade. They attend to the veterinary needs and general welfare of animals, both those of commercial importance and those kept as companion animals.

### Curriculum

The BVSc. degree is a 7-year programme consisting of a 3-year BSc. (Veterinary Biology) component offered by the Faculty of Natural and Agricultural Science and a 4-year professional veterinary (BVSc.) component offered by the Faculty of Veterinary Science of the University of Pretoria at the Onderstepoort campus, on a full-time basis only. Students will be required to apply for admission and register for a BSc. (Veterinary Biology) in the Faculty of Natural and Agricultural Sciences of the University of Pretoria's Hatfield campus. Students wishing to be considered for admission to the first year of study of BSc. (Veterinary Biology) have to satisfy an adapted M-score of at least 24 and the entry requirements in Table 5.

Table 5 Entry requirements in BSc (Veterinary Biology)

Career	Universities	Qualification	Duration	Entry requirements
Veterinarian	Pretoria	BVSc	4 years	BSc. Veterinary Biology
		Bachelor of Veterinary Biology	3 years	Mathematics (HG—D) Physical Science (HG—D) Biology/Agriculture (HG—D) English (HG—D)

Students will be allowed to their second year of BSc. (Veterinary Biology) degree programme if they pass and satisfy all the requirements of the first year. Students who will be selected for admission to the third year of study will be ranked according to their weighted academic performance in the core modules of the second year. Selected students will be guaranteed entry to the BVSc. programme provided they pass and satisfy all the requirements for third year. Those who are not selected for admission to the third year of the BSc. (Veterinary Biology) programme will have to select an alternative BSc. degree in the Faculty of Natural and Agricultural Sciences.

Learners from other institutions who have obtained a BSc. degree will be considered for the BVSc. programme provided they complete third year of the BSc. (Veterinary Biology) successfully. The total number of places in the third year of study will be restricted to 135 students per annum, and learners will be admitted through a rigorous selection process. The BSc. (Veterinary Biology) serves as a precursor for admission to the 4-year BVSc. degree programme in veterinary science. It also serves as a precursor for postgraduate studies in the biological, agricultural and veterinary sciences. Apart from being the avenue of entry into the professional component of the new veterinary degree programme, the 3-year B.Sc. degree will also allow candidates a number of other career options such as molecular biology, genetics and agriculture.

### Role of veterinary scientist

Research: The veterinarian is also involved in research in a wide spectrum of areas (veterinary, agriculture and biomedical sciences) in matters

related to product development, animal improvement and monitoring the utilisation of animals for experimental purposes.

**State veterinarians:** They render essential regulatory services relating to the diagnosis, surveillance, monitoring, control, prevention and eradication of notifiable diseases. They are also responsible for matters relating to the import and export of animal products and for food safety and security.

The provision of routine or forensic services involving disciplines such as pathology, clinical pathology, microbiology and toxicology in the private, state and diagnostic laboratories. Veterinarians are also involved in general matters pertaining to the welfare of animals through the promotion of appropriate husbandry practices, nutritional practices, disease prevention strategies and sound production systems.

**Veterinary Public Health:** Veterinarians are responsible for ensuring the maintenance of meat and milk hygiene in abattoirs and milk processing plants and the control of zoonotic diseases (diseases transferred from animals to humans).

**Private practice/Companion practice:** provide veterinary services to pet owners (dogs, cats, exotic animals and birds); rural practice provide veterinary services to farmers (sheep, goats, cattle, horses, pigs, poultry and game); breeders (dogs, pigs, sheep and goats) and animal welfare organisations, game reserves, zoos.

### Potential employers

The majority of veterinarians offer clinical services, disease prevention strategies, advice in nutrition, management, production and reproduction of animals. Employment opportunities are available in government institutions, research organisations and meat-producer organisations.

## VITICULTURE AND OENOLOGY

### Viticulture

Viticulturists apply scientific principles to manipulate the vine to produce the kind of grapes necessary for the production of different wine types and styles as well as to augment both the quality and quantity of grapes. Viticulturists share a mutual purpose to make world-class wines to accompany food for pleasurable drinking.



Viticulturists learn theoretically and practically how the correct methods of anatomy, morphology, physiology, ampelography of scion and rootstock cultivars, plant improvement, natural and artificial disorders of the grapevine, spacing and trellising, pruning, canopy quality assessment and management as well as selection of cultivar and terrain, grape handling and packaging can contribute to the desired product.

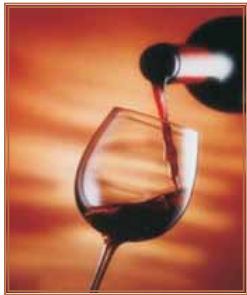
The production of wine is done by striking a balance between soil, climate, geography, winery “softness” and winery hygiene. Good wine delivers joy to the world. Students wishing to be considered for admission to the first year have to satisfy the entry requirements (Table 6).

### Oenology

Oenologists learn about the principles and practices of wine-making such as applied chemical and microbiological processes involved in producing wines such as, sweet wines, grape juice, concentrates and brandy, and also wine stabilisation and sensory evaluation of wine and brandy.

### Curriculum

Different curriculum choices enable students to major in any one of the following: Viticulture and Oenology; Viticulture and Soil Science; Viticulture and Entomology; Viticulture and Plant Pathology; Viticulture and Agricultural Economics; Oenology and Chemistry; or Oenology and Enterprise Management.



### Potential employers

Qualified viticulturists are employed in universities, the Agricultural Research Council, wine companies,

TABLE 6 Entry requirements in BSc Agric Viticulture/Oenology

Career	Universities	Qualification	Duration	Entry requirements
Viticulturist/ Oenologist	Stellenbosch	BSc Agric Viticulture/ Oenology	4 years	Mathematics (HG—E/SG—D) Physical Science (HG—E/SG—D)

estates, wine cellars, farms, consulting companies and marketing companies.

## GRASSLAND SCIENCE

Grassland Science is divided into two categories: rangeland and pasture management.

### Rangeland

Rangeland management is a discipline and an art that skilfully applies an organised body of knowledge accumulated by range science and practical experience for two purposes:

- Protection, improvement, and continued welfare of the basic resources, which in many situations include soils, vegetation, endangered plants and animals, wilderness, water, and historical sites.
- Optimum production of goods and services in combinations needed by society. Management of rangeland requires selection of alternative techniques for optimum production of goods and services with no damage to the resources. While emphasis is often placed on effects and management of domestic animals, the main goal is rangeland resource rehabilita-



TABLE 7 Entry requirements for Bachelor of Science in Pasture/Grassland

Careers	Qualification	Duration	Institution	Entry requirements
Pasture/ grassland scientist	BSc (Agric)	4 years (full time)	Most universities	Mathematics (HD) Physical Science (HD)
	ND Nature Conservation	3 years (full time)	Most Universities of Technology	Mathematics Physical Science

tion, protection, and management for multiple objectives, including biological diversity, preservation and sustainable development for people.

### Grassland

Grassland Science entails the study of all aspects of the utilisation, conservation and improvement of the veld and cultivated pastures. The education of grassland scientists is essential for sustainable animal production, on rangeland and cultivated pastures.

Grassland Science not only plays an important role in the increasing demand for meat and other animal products, but also makes a large contribution to soil and nature conservation, game farming and the future of game parks, which are important for the tourism industry.

### Potential employers

The profession offers exceptional opportunities for employees such as fertiliser and seed companies, National Parks Board, various sections of nature conservation and the Department of Agriculture on national and provincial level.

## Other careers in agriculture

### AGRONOMY

Agronomy is the integration of the disciplines of agricultural engineering, agro-forestry, crop production, genetics and plant breeding, horticulture, plant protection and soil science. All these disciplines are supported by a strong foundation in the physical and biological sciences. Special attention is given to the sustainable intensive and extensive production of food and fibre crops, under rain-fed conditions or under irrigation, for local and export markets.



TABLE 8 Entry requirements for Bachelor of Science and National Diploma in Agronomy

Careers	Qualification	Duration	Institution	Entry requirements
Agronomist (scientist)	BSc (Agric)	4 years (full time)	Most niversities	Mathematics (HD) Physical Science (HD)
Agronomist (technician)	ND in Agronomy and BTech in Crop Production	3 years (full time)	Most Universities of Technology	Mathematics Physical Science

This degree covers the following: overview regarding the grain industry and more specifically the small-grain industry, relationship between soil, climate, environment and production capacity, problem areas, marketing and market tendencies in the grain.

## PLANT PATHOLOGY

Plant Pathology is defined as the study of the organisms and environmental conditions that cause diseases in plants, the mechanisms by which these factors cause disease, the interactions between these causal agents and the plants (effects on plants growth, yield and quality), and the methods of managing or controlling plant diseases. It also interfaces knowledge from other scientific study fields such as mycology, microbiology, virology, biology, chemistry, bioinformatics, etc.



TABLE 9 Entry requirements for Bachelor of Science in Plant Pathology

Careers	Qualification	Duration	Institution	Entry requirements
Plant pathologist	BSc (Agric)	4 years (full time)	Most Universities of Technology	Mathematics (HD) Physical Science (HD) Biology

## Potential employers

The profession offers exceptional opportunities for research in government (national and provincial departments) as plant pathologist, at the ARC, agrochemical companies, seed companies, fertiliser companies, universities, farms, nurseries and pharmaceutical companies.

## SOIL SCIENCE

Soil scientists specialise in the origin of soils and the formation thereof: origin/development and composition of soil and soil-forming factors. It also covers the most important physical characteristics of soil: texture, structure, colour, consistency, overall density, soil air, temperature and water, problems arising as a result of tillage, soil compaction and crust formation.

### Focus areas

#### *Soil Survey*

This study field involves profile pit observation by drilling mechanical augers and then doing physical and chemical laboratory analyses.

The results obtained (also compiled as maps and aerial photographs) are used as vital information for infrastructural planning (urban planning, roads, pipelines, power lines, etc.) and for agricultural management purposes.

#### *Soil Physics and Hydrology*

Soil physicists and hydrologists study problems relating to water and soil interaction, soil air permeability, etc.

TABLE 10 Entry requirements for Bachelor of Soil Science

Career	Qualification	Duration	Institution	Entry requirements
Soil Scientist	BSc Agric. Soil Science	4 years (full time)	Most universities	Mathematics (HG) Physical Science (HG)
	ND in Soil Science	3 years (full time)	Most Universities of Technology	Mathematics

### *Soil Chemistry and Fertility*

The soil chemist is concerned with soil nutrients availability and deficiencies using specialised techniques for the purpose of compiling the most effective fertilisation programmes.



### *Soil Biology*

The focus in Soil Biology is on transformation brought about by microorganisms.

### *Potential employers*

The ARC, DoA (national and provincial), universities, agricultural cooperatives and manufacturers of fertilisers.

## **ANIMAL SCIENCE**

Animal scientists are qualified people involved in research and development and who give advice to the livestock industry concerning the production of animals and their products.

### **Focus areas**

These scientists' focus areas are as follows:

#### *Agricultural Genetics (plant or animal genetics)*

This course covers breeds and breeding standards of animals and basic breeding principles, selection systems and performance. It also involves the most important dairy and beef cattle breeds in South Africa, qualitative and quantitative inheritance.



TABLE 11 Entry requirements for Bachelor of Animal Science

Career	Qualification	Duration	Institution	Entry requirements
Animal scientist	BSc Agric Animal Science	4 years (full time)	Most universities in the country	Physical Science (HG) Mathematics (HG) Biology (HG)

ance, responses to selection, methods of selection and selection systems with dairy and beef cattle.

#### *Animal Nutrition*

Practical feeding of different farm animals and balancing of feed rations are covered in this field.

#### *Dairy Science*

Dairy Science involves the anatomy and physiology of the udder and the elements of the milk procedure, the composition of milk, factors that influence the composition of milk, machine milking, milk hygiene and bad taste in milk and dairy products.

#### *Poultry Science*

This field involves behaviour and biology of poultry, poultry management, production of broilers, egg production, hatching of eggs and rearing of young hens and disease control.

#### *Meat Science*

The study of meat involves growth, development and tissue composition and distribution in small and large stock. It also covers meat quality, meat processing and meat ageing.

#### *Wool Science*

This field covers the biology of wool follicle and physical characteristics of wool, shearing and shearing-pen organisation (management), class and class standard of wool, wool processing and wool products as well as by-



products of wool. The marketing of wool and other natural and synthetic fibres are also included in this field.

### **Potential employers**

The ARC, DOA (national and provincial), universities, agricultural cooperatives and manufacturers of feeds.

## **HORTICULTURE AND HYDROPONICS**

Horticulture involves the application of scientifically-based production systems of vegetables, fruit and ornamental plants.

Hydroponics is a kind of a production system called soil-less growing, in which fertilisers and minerals are added/mixed with water and supplied to plants.

TABLE 12 Entry requirements for Bachelor of Horticultural Science

Career	Qualification	Duration	Institution	Entry requirements
Horticulturist	BSc Horticulture	4 years (full time)	Most universities	Mathematics (HG) Physical Science (HG) Agriculture (HG)
	BTech. Horticulture	3 years	Most Universities of Technology	Mathematics Physical Science Agriculture

### Focus areas

- Plant production
  - propagation techniques
  - production practices
- Plant knowledge—a study of:
  - plant names
  - origins
  - characteristics
- Horticulture management
  - principles of horticultural enterprises/organisations
  - management of personnel
  - financial management



### Potential employers

The ARC, DoA (national and provincial), universities, agricultural cooperatives, seed companies.

### AGRICULTURAL TECHNICAL SERVICES

Agricultural technicians assist agricultural scientists in their work and help with the collection of information. They also give advice and information to the farming industry.

TABLE 13 Entry requirements for Agricultural technician

Career	Qualification	Duration	Institution	Entry requirements
Agricultural technician	National Diploma Agriculture: Botany	3 years (full time)	Most universities	Mathematics Agricultural Science Physical Science
	National Diploma Nature Conservation National Diploma Analytical Chemistry National Diploma Agriculture: Animal Production			

### Role of agricultural technician

#### *Agricultural resource technician*

- Works together with the agricultural resource officer.
- Involved in classification, description and plotting of a region's natural resources.



#### *Agricultural extension technician*

- Assists the agricultural extension officer.
- Collects information to determine the needs of extension.

#### *Agricultural research technician*

- Assists the agricultural researcher.

### Potential employers

The ARC, DoA, DWAF, agricultural cooperatives.

### BIOLOGICAL NITROGEN FIXATION

A biological nitrogen fixationist should have a strong interest in biology and research, and should love to work with soil under uncomfortable conditions.

TABLE 14 Entry requirements for Biological nitrogen fixationist

Career	Qualification	Duration	Institution	Entry requirements
Biological nitrogen fixationist	BSc Agriculture or Microbiology	3 years (full time)	Most universities	Biology, Agricultural Science and Chemistry

### What is Biological Nitrogen Fixation (BNF)?

Availability of nitrogen in the soil is probably the single most important factor limiting plant growth and crop yields. Some free-living and symbiotic bacteria directly influence the availability of nitrogen in the soil by conversion of atmospheric dinitrogen to ammonia in the process termed BNF. Worldwide BNF accounts for 65 % of the nitrogen used in agriculture, of which the symbiosis of legumes with nitrogen-fixing rhizobia is by far the most important source.



### Potential employers

The ARC, DoA (national and provincial), universities, commercial inoculant manufactures, and own company—consultant.

### ENTOMOLOGY

The entomologist is basically involved in research to ensure plant protection. He has a strong interest in science studies and research. There are various categories such as Plant Pathology, Microbiology and Insect Diversity



TABLE 15 Entry requirements for Entomologist

Career	Qualification	Duration	Institution	Entry requirements
Entomologist	BSc Entomology	3 years (full time)	Most universities	Mathematics Physics and Biology

## Potential employers

The ARC, DoA, and universities.

## MICROBIOLOGY

Microbiology is defined as the study of microorganisms such as bacteria, viruses and protista, which can only be seen with a microscope, and these are called/known as “unseen multitudes”.



Microbiologist mostly works in a laboratory or a place where a microscope can be installed. It can be anywhere in the fields of nutrition, medicine, ecology, pharmacology, cosmetics, marine life or any place where animals and plants or people live. Identification is by means of DNA karyotyping.

## Potential employers

The ARC, DoA (national and provincial), food industries, wine cellars, universities, and private companies.

TABLE 16 Entry requirements for Microbiologist

Career	Qualification	Duration	Institution	Entry requirements
Microbiologist	BSc (Agric) Microbiology	4 years (full time)	Most universities and universities of Technology	Mathematics HG—E or SG—C; Science HG—E or SG—C; Biology HG—E or SG—C

## STATISTICS

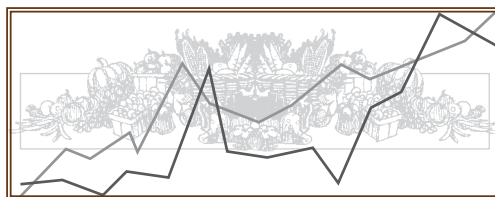
Statisticians generate, collate, verify, maintain and disseminate statistical information on the agricultural sector, including monitoring and projection of trends in the agriculture, food security and food utilisation.

TABLE 17 Entry requirements for Statistician

Career	Qualification	Duration	Institution	Entry requirements
Statistician	BSc (Agric) Economics or BCom (Agric. Economics)	4 years (full time)	Most universities	Mathematics, Agricultural Science or Economics/ Business Economics

### Potential employers

The DoA, commercial banks and other financial institutions, and academic institutions.



### WEED BIOCONTROL SCIENCE

Biocontrol scientists specialising in aquatic weeds regularly wade in populated, weed infested rivers or dams, wearing waders or use boats.

### Role of a weeds biocontrol scientist

The field involves searching for natural enemies (either insects or disease-causing organisms such as fungi) of invasive plants (weeds) in the weed's country of origin, and studying the natural enemies in quarantine to determine whether these have a potential use in controlling the invasive plant, and are host-specific.

The host-specific and damaging insects and fungi are released from quarantine and placed onto their target weeds in the field. The release sites are regularly visited to see whether they have become established and are controlling the weed.



TABLE 18 Entry requirements for Weed biocontrol scientist

Career	Qualification	Duration	Institution	Entry requirements
Weed biocontrol scientist	BSc or BSc (Hon) Entomology	4 years (full time)	Most universities	Mathematics, Physical Science or Agricultural Science (all HG)

### Potential employers

The ARC, government departments, universities, private consultant, and private companies.

# Annexure

## CONTACT DETAILS FOR SCARCE SKILLS IN AGRICULTURE-RELATED COURSES

### Agricultural Economics

Department of Agricultural Economics,  
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University of Pretoria  
PRETORIA  
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School of Agricultural Sciences and Agribusiness  
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University of the Western Cape Private Bag X17 BELLVILLE 7535	Tel. (021) 959 2911 Fax (021) 959 3126 <a href="http://www.uwc.ac.za">www.uwc.ac.za</a>
University of Pretoria Private Bag PRETORIA 0002	Tel. (012) 420 3111/4578 Fax (012) 420 4555 <a href="mailto:csc@up.ac.za">csc@up.ac.za</a> <a href="http://www.up.ac.za">www.up.ac.za</a>
The Registrar Vaal University of Technology Private Bag X021 VANDERBIJLPARK 1900	Tel. (016) 950 9000 Fax (016) 950 9772 <a href="http://www.vut.ac.za">www.vut.ac.za</a>
Tshwane University of Technology Private Bag X680 PRETORIA 0001	Tel. (012) 318 5911 Fax (012) 318 5114 <a href="http://www.tut.ac.za">www.tut.ac.za</a>
Durban Institute of Technology PO Box 953 DURBAN 4000	Tel. (031) 204 2111 Fax (031) 202 3405 <a href="http://www.dit.ac.za">www.dit.ac.za</a>

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### Food Science and Food Technology

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## Viticulture and Oenology

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## CONTACT DETAILS OF INSTITUTIONS OFFERING AGRICULTURAL COURSES

### Colleges of Agriculture

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## Universities of Technology

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The dean TUT Private Bag X 680 PRETORIA	Tel. (012)382 5119/5919  maraispjj@tut.ac.za
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