KNOW THE CAREER WORLD

Agriculture, Food and Natural Resources Careers

By Dr Charles Mugaviri

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Purposeful Career Planning

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DEDICATION

I dedicate this book to the millions of teenagers in and from the African continent. May your lives be consumed by a deep desire to build leadership legacies that will unlock Africa's potential and greatness. Africa is too rich to be poor. You were born for a purpose. You were born to leave Africa a better continent than you found it. Don't disappoint and don't settle for less.

Acknowledgements

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I would like to also acknowledge the inspiration and motivation that I have received over the years from the legacy building individuals that I have worked with in the Church community, at the University of Zimbabwe and at LASOF Leadership Institute. Our journey together of inspiring and empowering thousands of learners to make purposeful career choices and become character based leaders ignited the desire and vision for this career guidance series.

Each learner, parent, school, company, government department, Church or NGO who came through our career and leadership programs in Zimbabwe and the wider African region has inspired us to continue the journey and they deserve special acknowledgement. You each made me believe this was a worthwhile cause.

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Introduction

The career world is diverse and dynamic. Before you make a career choice, it is important that you have an appreciation of the width and depth of the career world in terms of options that are available.

A career is a chosen pursuit, a profession or occupation requiring special training, followed as one's lifework. It is a path or course one chooses to follow to earn a living. It is the progression of one's working life or one's professional achievements, for instance a soldier or a teacher. A career is a course of successive situations that make up a person's occupation. A career is therefore doing what one does as a permanent occupation.

The term career is derived from the Latin word *carrera,* which means race. The verb was first attested in 1594 from the notion of a horse "passing a career" on the jousting field. A career is usually considered to pertain to remunerative work and formal education. One can have a sporting career or a musical career without being a professional athlete or musician, but most frequently "career" in the 20th century referenced the series of jobs or positions by which one earned one's money.

Career Cluster is a broad group of related career majors within an occupational interest area. They represent groupings of occupations and industries based on shared traits. There are sixteen (16) career clusters that cover all occupations.

This book focuses on the Agriculture, Food and Natural Resources career cluster.

Perspectives on career planning

One of the most important choices you have to make in your life time is selecting a career. This choice has far reaching implications and it has to be an informed choice. The quality of information you have determines the quality of decisions you make. This book is a tool designed to empower you to make an informed career choice that you won't regret in the future. In this introduction, we are going to share some perspectives that you need to take into account as you make use of this book.

Purpose perspective to career planning

Take a moment and think of the best footballer in your nation. Think also about your favourite local musician. Can you imagine the two of them switching places? How do you think the footballer would perform on the music stage and the musician in the football field?

We were all created and designed to fulfil a specific purpose in life. None of us was created to do everything. You have a life purpose that will bring out your best. That purpose is your life assignment. You need to choose a career that is aligned to that assignment. In fact your career should be an expression of that assignment. The platforms for expressing your purpose

may vary from one season to another but the assignment itself does not change. Its expressions may also change but your purpose will remain a constant factor in life.

Many professionals today are not fulfilled and satisfied with their careers mainly because of a lack of purpose perspective in the manner they selected their careers. Your career should be an expression of who you are and it must be an opportunity for you to utilize your gifts, talents, passions and other latent abilities. This is why you must first know yourself well before you make your career choice. This question of self-knowledge is fully addressed in the book "Know Yourself: A Foundation for Career and Character Development" which is the first book in the Career Education series.

Dynamic perspective to career planning

You also need to appreciate the career world is so dynamic and ever changing. Did you know for example, that the top ten jobs in the world in 2010 did not exist in 2004? You need to be aware that some of the jobs that are on demand today may not be relevant in the future. Can you imagine what is happening to someone who invested all their time in developing a career that has to do with manufacturing or repairing manual type writers?

The dynamism of the career world means you need to be prepared to continuously develop new knowledge and skills that are relevant to the ever changing career world. Multi skilling is also important as you will have to adapt to the changing socio economic and political environment.

Please note the career listing in this book is not exhaustive. There are other careers that are not mentioned in this book under this career cluster. The ones listed here are only samples.

Local perspective to career planning

When making a career choice, invest effort in developing an understanding of the economic environment in your country as it has a direct bearing on the labour markets. You don't want to spend years developing knowledge and skills in an area where there are limited or no employment prospects. You need to have some insights in terms of employment trends in your local job market.

For example, a country like Zimbabwe did not have diamond mining until a few years ago. Today, however, diamond mining is redefining the economic terrain in ways that have far reaching implications in terms of new career opportunities. Diamond cutting, for example, is a new career pathway that had never been explored before but that is becoming a major area of employment opportunity as Zimbabwe has the fourth largest diamond deposits in the world. We have other examples of countries in countries that have discovered oil deposits like Ghana. Such developments have far reaching economic implications that are reflected in new career opportunities.

Global perspective to career planning

We encourage all learning to also develop knowledge and an appreciation of regional and global economic and employment trends. There is a lot of migration of skills across nations and continents. Developments in other parts of the world will have some bearing on developments in your nation as well. It is wise to have a global perspective even when you are deciding to pursue your career locally.

In this book, we have looked at the Career world from both an African and global perspective. There will be many careers you may see that you have not heard about before. Some of them may be in your country but you have not been aware of it. Other listed careers may not be found in your country. This broad view should help you to appreciate local, regional and global trends in terms of the career world.

Entrepreneurial perspective to career planning

The rate of unemployment has been growing across the nations of Africa and the world. There is need to rethink the traditional approach to career planning and employment. It is important to observe that in most African nations the informal or Small to Medium Enterprises (SMEs) sector is growing rapidly. Many people are creating jobs for themselves and others instead of seeking and waiting for non-existent employment opportunities.

As you plan your career, you need an entrepreneurial perspective where you see yourself as a prospective employer not just an employee.

Content

Agriculture, Food and Natural Resources Career Pathways and Sample Careers

Focus: The production, processing, marketing, distribution, financing, and development of agricultural commodities and resources including food, fiber, wood products, natural resources, horticulture, and other plant and animal products and resources.

Cluster Summary: Careers in the Agriculture, Food and Natural Resources cluster help us to wisely utilize what God gave us through nature. People in these kinds of occupations can work with plants, trees and animals. They work on farms, in veterinary offices, forests or even out at sea. They mow laws, catch fish, grow food and raise animals. You can be an engineer, pest control worker, farmer, tree pruner or forest worker and be in this career cluster.

Below we list careers that fall under this career cluster. Please note that the list is not exhaustive but we have sought to make it as comprehensive as possible.

Career Pathways	Sample Careers
Food Products and Processing Systems (Food Processing and Preserving, Packaging, Distribution, Government Monitoring & Regulation)	●Agricultural Sales ●Agricultural Communications Specialists ●Agricultural-Educators ●Food Scientists ●Meat Processors-Toxicologists ●Biochemists-Nutritionists-Dieticians ●Food Brokers-Food Inspectors ●Meat Cutters-Meat Graders ●Meat Science Researchers ●Food Meal Supervisors ●Cheese Makers ●Microbiologists ●Produce Buyers ●Bacteriologists ●Food & Drug Inspectors ●Bioengineers ●Biochemists ●Food & Fiber Engineers ●Food Processors ●Storage Supervisors ●Fieldman ●Quality Control Specialists.
Plant Systems (Agronomic, Horticulture, Forestry, Turf, Viticulture, Soils, etc.)	●Bioinformatics Specialists ●Plant Breeders and Geneticists ●Biotechnology Lab Technician ●Soil & Water Specialists ●Crop Farm Managers ●Agricultural Educators ●Plant Pathologists ●Aquaculturalists ●Sales Representatives ●Botanists ●Tree Surgeons ●Education & Extension Specialists ●Agricultural Journalists ●Commodity Marketing Specialists ●Grain Operations Specialists ●Custom Hay/Silage Operators ●Forest Geneticists ●Golf Course Superintendents ●Greenhouse Mangers ●Growers ●Farmers ●Ranchers
Animal Systems (Large Animals,	●Agricultural Educators ●Livestock producers ●AI Technicians-Aquaculturalists ●Animal Caretakers-Poultry Managers ●Equine

Small Animals, Wildlife Animals, and Research Animals)	Managers-Veterinarians ●Veterinary Assistants-Feedlot Specialists ●Animal Scientists ●Embryo Technologists ●Livestock Buyers ●Feed Sales Representatives ●Technicians ●Wildlife Biologists ●Livestock Geneticists ●Animal Nutritionists ●Dairy Producers ●Livestock Inspectors ●Feed Sales Specialists ●Animal Health Salespersons ●Meat Science Researcher ●Reproductive Physiologists ●Embryo Transfer Technicians ●Pet Shop Operators
Power, Structural & Technical Systems (Power, Structures, Controls, Geospatial Technology, Computer Systems, Electronics, Hydraulics, Pneumatics, etc.)	Machine Operators ●Electronics Systems Technicians ●Agricultural Engineers ●Agricultural Extension Engineering Specialists ●Heavy Equipment Maintenance Technicians ●Recycling Technicians ●Waste Water Treatment Plant Operators ●Equipment/Parts Managers ●Welders ●Machinists ●Communication Technicians ●Agricultural Applications Software ●Developers/Programmers ●Database Administrators ●Computer Service Technical Support Technicians ●Information Lab Specialists ●GPS Technicians ●Remote Sensing Specialist ●Agricultural Educator
Natural Resources Systems (Habitat Conservation, Forest Products, Parks and Recreation, Mining, Environmental Services, Fisheries, Soil Conservation, etc.)	Cartographers ●Wildlife Managers ●Range Technicians ●Ecologists Park Mangers ●Environmental Interpreters ●Fish and Game Officers Loggers ●Forest Technicians ●Log Graders ●Pulp and Paper Manager Soil Geology Technician ●Geologists ●Mining Engineers Fisheries Technicians ●Water Monitoring Technician ●Hydrologists ●Fish Hatchery Manager Commercial Fishermen ●Fishing Vessel Operators ●Vessel Crew ●Agricultural Educator
Environmental Service Systems (Pollution Prevention, Water & Air Quality, Hazardous Materials, Solid Waste Management, Health & Safety Sanitation, etc.)	Pollution Prevention and Control Managers ●Pollution Prevention and Control Technicians ●Environmental Sampling and Analysis Scientists/Technicians ●Health and Safety Sanitarians ●Environmental Compliance Assurance Managers ●Hazardous Materials Handlers ●Hazardous Materials Technicians / Managers ●Water Environment Managers ●Water Quality Managers ●Waste Water Managers ●Toxicologists ●Solid Waste Disposers / Recyclers ● Solid Waste Technician ●Solid Waste Managers ●Solid Waste Specialists ●Agricultural Educator
Agribusiness Systems (Sales, Service, Farm and Ranch Management,	Salesperson ●Sales Manager ●Banker/Loan Officer ●Field Representative for Bank, Insurance Company or Government Program ●Farm Investment Manager ●Agricultural Commodity Broker ●Agricultural Economist ● Farmer /Rancher/Feedlot

Entrepreneurship, Economics, etc.)	Operator ●Farm Manager ●Livestock Rancher/Breeder ●Dairy Herd Supervisor ●Agricultural Products Buyer ●Animal Health Products Distributor ●Livestock Seller ●Feed and Supply Store Manager ●Produce Commission Agent ●Ag Lenders ●Agricultural Chemical Dealer ●Field Service Representative ●Chemical Sales Representative

Career 1: Agricultural Economists

The primary objective of agricultural economists is to maximize profitability in agriculture to the benefit of society. They pursue this aim through studying and analysing the aspects that influence the agricultural economy and distribution of resources, such as land, raw materials, labour and machinery.

This includes the manufacture and distribution of agricultural means of production; farming itself; the understanding of and, in some cases, the determination of, government policy concerning agricultural and consumption affairs; the purchasing, processing and distribution of agricultural products; the financing of all aspects of agricultural production; the marketing and selling of agricultural products; economic evaluation of agricultural projects; agricultural development; as well as research and giving advice on all these facets.

Agricultural economists advise the agricultural sector on issues such as financing, marketing, agricultural development, policy, research and production. They use mathematical models to develop programmes that can predict the length and nature of agricultural cycles; they do research, and then review and analyze their research and report on it in clear, concise language that can be understood by non-economists.

The field of study of agricultural economics can be divided into seven components, namely:

Production Economy: This involves the relationship between the inputs, production and profit as well as labour utilization.

Financial Management: This includes aspects such as the management process itself, agricultural planning and the principles of financing.

Agricultural Marketing: This involves all aspects of marketing such as the price system and market types.

Agricultural Policy: This involves the interaction between agriculture and other sectors, the trade policy, production policy, price and income policy and the government functions.

Agricultural Development: This is about the role which agriculture plays in the development of the economy as well as the role of the government and private initiative.

Operational Research: This is the application of economic simulation and optimization techniques on agricultural problems.

Agricultural Environmental Economics: The economic evaluation of the interaction between agricultural production processes and the natural environment.

Agricultural economists work both indoors, in offices and such places as conference venues, and outdoors, doing research and consultations on farms. They often need to travel to perform research on special projects. They need to be comfortable working with government, national and international trade policies and regulations, production costs and techniques, market trends, economic principles and theories, statistical data and other financial information.

Some fulfilling and satisfying aspects of this career
- variety of research projects
- meeting different people
- working in various locations

Some demanding and challenging aspects of this career
- very detailed work
- heavy responsibilities to furnish correct information at all times
- working to deadlines
- sometimes having to work overtime.

Purpose Orientation
An agricultural economist should:
- be interested in the environment, particularly as it relates to agriculture;
- be interested in economics;
- have a high mathematical, analytical and scientific aptitude;
- be creative, thorough and analytical;
- have good communication, research and organisational skills.

School Subjects
Advanced Level certificate meeting degree requirements for a degree course
Each University will have its own minimum entry requirements.

Compulsory Subjects: Mathematics
Recommended Subjects: Physical Sciences, Life Sciences, Economics and Agricultural Sciences

Training
Degree: the minimum qualification is a BSc (Agric) degree or a B Com (Agricultural Economics) degree. The BSc (Agric) degree takes four years to complete and it prepares candidates for careers in which not only knowledge of economic principles is necessary but also biological / agricultural knowledge. Besides careers in marketing and financing, the BSc (Agric) degree is especially suitable for persons in farming, input and processing industries.

The B Com (Agricultural Economics) degree takes three years to complete. The aim of the degree is to train experts for careers in Agricultural Economics in which biological / scientific knowledge is less important, such as in most facets of marketing, financing, commerce and

income and trade policy.

Employer

- agricultural boards and development corporations
- consultants and development organizations
- financial houses and commercial banks
- insurance companies
- commercial and manufacturing companies concerned with agricultural products, such as the fertilizer-, chemical-, machinery-, forage-, meat processing, fruit trade and processing and food preservation and canning industries
- various government departments, such as the Departments of: Agriculture; Foreign Affairs; Trade and Industry; Labour; Environmental Affairs and Tourism; Water and Forestry
- self-employment - many agricultural economists set up their own consultancies

Career 2: Agricultural Engineers

Agricultural engineers, also sometimes known as natural resource engineers, apply engineering principles of science and technology, as well as knowledge of agricultural practices, to solve problems relating to sustainable agricultural production, the environmental impacts of intensive agriculture and the post-harvest handling of agricultural products. They manage living things and life-giving resources in such a way as to protect and preserve them by using mechanical, civil and electronic engineering skills.

They design equipment, buildings, and dams, which can utilize the environment and resources more effectively, while ensuring their renewability and sustainability. Some practise in areas such as forestry, food processing, urban and rural development, agricultural machinery design and manufacturing.

Agricultural engineers design agricultural machinery and equipment and develop methods to improve the production, processing and distribution of food and other agricultural products. They are involved in the conservation and management of energy, soil and water resources. These engineers design and use instruments to study the effects of light, humidity and temperature on plants and animals. They also design structures for crop storage and animal shelters. Some teach at universities and universities of technology.

Agricultural engineering provides challenging career opportunities in various fields such as research, consulting, development, testing, engineering surveys, management, planning, teaching and counselling.

Areas of specialization in agricultural engineering include:

Water Supply And Irrigation: Effective utilization of available resources is of primary importance. In this field the agricultural engineer is involved with hydrology and farm dam design; canal, pipeline and pump systems; sprinkler, drip and micro-irrigation systems; mechanized irrigation; surface irrigation; and drainage.

Agricultural Mechanization: Agricultural machinery plays an important role in the production of food. Agricultural engineers assist producers, contractors and farmers with: tractor and other engine tests; development of new machinery; design of agricultural equipment; planning and evaluation of mechanization systems; agricultural energy research and consultation; and appropriate technology for developing areas.

Soil Conservation*:* Agricultural engineers' civil engineering knowledge is essential for the planning and designing of: conservation and reclaiming structures; systems for the safe discharge of flood water; contour and other appropriate cultivation systems to safeguard vulnerable agricultural lands against erosion and specially adapted farming practices to

enhance soil conservation.

Agricultural Buildings And Structures: This field includes the following: buildings for the intensive production of meat, dairy products, poultry and eggs; buildings with controlled environments such as green- and glass- houses, nurseries, and aquaculture; buildings for the storage and processing of products such as grain silos and dryers for maize, tobacco and fruit; and plastic sheeted tunnels for intensive cultivation of flowers and vegetables.

Food and Fibre Processing: Processing involves the preparation of commodities that are used by human beings or animals. Agricultural engineers guide entrepreneurs in the following: drying, milling, mixing, compacting, cooling, heating and liquidizing of agricultural products; handling, storage, transportation and packing systems, for example, of fruit, vegetables and meat.

Work settings vary from indoors, in modern well-equipped laboratories and offices, to outdoors at farm sites. They may also vary according to the type, size, location and financial resources of the employer.

Some fulfilling and satisfying aspects of this career
- working outdoors
- problem-solving
- having a variety of specialities available
- earning good money
- achieving prestige

Some demanding and challenging aspects of this career
- working outdoors in bad weather
- not always being able to solve a problem
- having to continuously study to keep up with latest developments

Purpose Orientation
An agricultural engineer should:
- have aptitude for and interest in biology, including the soil, plants and animals
- have the ability to identify, analyze and solve problems
- have good oral and written communication skills
- have aptitude for computing and design
- have ability to work without supervision and accept responsibility
- be logical and practical
- be inventive and innovative
- be creative and analytical
- have general scientific interest
- be enthusiastic, have perseverance and patience with details

School Subjects
Advanced Level Certificate meeting degree requirements for a degree course
Each University or College will have its own minimum entry requirements.

Compulsory Subjects: Mathematics, Physical Science
Recommended Subjects: Agricultural Sciences, Life Sciences, Engineering and Technology

Training
Degree: This is a four-year BSc (Eng) degree. The completion of the degree and a minimum of three years' in-service training leads to registration as a professional engineer.

Employer
- Department of Agriculture
- Manufacturers of agricultural remedies and food companies
- Manufacturers of farm equipment and supplies
- Government and private research institutes
- Universities, colleges and universities of technology
- Consulting firms
- Agricultural control boards and unions
- Agricultural co-operatives
- Large farming enterprises, such as estates
- Self-employment - skilled and entrepreneurial agricultural engineers can start their own consulting or manufacturing businesses

Career 3: Agricultural Extension Officers

Agricultural extension officers are intermediaries between research and farmers. They operate as facilitators and communicators, helping farmers in their decision-making and ensuring that appropriate knowledge is implemented to obtain the best results.

Agricultural extension officers need to communicate to farmers agricultural information on natural resources, animals, crops, on how best to utilise the farmland, how to construct proper irrigation schemes, economic use and storage of water, how to combat animal disease, and save on the cost of farming equipment and procedures. They need to ensure that farmers understand this information and use it on their farms in order to obtain the best production.

Agricultural extension officers often propagate new farming methods. This always takes place in conjunction with the farmers, who make the final decision. They also research food, fibre and animal products in conjunction with agricultural scientists. They assist cattle farmers, and guide and assist veterinary surgeons in the treatment of different animal diseases. Each agricultural extension officer is linked to one of the agricultural development centres throughout the country, which render agricultural services to farmers.

Agricultural extension officers encourage farmers to adopt new, improved methods of farming, using a variety of methods to reach farmers i.e. organising study groups for farmers, 'farmer days', demonstrations, lectures and literature, as well as informing the media. The best method though, is through personal contact with farmers on their farms.

It sometimes happens that an agricultural extension officer must re-plan a farm in conjunction with the farmer. All the resources on the farm are then thoroughly investigated. Sometimes it is necessary for agricultural extension officers to develop recovery programmes for eroded soil, protect cultivated land against erosion and develop a new pasture system.

They propagate farming and development programmes aimed at reaching marginalised farmers or those who have little access to information and extension services. They do this in collaboration with farming communities, helping them to help themselves to become more self-reliant and independent.

Some fulfilling and satisfying aspects of this career
- working with people
- helping to improve the quality of their lives, by helping them achieve higher yields which in turn provide better returns

Some demanding and challenging aspects of this career
- planning and implementing various programmes can become time consuming and very taxing

Purpose Orientation
- good communication and interpersonal skills
- possess persuasive abilities
- tact
- keen interest and knowledge of farming and the environment
- enjoy working outdoors

School Subjects
Advanced Level Certificate meeting degree requirements for a degree course
Ordinary Level Certificate meeting diploma requirements for a diploma course

Each University or College will have its own minimum entry requirements.

Compulsory Subjects: Mathematics, Physical Sciences are usually required
Recommended Subjects: Life Sciences, Geography, Agricultural Sciences, Information Technology

Training
The minimum requirement for appointment as an agricultural extension officer, is a BSc (Agric) or BAgric degree.

Employer
- Department of Agriculture
- various industries and manufacturers of agricultural products and farming co-operatives
- own business, working as a consultant
- pest control companies
- corn-chandlers
- agricultural co-operations
- self-employment, working as a consultant

Career 4: Agricultural Inspectors

As agriculture is of the utmost importance for African economies and agricultural products are exported to other countries and the fact that the African population is dependent on agricultural products for food, it is important to maintain high quality standards. Agricultural inspectors are technicians who inspect and evaluate the quality and standard of various agricultural products, used domestically or exported.

There are three areas in which an agricultural inspector may specialize:

Plants: Plant and quality control technicians are responsible for plant health services, plant and seed control services and analysis services. These people control the quality and marking requirements of fresh plant, animal, and liquor products and also focus on the control of plant diseases and harmful insects.

Meat: The primary function of meat inspectors is to ensure that slaughtered animals are fit for human consumption. It is important to inspect the levels of hygiene and cleanliness in abattoirs.

Animal Health: Animal health technicians assist veterinary surgeons in preventing and controlling diseases through a variety of methods, including research into these diseases and the production of vaccines and dips. These people ensure that farmers respect the laws regarding animal health and inform and guide farmers in the control of animal diseases.

Some fulfilling and satisfying aspects of this career
- contributing to making South Africa's economy stronger
- meeting various types of interesting people
- gaining more experience and knowledge about various types of disease

Some demanding and challenging aspects of this career
- extensive travelling can be exhausting
- being away from home when farmers are far away
- having to work in various weather conditions

Purpose Orientation
An agricultural inspector should:
- have an interest in the environment (animals and plants in particular);
- have good communication and persuasive skills in order to effectively guide and inform farmers;
- be able to work under different conditions.

School Subjects
Ordinary Level Certificate meeting diploma requirements for a diploma course

Each University or College will have its own minimum entry requirements.

Compulsory Subjects: Mathematics, Physical Science
Recommended Subjects: Life Sciences, Agricultural Sciences

Training
Diploma: Prospective agricultural inspectors must have an applicable university diploma in Animal Health; Agriculture: Animal Production, Agriculture: Plant Production or Meat Hygiene.

Employer
- Department of Agriculture

Career 5: Agricultural Scientists or Agriculturists

Agricultural scientists or agriculturists study farming and endeavour to increase productivity. They look for ways to improve quality, but in a less labour-intensive way. They also try to conserve soil and water and make farming more safe and effective.

Agricultural science is similar to biological science in that it makes use of Mathematics, Chemistry, Physics and Biology to solve agricultural problems. To obtain knowledge about biotechnology, agricultural food scientists often work closely with biological scientists. They communicate new ideas to farmers and technicians.

Agricultural scientists can specialize in various fields such as agronomy, biochemistry, zoology, physics, genetics, soil science, entomology, agricultural extension, agricultural meteorology, botany, dairy science, animal science, agricultural economy, agricultural engineering, pasture science, oenology and wildlife management.

The agricultural scientist concerned with crop science investigates field crop problems and develops new and improved growing methods to obtain higher yields or better quality. They may specialize in a specific crop, group of crops, production, weed and pest control or irrigation.

The agricultural scientist concerned with animal science conducts research on animals, and develops scientific methods of breeding, caring for, and managing farm animals. They specialize in certain types of animals, their breeding, physiology, or nutrition or the products of animals such as meat, butter or eggs.

Agricultural scientists work in a variety of environments, again depending on the specialization; for example: office environments, in laboratories, test kitchens or dairies and outdoors, particularly when doing research. They use scientific equipment.
An agricultural technician processes the information from the agricultural scientist so farmers can use it. They advise farmers on farming methods. Sometimes they are also involved in agricultural research. Farmers use existing knowledge to produce food and fibres without harming the environment. Training, counselling and research are important tasks of an agriculturist.

Some fulfilling and satisfying aspects of this career
- knowing you are contributing to improving agriculture
- discovering new things
- being able to solve problems
- being able to utilize resources fully
- working with other people
- working outdoors.

Some demanding and challenging aspects of this career
- hard work
- sometimes difficult or unpleasant environments in which to work
- a results-driven career, with time and other pressures; and the success of projects often depend on making the correct recommendations

Purpose Orientation

- ability to perform research
- ability to work independently
- above average intelligence
- creative and innovative thinker
- interest in agriculture - soil, plants and animals
- good communication and interpersonal skills
- practical
- patience and perseverance

School Subjects
Advanced Level Certificate meeting degree requirements for a degree course
Ordinary Level Certificate meeting diploma requirements for a diploma course
Each University or College will have its own minimum entry requirements.

Compulsory Subjects: Mathematics, Physical Sciences

Recommended Subjects: Accounting, Economics, Agricultural Sciences, Life Sciences

Training
Degree: Most universities in Africa offer a degree and diploma in Agriculture

Employer
- universities and colleges
- government and private research institutes
- animal food producers
- Department of Agriculture
- commercial organizations such as manufacturers of agricultural remedies
- industrial companies
- colleges and universities
- control boards and agricultural unions
- co-operatives
- large farming undertakings
- self-employment - as consultants, advisors and farmers

Career 6: Agricultural Technicians

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

Agricultural technicians assist agriculturists and farmers with a variety of tasks related to different aspects of agriculture. These include planning, research and the application of agricultural knowledge. They help farmers to make the best use of their land without damaging it and may suggest terracing land in the event of erosion or growing hedges to act as windbreaks.

They serve as technical advisers on soil and water conservation committees. They assist veterinary surgeons and farmers in the treatment of diseases and the general handling of animals. They also instruct on the classification and grading of skins, wool, and mohair.

There are three main kinds of agricultural technicians, namely agricultural resource technicians, agricultural extension technicians and agricultural research technicians. Depending on the field chosen, the nature of the work will be as follows:

Agricultural Resource Technician: The agricultural resource technician works together with the agricultural resource officer. They are involved in the classification, description and plotting of a region's natural resources.

Agricultural Extension Technician: The agricultural extension technician assists the agricultural extension officer. They collect agricultural information to determine the needs for agricultural extension. This information is then used to plan agricultural extension activities. The agricultural extension technician is also involved in the classification of agricultural resources and the planning of farms. They advise farmers on specific farming methods.

Agricultural Research Technician: The agricultural research technician helps the agricultural researcher with their research but can also undertake their own research project in one of the following fields: Botany, Agricultural Microbiology, Analytical Chemistry, Zoology, Veterinary Science, Food Technology, Agricultural Meteorology and Soil Science.

Some engineering technicians, namely civil, mechanical, electrical/electronic and civil agricultural engineering technicians, are also involved in the agricultural industry. They use their knowledge of engineering to solve problems with regard to irrigation schemes, soil conservation, agricultural structures, agricultural mechanization and the use of electronics and electricity.

Some fulfilling and satisfying aspects of this career
- being able to solve problems

- being able to utilize resources fully
- being able to work without supervision
- working with other people
- working outdoors

Some demanding and challenging aspects of this career
- a results-driven career, with time and other pressures, the success of projects often depend on making the correct recommendations

Purpose Orientation
An agricultural technician should:
- have an interest in agriculture - soil, plants and animals;
- enjoy nature and working outdoors;
- have good communication and interpersonal skills;
- work well with others;
- be practical and have good problem-solving skills;
- be enthusiastic and responsible;
- be organised and observant;
- have patience and perseverance;
- have good health and physical stamina.

School Subjects
Ordinary Level Certificate meeting diploma requirements for a diploma course

Each University or College will have its own minimum entry requirements.

Compulsory Subjects: Mathematics, Physical Science
Recommended Subjects: Life Sciences, Agricultural Sciences

Training
To become an Agricultural Resource Technician or an Agricultural Extension Technician, the minimum requirement is the Diploma in Agriculture: Resource Utilization, offered by most leading Universities in Africa.

To become an Agricultural Research Technician, any of the following Diplomas at a university of technology will lead to eventual qualification:

Agricultural Research Diplomas in Botany; Nature Conservation; Analytical Chemistry; Agriculture Diplomas in Animal Production; Veterinary Technology or Food Technology.

Engineering Technicians need a National Diploma in Electrical, Civil or Mechanical Engineering.

Employer

- Government Departments of Agriculture, Environment and Tourism
- Veterinary and botanical laboratories
- Various research stations
- Self-employment, as consultant to farmers and agricultural co-operations

Career 7: Agronomists

Agronomy is the science of the successful growing of certain land crops, whether it is under dry land conditions or irrigation. Crops include: corn, maize, grain sorghum, peanuts, sunflower, cotton, sugar cane, forage crops and fruit.

Agronomists develop and implement production systems so that economical production is maximized without harming the environment.

They investigate field-crop problems and develop new and improved growing methods for higher yields or better quality. They advise farmers about the best crops and cultivars, crop rotation, fertilizers, field drainage, irrigation, and harvesting techniques and provide information on plant diseases, weed killers and the biological control of insect pests.

Aspects such as the choice of crop and cultivar, preparation of soil, planting of crops, irrigation, protection of the harvests and the harvesting and grading of all agricultural crops are all studied by agronomists. The aim is to effectively manipulate the interaction between plant and environment through the use of correct management practices.

Soil is cultivated and fertilised according to the conditions each crop demands of the soil. Agronomists take climatic conditions of specific regions into consideration since this determines which cultivar should be planted, as well as the planting-time and planting-techniques that should be used.

Plants need to be protected against weeds, diseases and insects. If crops are irrigated, the right amount of water at the right stage of development needs to flow. Finally, crops need to be harvested at the right stage with the correct harvesting techniques to ensure the best quality.

Some agronomists become representatives of manufacturers and show farmers the most effective uses for new products. Some travel to neighbouring countries to help the people increase their food production by means of new techniques.

Other agronomists work on developing new types of grain, legumes, and grasses with techniques that will increase and improve food production and help replenish soil.

Some fulfilling and satisfying aspects of this career
- working outdoors
- helping others
- variety of work
- opportunities to travel

Some demanding and challenging aspects of this career
- working in remote areas
- sometimes working in unpleasant weather conditions
- frustration with failed research

Purpose Orientation
An agronomists should:
- have interest in agriculture - soil and plants in particular
- enjoy nature and working outdoors
- have scientific interest
- have good aptitude for biology
- have ability to communicate ideas clearly, both in speech and in writing
- have good interpersonal skills, able to work well with people
- be practical and able to adjust well to change
- be enthusiastic and responsible
- have patience and perseverance

School Subjects
Advanced Level Certificate meeting degree requirements for a degree course

Each University or College will have its own minimum entry requirements.

Compulsory Subjects: Mathematics, Physical Science
Recommended Subjects: Life Sciences, Geography, Agricultural Sciences

Training
Degree: The minimum requirement is a four-year BSc (Agric) degree with Agronomy or Plant Production as a major subject. Other subjects that may be taken are Plant Physiology, Soil Science, Plant Diseases and Meteorology

Employer
- Government departments of Agriculture, Water and Forestry
- Manufacturers of fertilisers, weed killers and agricultural implements
- Seed and plant producers
- Teaching institutions such as universities and agricultural colleges
- Agricultural co-operatives
- Self-employed (consultant)

Other career possibilities include research, agricultural extension, education and training, as well as the management of agricultural projects.

Career 8: Animal Attendants

Animal attendants take care of animals and all aspects associated with this, e.g. feeding, cleaning, dipping and giving medicine. When working on a small holding, animal care attendants usually perform all these duties, but if they work with lots of animals, then their duties are usually split up, e.g. one attendant will be responsible for weighing and mixing the recommended feed before they feed the animals.

All animals are on special diets and their attendants need to follow this diet in order to keep the animals healthy. Another attendant would clean out the cages, stables or barns, while a third attendant would take care of the animals by exercising them - horses for example, or watching the animals graze, e.g. cows or deer. Some caretakers specialize in giving the animals their medication or dipping them to prevent ticks and fleas from harming them. Animal attendants need to report any problems to the person in charge and are then advised what to do. They also change bandages whenever an injury has occurred. They perform similar duties to a veterinarian assistant.

In their work, animal attendants use cleaning equipment and materials, such as brooms; dips (for fleas and ticks); medicine; and general office equipment, eg. computers to keep track of things. They work mostly outdoors with the animals.

Some fulfilling and satisfying aspects of this career
- meeting lots of people, who can expand the business
- helping animals, especially when they are in distress
- generally, the satisfaction of caring for and raising animals

Some demanding and challenging aspects of this career
- difficult animals can cause frustration
- working in various weather conditions
- having to work irregular hours at times, especially if something goes wrong with the animals

Purpose Orientation
- responsible and reliable
- patient and kind
- friendly and helpful
- sincere love of animals
- self-motivated

School Subjects
No set level of school required, but it is suggested that you progress as far as you can at school.

Compulsory Subjects: None
Recommended Subjects: Life Sciences and Physical Sciences

Training
In-service training under the supervision of an experienced animal care attendant.

Employer
- kennels or catteries
- farmers
- zoos
- stables and stud farms
- aviaries
- animal shelter organizations, eg. SPCA, animal anti-cruelty and wildlife orphanages

Career 9: Animal Behaviourists

Animal behaviourists diagnose and consult on behavioural disorders in animals and assist in preventing their inappropriate behaviour. They are also known as Animal Psychologists, Pet Psychologists and Animal Therapists.

Inappropriate behaviour includes aggression (intra-dog, intra-species or towards humans), anxiety, destructive chewing, digging, disobedience, escaping, excessive barking, fighting, inappropriate toileting, incompatibilities, manias, neuroses, phobias, self-mutilation, tail chasing etc.

Animal behaviourists discuss their animal's behaviour with clients and identify which aspect of the animal's behaviour the client is unsatisfied with. They determine the factors that are influencing the animal's behaviour and work out the appropriate therapy plan for the animal. They may be directly involved with the animal's therapy and may also adjust the animal's environment to manage difficult behaviour.

In some cases, they consult with other animal professionals and may receive and answer enquiries from the public. Some animal behaviour consultants run classes for people and their pets, while others teach at universities or polytechnics.

In rare cases, they may be involved in court cases and sometimes work with organizations such as the Department of Conservation or animal abuse regulation authorities. Some give talks to the general public, media, schools and tertiary institutions and write articles for magazines and publish or contribute to research papers.

Consultants usually specialize in certain animals, such as dogs, cats, horses, birds, cows etc. They strive to improve good human-animal interaction and conduct educational talks, TV, and radio shows. To study the mental and behavioural characteristics of animals, they need to have a sound background on the particular species being studied.

Animal behaviourists offer other services such as pet matching, character assessment, re-homing of animals, family counselling, animal training for stage and screen, grooming, breeding and showing of animals.

They attend courses and seminars, and are expected to keep up-to-date with developments in animal behaviour.

Animal behaviourists use animal training aids such as leads. They also make use of a car or van, and may use kennels and cleaning equipment. They work with animals inside in consultancy clinics and outside in most weather conditions.

Animal behaviourists work long, flexible and irregular hours to suit their clients' needs. They may also work weekends and be on call.

Some fulfilling satisfying aspects of this career
- working both indoors and outdoors
- great job satisfaction

Some demanding and challenging aspects of this career
- financially not very rewarding (most behaviour consultants also hold other jobs)
- working with creatures that the owners cannot always control
- working in various weather conditions
- in some cases a good deal of travelling, thus away from home a lot
- emotionally draining

Purpose Orientation
Animal behaviour consultants should:
- have a passion for animals, especially companion animals
- have excellent human communication skills
- have a sense of humour
- have incredible patience with both people and animals
- be adaptable, dedicated and self-motivated
- be emotionally well-balanced
- be confident and assertive to be able to deal with people and animals
- have good business and management skills to run own business
- be strong enough to control a large animal
- have objectivity - ability to distance oneself from others' problems

School Subjects
Advanced Level Certificate meeting degree requirements for a degree course
Ordinary Level Certificate meeting diploma requirements for a diploma course

Each University or College will have its own minimum entry requirements.

Compulsory Subjects: Mathematics, Physical Science
Recommended Subjects: Life Sciences

Training
A BVSc degree is necessary to pursue a career as an animal behaviour consultant. Alternatively a diploma in veterinary nursing at University followed by a part-time theoretical course in Companion Animal Behaviour at Animal Theory Behaviour Consultants of Southern Africa. Training is done at university level.

Employer

- veterinary clinics and hospitals
- universities and universities of technology
- self-employment

Career 10: Animal Breeders, Or Artificial Insemination Technicians

Animal breeders, or artificial insemination technicians as they are also known, carry out the process of artificially inseminating livestock.

They check they have all the equipment they need to use; travel to farms; check the farmer's instructions regarding the livestock to be inseminated; carry out insemination processes; and keep careful records of the tasks performed.

Animal breeders use semen banks and straws of semen. They use pipettes to insert semen into animals and a large sheath on their left arm to assist with this process. Some use hand-held computers to keep records and check their duties. They usually wear overalls and gumboots.

Animal breeding technicians need to know about livestock anatomy in order to carry out their duties. They need to be able to organize their time efficiently. They may also need to have some ability to work with computers, a reasonable level of literacy and good handwriting to complete records.

They normally work from home and travel to the farms they serve. Some may cover a small local region, while others travel all over the country.

During breeding seasons, animal breeding technicians can sometimes work seven days a week. Working hours are usually from very early in the morning and can continue late into the night, depending on the number of animals to be inseminated. As the job tends to be seasonal, technicians often have another job as well.

Animal breeding technicians spend most of their time working with farmers and sometimes veterinary surgeons. They may work with other technicians to inseminate large herds. Once they have gained experience, they usually work with little supervision and may also progress to a supervisory position.

Some fulfilling and satisfying aspects of this career
- performing a very useful function
- generally, the satisfaction of working with animals

Some demanding and challenging aspects of this career
- difficult animals can cause frustration
- working in various weather conditions
- large amount of travelling involved
- having to work irregular hours at times
- seasonal aspect of the work

Purpose Orientation
- a clean and tidy appearance
- able to relate well to farmers and animals
- able to concentrate for long periods of time
- good manual dexterity.
- physical and mental stamina
- a valid driver's licence

School Subjects
Advanced Level Certificate meeting degree requirements for a degree course
Ordinary Level Certificate meeting diploma requirements for a diploma course

Each University or College will have its own minimum entry requirements.

Compulsory Subjects: Mathematics, Physical Science
Recommended Subjects: Life Sciences

Training
Degree: Diploma or BSc (Agric)

Employer
- companies providing artificial insemination
- government departments, such as Department of Agriculture
- self-employment

Career 11: Animal Inspectors

Animal inspectors work for organisations that are involved in the rehabilitation of abandoned, neglected and abused animals.

Their time is taken up with investigations of animal abuse cases and inspections of properties for adopted animals, as well as the inspection of breeding facilities, pet shops, security companies, abattoirs, and any other places that have animals on the property or where animals are in any way involved.

With the variety of inspections that need to be conducted, working conditions vary greatly. They can be "wet, hot, filthy, tiring, indoors, outdoors, stressful, fun, difficult, heartbreaking …"

Their daily inspections also provide both funny and frightening moments. People get aggressive when they feel guilty, and working with dangerous or aggressive animals can be frightening.

Although this career path can be daunting at times, for dedicated animal-lovers it can be a dream job: As an animal inspector has said, "Saving animals will always be my goal and my passion. We should all fight for animal rights. God gave us the gift of animals, so it is our responsibility to look after them."

Some fulfilling and satisfying aspects of this career
- satisfaction when abused animals are rescued
- being able to follow your passion

Some demanding and challenging aspects of this career
- working long hours
- job is time-consuming and challenging
- having to deal with animals that cannot be saved

Purpose Orientation
- have a great love and compassion for animals
- be able to work with difficult people
- be mentally strong enough to deal with emotionally upsetting situations
- be reasonably fit

School Subjects
Advanced Level Certificate .

Compulsory Subjects: None

Recommended Subjects: Life Sciences

Training
To become an animal welfare inspector, you need to have completed Matric and have a valid driver's licence. You also need to complete the inspector's course. This makes it a possible career path for people who want to work with animals, but don't want to become veterinary surgeons.

Employer
- animal welfare organisations
- government departments

Career 12: Animal Nutritionists

Animal nutritionists analyse the nutritional content of food and supplements, and devise nutritious, economical feeding programmes for all animals, from captive tigers to birds at bird feeders.

It is important for captive animals to be fed correctly. Whether they are pigs being bred for bacon or show dogs looking for that first place ribbon at a contest, the healthier an animal is, the longer it will live, the more receptive it will be to affection, and, in the case of food animals, the tastier and more nutritious the meat will be for human consumption.

Animal nutritionists assess the nutritional and economic value of different feed products and combinations, investigate nutritional disorders, find ways to correct such disorders through the use of the correct food, write reports and give presentations

They advise animal owners on nutritious diet plans, they tell farmers about healthy, cost-effective ways to feed their animals. They create new combinations of supplements and foods for manufacturers of livestock feed.

They also advise farmers and other animal owners on different feed requirements for pregnant animals, very young and older animals, as well as for sick or injured animals. They may discuss environmental issues related to feed production and waste management. They test and retest products, feeding plans and programmes, to ensure their quality and effectiveness. If they work for a company that creates such products to sell, they may also market their products.

They travel often if they work in agribusinesses, advising farmers and feed companies, or in order to conduct research.

Animal nutritionists may work closely with one type of animal at a time in an office, or they may devise feed plans for a farm of 3000 cattle. They may not even get near animals when carrying out research, but research for a feed production company. They work on their own, or alongside other nutritional scientists and animal health practitioners.

Animal nutritionists are important because they not only protect the animals we keep as companions, but they also ensure the well-being of animals many of us eat. They ensure that the animals are healthy, making sure that consumers do not get sick from diseased or malnourished animals that were not fed in accordance with a well-researched diet plan.

Some fulfilling and satisfying aspects of this career
- meet many different types of people
- normally work regular hours
- opportunity to work outdoors

Some demanding and challenging aspects of this career
- may have to travel a lot
- dealing with difficult clients

Purpose Orientation
- scientifically minded
- have a good understanding of nutrition
- enjoy working with animals
- thorough, methodical and interested in research
- be self-confident
- have good communication skills
- able to take both criticism and praise
- able to work well independently and as part of a team
- have an inquiring mind

School Subjects
Advanced Level Certificate meeting degree requirements for a degree course

Each University or College will have its own minimum entry requirements.

Compulsory Subjects: Mathematics
Recommended Subjects: Life Sciences, Physical Sciences, Agricultural Science

Training
Degree: Animal nutritionists require a university degree in agricultural, horticulture, veterinary science, equine science, medicine, biology or nutrition, or a combination of some of these, such as nutrition and agriculture.

Postgraduate: For specialisation in certain species of animals, a Masters degree is required. They may also need to register with a professional body, depending on where they wish to practice.

Employer
- veterinary hospitals or animal clinics
- research departments at universities
- animal feed production companies
- governmental agricultural initiatives
- freelance consultants to farmers and animal owners

Career 13: Animal Scientists

Animal scientists are concerned with the study, rearing and management of domesticated animals. They use their expertise to assist in the growth and development of the agricultural industry.

They conduct research on livestock and the products they produce such as meat, milk, eggs, fibres, leather, and a variety of products essential to man.

Animal scientists advise on the production and presentation of animal products. They conduct research in the areas of animal selection, breeding, feeding, housing and disease control. Some may control breeding practices to improve strains of animals.

Animal scientists make an important contribution in the following areas: assisting the agricultural industry to effectively utilize the natural resources in the country; vital research in the problems of breeding, feeding, housing and disease control; conserving and ensuring the rich biodiversity of animal species found in the country; keeping the country up-to-date with developments in biotechnology in order to remain globally competitive.

The nature of the work varies from working directly with animals and research in laboratories, to travelling in order to consult various parties in the industry. Some animal scientists work in offices and lecture rooms of agricultural colleges and universities or in offices of control boards. Others spend time outdoors working with animals on agricultural experimental farms, company farms, or private research stations.

Areas of specialization include: animal nutrition; animal breeding; animal management; and quality control of meat.

Some fulfilling and satisfying aspects of this career
- working with animals
- the challenge and variety of the work
- good opportunities for promotion
- opportunities to specialize
- the possibility of doing research in areas of one's personal interest

Some demanding and challenging aspects of this career
- the frustration involved in doing research work
- the need for advanced, post-graduate degrees to obtain more responsible positions

Purpose Orientation

An animal scientist should:
- be curious and imaginative
- have scientific aptitude
- be thorough and patient
- enjoy working with animals
- have good communication skills both in speech and in writing
- have ability to work independently or as part of a team
- have good health, physical stamina

School Subjects
Advanced Level Certificate meeting degree requirements for a degree course
Ordinary Level Certificate meeting diploma requirements for a diploma course

Each University or College will have its own minimum entry requirements.

Compulsory Subjects: Physical Science
Recommended Subjects: Life Sciences

Training
Degree: A four-year BSc (Agric) degree

Employer
- Research organisations
- Agricultural Research Council
- Companies involved in farming
- Manufacturing industries
- The Department of Agriculture
- Agricultural colleges and universities
- Agricultural advisors
- Livestock industry
- Agricultural consultants

Career 14: Animal Trainers

Animal trainers teach animals to perform and compete in shows, perform tricks and to obey commands. Most animal trainers specialize in training one animal type but some work with several types. Animal trainers set up programmes that consist of repetition and reward, to teach animals to behave in a particular manner and to do so consistently.
Before training starts the trainer will evaluate the animal's ability and temperament to determine which method of training would be appropriate and whether the animal can be trained. They then repeat routines continuously until the animal does what is required. The animal is then rewarded accordingly.

Animal trainers are also responsible for grooming, exercising and feeding the animals. They either do this themselves or they ask an assistant or worker to do it.

They sometimes direct or organize animal shows, for instance a circus, television or film performance. Here they guide the animal in its performance. Some animal trainers train guide-dogs or dogs used in the search of drugs or bombs in the army or police force.

Some fulfilling and satisfying aspects of this career
- working outdoors and with animals
- helping animals in distress
- seeing how animals respond to teaching is a rewarding factor
- training a wild animal can also be emotionally satisfying

Some demanding and challenging aspects of this career
- frustration when animals do not respond to training
- having to work long hours in all kinds of weather conditions

Purpose Orientation
- keen interest in and love of animals
- extremely patient and kind
- friendly and caring
- managerial traits
- physically strong and fit

School Subjects
No set level of school required, but it is suggested that you progress as far as you can at school

Compulsory Subjects: None
Recommended Subjects: Biology and Science

Training
No set level of school required, but it is suggested that you progress as far as you can at school.

Compulsory Subjects: None
Recommended Subjects: Life Sciences and Physical Sciences

Employer
- circuses
- zoos and aquariums
- racecourses
- stables
- armed services
- self-employment

Career 15: Beekeepers / Apiculturists

Beekeepers look after apiaries or beehive sites, with the main aim of producing honey. They are also known as apiculturists, bee farmers or apiarists. The hives produce honey, wax, pollen and other products for sale to the public. They also provide pollination services to horticultural and seed crop producers. Bees are an excellent aid in pollination, thus farmers growing fruit, vegetable crops and seeds make use of this service.

Apiarists need to have a thorough knowledge of the yearly cycle and habits of bees, plant types and life cycles, and how plants produce nectar. They need to be able to identify bee disease and know about different methods of disease control and how to introduce a queen bee into a colony.

Beekeepers' tasks vary depending on the season. In the breeding season (spring) they: check the food supply, health and laying ability of the queen bee and check the hives to prevent swarming. They breed replacement queen bees; shift hives to orchards and collect the hives when the flowering period is over. During spring they might also provide a pollination service by renting hives to orchards / farms.

In summer they visit apiaries and place boxes on hives to prepare for honey production. In autumn (harvest time) they take bees off combs or use a blower and collect the honey. They extract honey from the comb using extractors, containers that rotate quickly separating the comb from the honey at the honey-house and may send the honey away in containers for further processing into retail packs, usually glass jars. They may also collect other bee products, such as pollen and wax, and collect and package bees for export.

Once hives have been prepared, sheets of wax embossed with a honeycomb imprint are inserted. During autumn, they also feed hives to ensure that they have sufficient food until spring.

Throughout the year beekeepers build and repair hives and divide colonies for replacement or to increase bee numbers. They continually inspect hives using hive tools and a smoker and check hives for pests, parasites and diseases, destroying diseased bees and hives where necessary. They may analyse and test micro-organisms themselves or send them away to be analysed.

They need heavy machinery, such as trucks and tractors, driving skills; mechanical skills for repairing equipment are also useful. They should have carpentry skills for building and repairing hive boxes and be familiar with methods of building hives etc.

If involved in production and marketing of other bee products, apiculturists also need to be able to assess the quality of bee products such as wax, royal jelly and propolis, and know how

to handle them. They need marketing and business skills, especially if involved in retail or business management.

Anyone can keep a beehive, but each apiary site must be registered with the Ministry of Agriculture and Forestry to help monitor diseases that affect bees. Many apiarists struggle to make a living from just selling honey, so they may work as apiary advisors or laboratory diagnosticians.

Some fulfilling and satisfying aspects of this career
- working outdoors
- variety of work
- being your own boss
- producing a natural, marketable and popular food
- always learning more about bees, hives, etc

Some demanding and challenging aspects of this career
- mostly poor financial rewards
- some travelling and being away from home
- being stung and possibly developing an allergy to beestings
- sometimes having to work in poor weather conditions

Purpose Orientation

- good bee-handling skills, knowing when and how to approach bees
- like bees and not be afraid of stings
- good organization and time management skills
- good oral and written communication skills
- concerned about environmental issues
- self-motivated and willing to work hard
- able to plan ahead
- able to accurately record information
- enjoy working outside
- good eyesight
- fit and healthy, with no allergies to bee stings or pollen

School Subjects
No specific educational requirements

Compulsory subjects: None
Recommended subjects: Mathematics, English, Life Sciences and Physical Sciences

Training
Mostly beekeeping skills are learned on the job. Employers may support beekeepers in gaining their heavy trade and forklift licences or assist them to complete training courses,

such as disease control.

Beekeepers may do a Certificate in Beekeeping. A degree in zoology may be useful. Courses are available full-time or by correspondence.

Employer
- farms
- specialized beekeeping farms
- government departments, such as agriculture and forestry
- self-employment

Career 16: Aquatic Scientists

Aquatic scientists study the physical, chemical, biological and ecological aspects of inland and marine water environments.

There are several career possibilities that can be distinguished, namely:

Research: on various aspects of the water environment.

Administration: administrators in the public or other sectors related to the various activities concerned with water, for example water purification, water supply etc.

Teaching and Training: careers in the training of aquatic scientists.

Aquatic scientists study the following aspects of the water environment: physical aspects - temperature, available light and water movement; chemical aspects - the organic and inorganic composition of water, the importance and role of nutrients; biological aspects - the types, migration, distribution, behaviour, environmental requirements, etc. of the different types of plants, bacteria, algae and organisms associated with water; interrelated aspects - the relationship between the organisms and environments; and pollution aspects - the occurrence, intensity, treatment and control of different types of pollution that results in the death of fish, the colour, smell and taste of pure water that is affected by the excessive growth of certain organisms.

Other areas of study include: the management and potential for multipurpose utilization of inland and coastal waters such as the re-use of water for certain activities; and the cultivation of organisms for the manufacture of chemicals and for food, for example oyster-cultivation and the cultivation of shrimps and fish.

Aquatic scientists are also involved in the development of plans to ensure the ongoing health of aquatic ecosystems. Working time is divided between research in the laboratory and field research in a water environment.

Depending on academic qualifications, aquatic scientists use advanced technology and various methods, such as biological monitoring, chemical analysis and computer models.

Aquatic scientists spend time in laboratories and in the field. The development of new methods and procedures forms an integral part of most of their projects.

Some fulfilling and satisfying aspects of this career
- making exciting, new discoveries
- learning more about marine life
- working independently and in teams

- working both indoors and outdoors

Some demanding and challenging aspects of this career
- focusing or concentrating for long periods of time can be taxing
- seeing aquatic life die due to human negligence can be frustrating
- sometimes long periods away from home when doing field research

Purpose Orientation
An aquatic scientist should:
- have a serious interest in the natural environment, particularly water environments
- have a scientific aptitude
- be a good observer and naturally inquisitive
- be able to work very accurately
- be responsible
- have conservationist attitude
- take initiative, patience and perseverance

School Subjects
Advanced School Certificate meeting degree requirements for a degree course

Each University or College will have its own minimum entry requirements.

Compulsory Subjects: Physical Sciences, Mathematics
Recommended Subjects: Life Sciences

Training
Degree: Various universities in Africa offer training in Aquatic Science, as part of the Botany, Zoology and Ecology courses. The BSc degree takes three years to complete.

Postgraduate: Specialization through postgraduate studies is recommended.

Employer
- Consulting firms
- Universities
- Department of Environmental Affairs and Tourism
- Department of Water Affairs and Forestry
- Various water boards
- Municipalities

Career 17: Biologists

Biologists study and do research on the origin, relationships, development, derivation, anatomy, functions, heredity and other basic characteristics of plant and animal life.

Biologists study all aspects of living organisms, as well as the relationships between animals and plants and their environment. They usually specialize in research or the development of specific plants, animals or aspects of biology. The nature of their work depends on the field chosen, namely:

Botany: Botanists are scientists who study the origin, development, physiology, reproduction, distribution, interdependence, classification and other aspects of plants. They can specialize in plant morphology, plant ecology, plant genetics, to name but a few.

Zoology: Zoologists study several aspects of animals, namely the origin, behaviour and processes of life. Fields of specialization include: morphology, taxonomy, genetics, zoogeographics, embryology, behavioural studies and aquaculture.

Entomology: Entomologists study all aspects connected with insects. Extensive study and research can be done in the fields of taxonomy, behaviour, insect pest control, etc.

Biochemistry: Biochemists examine the structure and functions of chemical compounds in all living organisms such as plants, animals, insects, viruses and microbes. They study aspects such as the metabolism, interrelationships between structures, etc.

All such studies help to make advancements in fields such as medicine, industry and agriculture, and can be broken down into various fields of study:

Aquatic Biologists study plants and animals that live in water
Physiologists study the life stages of plants and animals
Cytologists study plant and animal cells. Anatomists study the bodies of animals, from organs and tissues to cell structures. Mycologists look into parasitic, poisonous and edible fungi, such as mushrooms and yeast.

Nematologists study nematodes, which are parasitic to plants, attack insects and transmit diseases, to find ways to control these pests. Geneticists examine hereditary factors in plants and animals.

Biologists conduct their research in laboratories or outdoors in the natural habitat of the species they are studying.

Some fulfilling and satisfying aspects of this career
- making new discoveries can be exciting
- advancing particular fields
- working in a relatively stress-free environment

Some demanding and challenging aspects of this career
- focusing for long periods can cause eye-strain
- standing for long periods can be physically taxing

Purpose Orientation

- very observant
- deep interest in biological science
- love of nature and outdoor life
- enjoy working in a laboratory
- patient, accurate, determined and disciplined
- ability to perform highly specialized research

School Subjects
Advanced Level Certificate meeting degree requirements for a degree course

Each University or College will have its own minimum entry requirements.

Compulsory school subjects: Mathematics
Recommended school subjects: Physical Sciences, Life Sciences

Training
Degree: A BSc degree takes 3 years' full-time or 4 years' part-time study.

Diploma: Various universities of technology offer related biological science courses.

Employer
- government departments, such as Trade and Industry and Health
- universities and tertiary institutions
- game reserves and zoos
- private organizations
- high school biology teacher
- self-employment, eg. zoologists can start their own businesses by cultivating oysters, mussels, shrimps, etc. or rehabilitation centres where wounded or poisoned animals can be rehabilitated and other biologists can open their own pollution laboratories, nurseries, pet shops, eco-tourism and environment impact centres

Career 18: Bird Farm/Avian Manager

Bird farm managers specialize in breeding birds of various types, ranging from exotic species to poultry. They breed birds and sell them to pet shops, customers, or export them to various countries. Bird breeders have to obtain special permits to do this.

The basic duties of a bird-farm manager include protecting the birds from their natural enemies, ensuring that the birds are healthy by feeding them and sheltering them from extreme weather conditions, such as strong winds that may damage or destroy their nests.

Bird farmers need to ensure that every bird is kept in an environment that is similar to its habitat. For example, owls need lots of space as they are used to hunting. Some bird farmers breed homing pigeons, often to sell them to pigeoneers or pigeon trainers.

If a bird farmer keeps chickens or other poultry, they shelter the newly hatched chicks in brooder houses. When the chicks are seven or eight weeks old, they are moved to pens. After six months, roosters are culled for meat and the hens begin to lay eggs.

They need to have an extensive knowledge of various bird species and their anatomy to run successful bird farms. They also need to be able to detect when birds are unstable, or uncomfortable in any way. They can detect a bird's odd behaviour by comparing it to its normal pattern.

Some fulfilling and satisfying aspects of this career
- working with beautiful and exotic birds, as well as with people
- helping birds maintain healthy and long life spans
- working outdoors

Some demanding and challenging aspects of this career
- the responsibility of keeping birds alive and well, especially when a disease or plague is in the area
- working long hours and with unpleasant smells
- working in all kinds of weather conditions

Purpose Orientation
Bird farm managers should:
- have a love of birds and nature
- enjoy working outdoors
- have an aptitude for biology
- be self-motivated and dedicated
- be alert and very observant

School Subjects
No defined level of schooling is required

Compulsory Subjects: None
Recommended Subjects: Life Sciences

Training
Training is usually done on the job, working alongside an experienced bird farmer. No specialized training is available to become a bird-farm manager, however a keen interest in birds is a pre-requisite. These managers may find it helpful to do a course in Business Studies.

Employer
- private bird parks
- zoos
- universities
- bird farms

Career 19: Bonsai Culturists

Bonsai culturists nurture and grow "miniature" or ''dwarf'' trees. After they have selected a suitable tree for bonsai, chemicals are added to the soil and the branches and roots are pruned to stunt growth. There are various types of bonsai trees; for example: chokkon (formal upright), mayogi (curved informal upright), hon-kengai (semi-cascade), shakan (slanting style), kengai (hanging style), sankan (triple trunk), yose-ue (multi-tree), to mention but a few.

Successful bonsai culturists are artists in their own right because they capture the feel of a tree and shape it accordingly. The Japanese have a dislike of even numbers (only the number two is acceptable). Bonsai shapes are influenced by symmetrical shapes, which again are not favoured by the Japanese. To be a successful bonsai culturist, one needs to capture the specific atmosphere of these trees. Beginners find group plantings great fun although, as time passes, it might become a problem caring for the trees, as each tree has an individual need and one tree may upset another.

Soils used for planting are granule chipping, fresh peat with grit and sanding loam. Slow growing bonsai, for example conifers and pines, do better in a dry soil mixture containing sand. Bonsai can be planted in rocks to form a natural looking unity. Rock bonsai with plants rolled onto the rock can become dislodged from the stone if not kept frost-free. A bonsai tree needs a lot of care and attention, but it brings the feeling of tranquillity to the minds of those who cultivate them.

Some fulfilling and satisfying aspects of this career
- activity that has a calming effect on the mind
- old and well-kept bonsai trees sell at extremely high prices
- being creative

Some demanding and challenging aspects of this career
- caring for the trees takes time, effort and patience

Purpose Orientation
Bonsai culturists should:
- enjoy working with plants
- be self-motivated and disciplined
- have an eye for balance and form
- be dedicated to the creation of unique miniature trees
- have a love of nature
- be meticulous
- be patient enough to wait many years to see the results

School Subjects
No specific schooling required

Compulsory Subjects: None
Recommended Subjects: Life Sciences

Training
In service training may be provided under the supervision of an experienced bonsai culturist.

Employer
- nurseries
- bonsai shops
- self-employment

Career 20: Botanist

Botany is the branch of biology that deals with plant life ranging from bacteria, algae, fungi, mosses, ferns, gymnosperms and flowering plants. Botanists can specialize in any on of the following areas:
- Plant ecology
- Plant genetics
- Plant morphology
- Plant pathology
- Plant physiology
- Plant taxonomy
- Economic botany

Plant taxonomists identify and classify plants. They study the systematics, chemistry, structure, genetics and reproduction of plants.

Ethnobotanists research all the plants traditionally used for food and medicine.

Palaenologists study fossil and living pollen. These studies often shed light on the historical background of a certain region. Palaeobotanists study plant fossils and must have an interest in rocks and geology.

Plant physiologists study the functioning of plants. This involves the growth, development, nutrient uptake and biochemical processes of plants.

Mycologists study fungi.

Plant pathologists study diseases in plants.

Plant geneticists work in two main areas, namely, the cultivation of crops and population and evolutionary genetics.

Weed scientists study the different types of weed as well as mechanical, chemical and biological methods of control.

Some fulfilling and satisfying aspects of this career
- working with plants
- the challenge of and variety in the work
- being able to specialize in an area of interest

Some demanding and challenging aspects of this career
- the frustration sometimes involved in doing research

- having to work long hours during some stages of research
- working under pressure

Purpose Orientation

- A botanist should:
- be interested in science;
- have an inquiring mind;
- be patient and curious:
- like to study and observe nature;
- be able to work independently and as part of a team;
- have a love of nature;
- be able to communicate ideas clearly in speech and in writing.

School Subjects
Advanced School Certificate meeting degree requirements for a degree course
Ordinary Level Certificate meeting diploma requirements for a diploma course

Each University or College will have its own minimum entry requirements.

Compulsory Subjects: Mathematics, Physical Sciences
Recommended Subjects: Life Sciences

Training
Degree: The minimum requirement is a BSc with Botany as a major. A student should decide beforehand on the preferred field of specialization and should choose the majors and additional subjects accordingly.

Post-graduate study: Although a BSc degree is adequate for some jobs in this field, most positions require postgraduate studies.

Diploma in Forestry, Horticulture or Nature Conservation. With a diploma one is not able to work as a professional botanist, but can work with professional botanists in a large number of fields. For example, foresters work with plant ecologists and horticulturists work with plant geneticists.

Employer
- Government departments of Agriculture, Water and Forestry, Environment and Tourism
- National Botanical Institutes
- National Parks Boards
- universities, universities of technology and schools
- self-employment, as consultant, for example to fertilizer companies
- breweries

Career 21: Conservation and Wild Life Management Careers

The increasing awareness that the world's natural resources are vital for man's survival has led to a growing interest in conservation. In this context, the concept of conservation through sustainable utilization has become of major importance.

In a number of African countries:
- provincial administrations are responsible for the conservation of the environment and of the fauna and flora of all areas outside national parks
- the system of national parks is managed by the National Parks Board
- the Ministry of Environment has overall responsibility for conservation in most African countries
- private game reserves are also becoming increasingly vital forces in conservation.

The provincial functions include
- management of conservation areas
- enforcement of conservation laws
- control of the utilization of natural resources such as fisheries, game and wild flower resources
- providing advice to landowners, local authorities and the general public on a variety of conservation matters

Likewise, the National Parks Boards in different countries also offer similar career opportunities. As semi-governmental bodies, they also have a responsibility to incorporate local communities into the decision- making process. They even have to promote socio-economic upliftment through various programmes.

Various work opportunities exist in the different sections of conservation. Each of these sections has different requirements and working conditions:

Wildlife Management : The management of state and private conservation areas, game ranches and other natural areas such as offshore islands, some State Forests and coastal areas, the primary objectives being the conservation and management of natural ecosystems, natural habitats and rare or endangered plant or animal communities.

The study and monitoring of plant and animal communities and their scientific management is the basis for this type of career. However, some staff may be more involved with practical aspects such as game capture, infrastructure development and maintenance, and tourism.

Extension: An important facet of conservation is the education of the public on matters such as:
- possible negative effects on the land-use practices of farmers

- game ranching
- stocking of dams with fish
- exploitation of wild flowers
- problems with wild animals coming into conflict with farming activities.

It has now also become vitally important to be able to communicate effectively with local communities, including rural ones, and to gain their cooperation and participation in conservation projects. This requires someone well-versed in environmental anthropology.

Law enforcement: The policing of the public is an important function, especially where rare and endangered plants and animals are involved. Several major industries utilize natural resources directly and because of the possibility of vast financial gains, poaching is always a problem. Other industries may impact negatively upon the environment and must adhere to a strict environmental protocol.

These officers must have a basic knowledge of the classification of plants and animals. They must also have a sound knowledge of the relevant legislation, investigative methods and court procedures.

Environmental Education: The future of conservation will, to a large extent, depend upon the education of our youth and creating the necessary awareness amongst them of how vital environmental conservation is to living a quality life, even in a city. Formal environmental programmes are offered to schools and adult groups at environmental educational centres. Informal environmental programmes are also offered at many nature reserves and other venues.

Members of the professional wildlife staff, preferably those with a teaching qualification or such experience, help to plan and execute the environmental educational programmes in association with communication specialists. Members of technical staff assist them in the execution of these programmes. Prospective candidates must not only be interested in environmental education, but also show the ability to work with groups of people.

Scientific Services: Scientific services serve mainly to supply the knowledge necessary to improve decision-making in conservation. Examples of tasks performed are:
- drawing up inventories of resources of fauna and flora
- evaluation of impact assessments of proposed developments
- the development of habitat and wildlife management programmes
- drawing up and monitoring the effectiveness of such management plans for conservation areas, be they government or privately owned

These are usually university-trained specialists in their respective fields.

Publicity Services: An important function of conservation is the production of published material in the form of books, pamphlets, posters, videos, etc. These are for distribution to the

public and for displays at exhibitions and shows. Liaison with the media is equally important, as the public must be kept informed of the activities of the organization and of the advances in the fields of conservation and management in general.

Professional and technical conservation staff, artists, photographers and journalists are all employed in this section. All of them must have appropriate qualifications or experience to qualify for appointment.

Administration: No organization can function without the supporting role of administrative staff. The duties include the drafting of legislation, financial administration, the acquisition of materials and equipment, correspondence matters and other administrative duties.

Some fulfilling and satisfying aspects of this career
- working with animals
- opportunity to specialize in area of interest
- able to observe animals of many different types in their natural environment

Some demanding and challenging aspects of this career
- long and irregular working hours
- working outdoors in poor weather conditions
- having to live in remote areas, far away from schools, hospitals, shops and other amenities
- not very rewarding financially
- work may be very routine
- unpleasant tasks such as the culling of animals

Purpose Orientation
- have a passionate interest in conserving natural resources
- love outdoor life and animals
- have good health and physical fitness
- be practical and self-sufficient
- be responsible and self-disciplined
- communicate well with people, be tactful
- be able to use a firearm and shoot accurately
- be dedicated to the work
- knowledge of local customs is recommended especially when working in rural areas
- knowledge of an African language
- be able to organize
- able to maintain good human relations
- be willing to study further.

School Subjects
Advanced Level Certificate meeting degree requirements for a degree course
Ordinary Level Certificate meeting diploma requirements for a diploma course

Each University or College will have its own minimum entry requirements.

Compulsory school subjects: Depends on course taken - Mathematics, Life Sciences, Physical Sciences.
Recommended school subjects: A third language and Geography.

Training
Degree: Special BSc or BTech courses in Ecology or Nature Conservation Zoology and Botany are offered at most African universities.

Post-graduate: BSc (Hons)(Environmental Management / Nature Conservation): Followed by MSc and PhD.

BSc (Hons) with an ecological approach, preferably in some applied fields such as Mammalogy, Ornithology, Limnology or Ecobotany, depending upon the student's specific interest, particularly suited for the person interested in research.

BVSc: Many veterinarians are active in conservation or wildlife management.

Diploma in Environmental Health / Management or Nature Conservation

Employer
- government Department of Environment
- National Parks Board
- provincial authorities
- local authorities, such as municipalities
- game ranching industry

The private sector also offers opportunities for a career in conservation. Game ranchers, the wild flower industry, the fishing, crayfish and perlemoen industries, and even the timber industry, have a vested interest in the management of natural resources. Many opportunities also exist for consultancy work within Africa.

Career 22: Ecologist

Ecologists are environmental biologists who study the interactions between organisms and their environment and between organisms themselves.

Ecologists undertake environmental studies by investigating the influence of human activity on the natural environment, for instance the impact of population size, housing, recreational facilities, pollution and farming on the environment. Through their research they attempt to rectify imbalances caused to the environment.

Ecology is actually a branch of Biology, dealing with organisms and their relationship to their physical environment. When people cause imbalances in the environment, ecologists try to rectify these imbalances. They are frequently involved with conservation management, which requires the intelligent interpretation and application of biological principles.

Commercial utilization of the environment has increased along with media and public interest in conserving our limited resources. Large building and mining projects, particularly in areas regarded as being ecologically sensitive, are, in most cases subject to a full report, called an environmental impact assessment (EIA), from a professional ecologist.

Professional ecologists are also known as environmental scientists or environmental engineers. Environmental and business interest groups often enlist more than one ecologist regarding a particular piece of land, in order to gain public approval for their agendas.

Ecologists work both indoors and outdoors. They spend time in nature where they collect material to help solve ecological problems. They also spend time in laboratories analyzing and interpretation data which is then used for improving our understanding of the ecosystem.

Some fulfilling and satisfying aspects of this career
- making positive contributions to maintaining natural, clean and pollution-free environments
- working both indoors and outdoors

Some demanding and challenging aspects of this career
- finding cost effective ways to prevent or minimize pollution, such as smog and industrial waste
- stabilizing or rectifying imbalances in nature

Purpose Orientation

- An ecologist should:
- have a love of nature and conservation
- have excellent observational skills
- have an enquiring mind and the ability to analyse data

- be adaptable and able to work under very demanding circumstances
- have physical stamina to withstand fieldwork under rough conditions
- be able to communicate well with a wide range of people
- have logical approach to problem-solving
- have scientific and technical aptitude
- have ability to work as a member of a team
- be able to gain a solid background in as many life sciences as possible to facilitate responsible interpretation of data.

School Subjects
Advanced Level Certificate meeting degree requirements for a degree course

Each University or College will have its own minimum entry requirements.

Compulsory Subjects: Mathematics, Physical Sciences
Recommended Subjects: Life Sciences

Training
Degree: BSc degree majoring in one or more of the following: Ecology, Botany, Zoology, Microbiology, Soil Science, Geology, with supporting courses in: Mathematics, Statistics, Computer Science.

Post-graduate Training: BSc Honours specializing in Ecology is essential for securing research positions.

Employer
- Research organizations
- Universities
- Departments of Agriculture, Environment, Water, Tourism & Forestry
- The National Parks Board
- Museums
- Large industries which have an interest in conservation
- Self-employed (consultants)

The opportunities for private consulting are likely to increase as pressure is placed on building consortiums to conduct their own independent environmental impact studies so that they are in a position to state their case when faced with opposition from various lobby groups to proposed building projects.

Career 23: Economic Geologist

An economic geologist studies mineral deposits and the processes leading to their formation. This information is extremely useful to mining companies as it helps them to locate and understand the nature of the resource they are mining.

Economic geologists apply geological principles to solve practical problems in the mining industry. Their training equips them to run the Geology department on a mine, and to organize a programme of prospecting in the field.

Some fulfilling and satisfying aspects of this career
- working outdoors
- solving problems
- variety of work
- travelling
- working with others

Some demanding and challenging aspects of this career
- being away from home and family for long periods
- primitive living conditions in the field
- the physical demands of doing on-site work

Purpose Orientation
An economic geologist should:
- be curious and imaginative;
- be observant and objective;
- have a scientific and mathematical aptitude;
- have problem-solving skills;
- enjoy working with others;
- be flexible and adapt easily to new situations;
- communicate clearly in writing and in speech;
- be responsible;
- be dedicated to his work;
- be willing to work underground in mines and in the field;
- have good health and stamina.

School Subjects
Advanced Level Certificate meeting degree requirements for a degree course

Each University or College will have its own minimum entry requirements.

Compulsory Subjects: Mathematics, Physical Sciences

Recommended Subjects: Life Sciences, Geography, Economics

Training
Degree: BSc degree with appropriate subjects, such as Geosciences, Earth Sciences, and Geology with Economics.

Employer
- mining companies
- government departments - Geological Survey, Water
- museums
- scientific bodies such as the Chamber of Mines
- civil engineering firms
- universities of technology and universities
- consulting companies
- self-employment, as a consultant

Career 24: Entomologist

Entomology is the scientific study of insects. Insects have a great influence on the state of our environment, especially on the availability of food and the control of disease.

Harmful insects lead to the destruction of crops in the field or stored food and they spread diseases from animals to human beings. Useful insects are responsible for the control of harmful insects and weeds, as well as the cross-pollination of crops.

Through the study of the anatomy, life processes, habits and life cycles of insects, the entomologist distinguishes between harmful and useful insects. Using this information, entomologists can develop suitable and economically viable measures of control against harmful insects. Entomologists are also responsible for the registration, standardisation and testing of insecticides.

Entomologists try to ensure that useful insects are not destroyed. Much attention is given to the increasing use of certain beneficial insects for the biological control of harmful insects and of weeds. Today, entomologists focus their research on "effective pest management" where the environment is also taken into account, rather than "pest control" which only focused on controlling pests regardless of damage caused to the environment.

New fields of research for entomologists include the use of insects for monitoring damage, pollution and the recovery of the environment through recording the insects. Entomologists are responsible for the identification and classification of insects. Knowledge regarding insects is gained through fieldwork as well as laboratory research.

Entomologists often do research work or are employed as extension officers and consultants in a variety of fields.

Some areas of specialization include:

- conducting detailed studies of insects and their behaviour
- taxonomy, which entails the classification and documentation of insect fauna
- use of beneficial insects
- biological control of harmful insects
- integrated pest management
- veterinary and medical entomology

As consultants, entomologists render a service to a wide range of people, including farmers, environmental organizations and departments, educationalists and the public in general.

Some fulfilling and satisfying aspects of this career
- making exciting new discoveries
- advancing particular fields
- working in a relatively stress-free environment

Some demanding and challenging aspects of this career
- focusing for long periods can cause eyestrain
- frustrations when trying to protect beneficial insects

Purpose Orientation

- An entomologist should:
- love nature;
- have a deep interest in insects;
- have an aptitude for mathematical and biological subjects;
- be willing to perform repetitive tasks
- be a careful and accurate worker
- have perseverance and patience
- enjoy laboratory work

School Subjects
Advanced Level Certificate meeting degree requirements for a degree course
Ordinary Level Certificate meeting diploma requirements for a diploma course

Each University or College will have its own minimum entry requirements.

Compulsory Subjects: Mathematics, Physical Sciences
Recommended Subjects: Life Sciences

Training
Degree: The minimum requirement is a BSc degree but a BSc Honours degree is recommended, available at most universities. Major subjects include Entomology (or Zoology with Entomology as part of the curriculum) in combination with one of the following: Botany, Chemistry, Physiology, Microbiology, Mathematics, Plant Pathology or Genetics.

Students can also follow a BSc (Agric) degree with Entomology as a major in combination with subjects such as Horticulture and Plant Production. Each university specializes in particular fields of zoology and it is recommended that prospective students first consult the yearbooks of different universities to ensure that a specific university offers courses in Entomology.

Employer
- Universities

- Museums
- Research institutes
- Department of Agriculture or Health
- Nature Conservation Boards
- Institutes for Medical Research
- Companies that manufacture pesticides

Career 25: Environmental Assessment Practitioner

Environmental assessment practitioners usually have a background in the environmental sciences, or natural or social sciences, and may specialise in one or more areas.

They work as part of a team of other experts in conducting environmental impact assessments, to determine the effect that a new development is likely to have on both society and the environment. For example, if a forestry company wishes to extend their plantations into a new area, a team of environmental and social scientists would be asked to carry out an assessment and make recommendations on whether the development should go ahead or not. If the answer is yes, they may need to recommend measures the company should put in place to mitigate any negative effects.

The assessment must take into account whether there are any wetlands in the area, and the existence of any rare, endangered or endemic plants, reptiles, amphibians, fish, birds, insects, bats or mammals. An environmental compliance officer is appointed to ensure that the recommendations are being followed

Environmental assessment practitioners must comply with the standards and regulations of the Environmental Assessment Bodies in their country. Such bodeis aim to keep standards high and ensure ethical conduct in this profession.

Their work is usually a stimulating combination of outdoor work involving the collection of information, desk work for studying other applicable research, policies and detailed development plans. A major part of their work involves the writing of reports. Many meetings have to be attended, both on and off site.

Some fulfilling and satisfying aspects of this career
- working largely outdoors
- playing an important role in conservation

Some demanding and challenging aspects of this career
- dealing with uncooperative people

Purpose Orientation
- need excellent research skills
- the ability to think logically, analytically and independently
- good communication skills, both verbal and in writing, in order to share their findings

School Subjects
Advanced Level Certificate meeting degree requirements for a degree course

Each University or College has its own entry requirements.

Compulsory Subjects: Mathematics (some institutions require Physical Sciences and / or Life Sciences)
Recommended Subjects: Physical Sciences, Life Sciences, Geography

Training
Degree: A BSc degree in Environmental Science, Natural Resource Management, or other related field, e.g. Zoology or Botany.
Postgraduate: further studies in the chosen field of interest are recommended

Employer
- Environmental assessment practitioners often work as independent consultants on their own, or in private consulting firms.
- They may also be based in NGOs or universities, where they would typically also have other duties such as research, teaching, and advocacy work.

Career 26: Environmental Education or Interpretation Officer

These careers are for people who are passionate about the natural environment and enjoy sharing that passion with others.

They communicate with a range of groups, in various different contexts:

Stewardship officers negotiate land deals with farmers who agree to set aside part of their land for conservation purposes. Afterwards they work out a conservation management plan for that part of the farm, and provide an extension service to assist the farmer to manage the land for optimum biodiversity.

Social ecologists help communities living on the borders of national parks to derive optimum benefit from the presence of the park. They facilitate the development of community-based natural resource management initiatives, legislative control of aspects such as hunting, sale of game, the importing and exporting of game, law enforcement as well as the administrative aspects of managing a nature conservation organisation.

Community development facilitators help many different communities to benefit from the wise use of their resources, whether they are wild flowers, or wildlife and spectacular scenery for eco-tourism, or trees and grasses for arts and crafts.

Education and interpretation officers teach visitors of all ages about nature and the significance of the cultural heritage sites in museums, national parks and other areas of interest. The work involves raising awareness and promoting an understanding of the environment to different audiences such as schools, colleges, businesses, community groups and the general public. Their tasks include giving presentations, running workshops, conducting guided walks and tours, working on local environmental conservation projects, producing and distributing learning materials for students as well as managing budgets and supervising staff.

Since these careers involve working with different groups of people, evening and weekend work may sometimes be required. A large part of their time may be spent away from the office in all kind of weather conditions, working with schools and community groups.

Some fulfilling and satisfying aspects of this career
- inspiring interest in the visitors
- helping the future of conservation

Some demanding and challenging aspects of this career
- working long hours, over weekends or holidays
- working in adverse weather conditions

Purpose Orientation
- be enthusiastic, and able to motivate staff, colleagues and volunteers
- have a good understanding of environmental or technical content
- have teaching skills together with good social and communication skills
- able to deal with discussions and objections from participants
- good command of languages, written and verbal
- be a good planner and project manager
- interested in and appreciative of other cultures

School Subjects
- Advanced Level Certificate meeting degree requirements for a degree course
- Ordinary Level Certificate meeting diploma requirements for a diploma course

Each University or College has its own entry requirements.

Compulsory Subjects: Mathematics (Life Sciences or Physical Sciences is required in some cases) Recommended Subjects: Life Sciences, Social Sciences, Physical Sciences

Training
People follow a variety of routes to become environmental education officers.

Degree: BSc or other degree in Environmental Science is offered at most universities.

Diploma: the conservation diploma or other environmental courses e.g. Diploma in Environmental Sciences, Environmental Management
Postgraduate: Higher National Diploma with subjects such as Geography, Biology or Formal Environmental Education courses at postgraduate level.

Possible Career Paths
Education officers start out running the courses and then progress to planning and producing new material and managing the staff that run them.

Employer
- local government - municipal
- nature conservation agencies
- national parks and game reserves
- wildlife rehabilitation centres
- educational institutions
- world heritage sites
- Botanical and Zoological Gardens
- research institutes
- Department of Environment – capacity development sections
- private companies and community based organisations

Career 27: Environmental Education Specialist, Training and Staff Development Specialist

These social scientists specialise in education, specifically in the environmental or biodiversity fields, including sustainable development education and in producing the necessary skills for working in the environmental sector.

They may play a research role and conduct needs analysis for training and development needs for environmental sector imperatives. They study educational processes, how people learn about the environment in different contexts, such as from school children to rural communities or business executives, and how best to support social change in relation to environmental issues.

When they specialise in developing environmental education programmes, they consider the environmental content of a particular field (e.g. marine science, or fynbos, or any endangered species) and work out how best to teach the different groups about this vital field of work. An important role is specialising in building human capital for the environmental sector, in which case they would determine what qualifications and courses are needed, and then put suitable policies and programmes in place.

The job involves:

- identifying the needs of a learner group
- conceptualising training
- implementing training
- evaluating training / learner intervention

A wide interdisciplinary knowledge of environmental issues, risk management and conservation is needed to design programmes for specific issues.

Working conditions are usually pleasant. Most offices are comfortable. Training sites could be indoor or outdoor and classrooms may contain equipment for demonstration purposes.

Purpose Orientation
- awareness of environmental / biological science
- a love of nature
- able to speak and write clearly and effectively
- a passion for working with people
- good observation skills
- attention to detail
- interpretative and analytic skills
- creativity

- research needs strong social science skills

School Subjects
Advanced Level Certificate meeting requirements for degree course

Compulsory Subjects: Mathematics or Maths Literacy
Recommended Subjects: Geography, Life Sciences, Physical Sciences

Training
Degree and Postgraduate: BA / BSc / B SocSc with subjects such as Geography and Environmental Science. Most universities have faculties with a number of options for study in the social sciences.

A teaching degree such as Post Graduate Certificate in Education could be followed by an environmental qualification. Most universities offer educational qualifications related to schooling, but few universities focus on the further education, higher education and adult education bands.

Possible Career Paths
Research in the social sciences has its own sets of acceptable methods and it is advisable to develop a sound background in these, before embarking on a social science area of study. Teachers in the Biological Sciences / Social Sciences could move into this field.

Employer
Environmental education specialists work in a range of organisations:
• NGOs
• research institutes
• government departments
• conservation agencies
• large companies with strong social corporate Investment programmes
• in some cases as consultants running their own businesses

Career 28: Environmental Journalist

One way of making a meaningful contribution towards preserving the earth is to enter a career in environmental journalism. Journalists investigate environmental problems and their causes, report on environmental policy disputes, and make the public aware of these issues and the importance of a healthy planet.

There are numerous important stories concerning the environment waiting to be written but too few reporters take the trouble to work on them in sufficient depth. However, environmental and wildlife issues are gradually gaining more prominence in the press and some of these are making it to the front page of newspapers or to the main news desk.

Although environmental journalism can be a daunting career at times, it is an opportunity to truly make a difference. Above all, a passion for the environment and wildlife protection is what motivates environmental journalists to find a story and pursue it.

Journalists may work in the offices of newspapers, magazines, or in radio and television. Generally these offices are crowded and busy although magazine offices are usually much quieter. Journalists have to visit the sites of events of interest. They need to research their assignments in libraries and information centres and on the internet. They work irregular hours and their duties often require them to work at night.

Some fulfilling and satisfying aspects of this career
- helping the public to keep informed about important environmental subjects and events
- working on a new story almost every day
- travelling
- meeting interesting people

Some demanding and challenging aspects of this career
- the pressure of the job
- the long and irregular hours
- frustration when stories are ignored

Purpose Orientation
- ability to write clear, concise, interesting and objective material quickly
- good general knowledge
- interest in current events
- accurate and unbiased
- initiative, curious and creative
- aptitude to learn keyboard and shorthand skills
- persistence to investigate records, interview and probe unremittingly
- able to mix well with all kinds of people

- ability to speak clearly when working on radio and television

School Subjects
- Advanced School Certificate meeting degree requirements for a degree course
- Ordinary Level Certificate meeting diploma requirements for a diploma course

Each University or College has its own entry requirements

Compulsory Subjects: None
Recommended Subjects: History, Languages

Training
A degree or diploma in science and a course in journalism or science communication would be a pre-requisite to work with newspapers / broadcast media in this field. A background in wildlife and environmental issues and related laws (possibly through a degree in environmental science or through additional diploma courses) would be beneficial.

Degree: Journalism, Communication Studies or Environmental Journalism

Diploma in Journalism / Communication. An advanced course (MTech and DTech Journalism).

Possible Career Paths
Read as much as you can about wildlife and environmental issues. Begin by building your portfolio by writing for local publications or making documentaries for smaller media houses. However, once you land a job, coaxing an article into existence will not be child's play.

It will often involve travelling to remote areas, being able to manage tough situations, often doing undercover investigations, negotiating and working with opposing campaign groups and through all of it, finding the objectivity and the talent to present the piece in a way that captures both the Editor's and readers' attention but does not lose its focus. Regularly interact with wildlife scientists and naturalists who can help verify facts and provide vital information and news.

Employer
- newspapers
- magazines
- radio and television
- websites of large environmental organisations

- government departments, e.g. as press secretary
- self-employment, working as a freelance journalist

Career 29: Environmental Lawyer

Environmental law is a relatively new and exciting field in which to work, having evolved rapidly over the last thirty years. An environmental lawyer is an attorney that focuses on litigation having to do with a broad range of environmental concerns. Examples include air and water quality, climate change, land use and agricultural issues, parks, game reserves and wilderness preservation, wildlife and biodiversity protection, as well as problems concerned with resource extraction and transportation, chemicals and pesticides and waste disposal.

It is important to remember that environmental law is merely the application of law on environmental issues. An environmental lawyer therefore applies the law of contract, law of delict, common law, public law, administrative law, criminal law, statutory interpretation, procedural law etc. on matters that affect the environment. Environmental law as such is not driven by a particular environmental protection sentiment. An environmental lawyer is most likely to end up working for mines and industry.

Although an environmental lawyer may find him/herself in a position to assist government and other institutions to draft, the bulk of environmental legal work is often in service of entities who have an impact on the environment. An environmental lawyer may be required to defend a person / company who is accused of contaminating land, air, soil or has negatively impacted on people or property in criminal prosecution matters, or to ensure that their operations are not shut down by relevant authorities.

Often, many workshops and presentations are held for industry, consultants and government. Environmental lawyers also perform environmental due diligence evaluations in mergers and acquisitions and are often required to perform routine environmental audits and compliance assessments for industrial clients.

It is very important to note that environmental law is mostly practiced in the corporate environmental where it has to integrate with commercial law. Many of their instructions aim to protect vulnerable industries and developers from in-equitable, unreasonable or incorrect enforcement of environmental laws against them by government.

An environmental lawyer has to be able to work with a wide range of natural scientists including engineers, geologists, toxicologists, animal plant and biodiversity specialists. As such an environmental lawyer has to have the ability to assimilate technical information at an enormous pace and to pragmatically incorporate such information in a legal context to find a solution for a client, sometimes under extreme pressure.

Sometimes, an environmental lawyer has clients who pursue a pure “green” agenda when they can afford to, and engage their personal convictions and love for the environment.

However, it is generally a passion for law, not environmental protection as such, that determines success.

An environmental lawyer may also deal with issues such as environmental impact planning, and sustainable growth and development. Environmental lawyers may find themselves having to take on unscrupulous developers whose actions cause or threaten the extinction of species, pollution of groundwater, or destruction of precious cultural heritage sites. They may argue or engage in litigation on behalf of workers or local residents to prevent pollution or other environmental hazards that put people's health at risk.

To summarise, environmental lawyers use their legal skill and training to develop policies and engage in litigation that prevents serious environmental damage, enforces environmental clean-ups, and ensures that people who have suffered harm or loss as a result of environmental contamination are adequately compensated. Environmental lawyers play a key role in the system of checks and balances to prevent government and big business from engaging in practices that undermine the natural environment, and harm people in the process.

Examples of cases handled by an environmental lawyer include those involving toxic mould in homes, builder negligence, illnesses resulting from companies' negligence or willful contamination of water and air, and litigation against the government to clarify or compel the enforcement of environmental regulations.

Environmental lawyers work in a variety of settings. Most law offices are quiet and comfortable. Lawyers also travel to the sites of complaints, to courtrooms record-rooms or archives.

Purpose Orientation

- have good listening skills and patience
- be able to handle a large amount of facts and see patterns in large bodies of evidence
- have a well-developed sense of fairness and justice
- be able to solve problems
- be able to handle stress and pressure
- be able to elicit trust and respect from clients and colleagues
- be able to persuade others to a specific point of view helps to win court cases
- be able to communicate effectively both orally and in written documents.
- be able to explain difficult legal concepts in easy terms
- be able to argue persuasively for their client's case

School Subjects

Advanced Level Certificate meeting degree requirements for a degree course

Each University or College has its own entry requirements.

Compulsory Subjects: English
Recommended Subjects: Mathematics, Physical Sciences, Life Sciences

Training
Degree: BA/BSc LLB with Environmental Law as a subject

A first bachelor's degree including Ecology or Environmental Science would be good preparation for a career in environmental law. Useful minor courses could be in Political Science and Government.

In some cases, you can earn a Master's degree alongside a law degree. A master's degree in planning, development, ecology, environmental studies, or a related field makes an excellent addition to a law degree if you plan to build a career in environmental law.

Employer
- Department of Justice
- private practice in legal firms
- government
- NGOs or other civil society agencies
- self-employment, environmental lawyers can work with the general public affected by environmental issues

Career 30: Environmental Manager

Environmental management is a broad career and the term can be used to refer to a range of different jobs in different organisations. We refer here in particular to the technicians and professionals responsible for implementing environmental management plans in a production landscape or at development sites such as mines, construction sites for power stations or wind turbines, or at forestry plantations.

The environmental manager must ensure that environmental laws or regulations are not contravened, and that companies do not cause unnecessary soil erosion, damage to wetlands or pollution of water sources, and when they do damage the environment, that they take action to restore ecosystems and their functions effectively, e.g. replace plants that have been removed. Environmental managers are also appointed to lead sustainability reporting for companies listed on the stock exchange, to demonstrate that they comply with the country's environmental laws.

Environmental managers work outdoors for some of the time, but also spend time at meetings in offices and boardrooms.

Some fulfilling and satisfying aspects of this career
- working with animals
- opportunity to specialize in area of interest
- able to observe animals of many different types in their natural environment

Some demanding and challenging aspects of this career
- long and irregular working hours
- working outdoors in poor weather conditions
- having to live in remote areas, far away from schools, hospitals, shops and other amenities
- not very rewarding financially

Purpose Orientation
- be able to handle antagonism
- able to manage one's own time and performance to excellent standards
- manage staff and client relations
- have good financial and business planning skills
- be fair, objective and able to see different viewpoints and uphold laws in sometimes highly disputed areas
- need excellent technical knowledge of a wide range of environmental topics
- specialist knowledge in one or two environmental areas can also be very valuable.

School Subjects
Advanced Level Certificate meeting degree requirements for a degree course

Compulsory Subjects: Mathematics (some institutions require Physical Sciences and / or Life Sciences)
Recommended Subjects: Life Sciences, Physical Sciences.

Training
Degree: a general degree in the environmental sciences is a good starting point (BSc or B SocSc). Most universities offer these courses. This can be followed by specialising in a particular area such as wetlands, estuaries, or restoration science, etc. Alternatively, one could specialise in one's first degree (e.g. a BSc. in Zoology followed by an MSc. in freshwater ecology) and thereafter do a short course in environmental law or sustainability reporting.

Courses to study would vary depending on the field one is interested in. A course in marine studies and oceanography could prepare one for working with the fishing industry, for example, while a general diploma or degree in environmental sciences may be appropriate for other areas.

Possible Career Paths
The necessary skills can be acquired if one joins a company and learns the ropes while on the job. With enough experience, environmental managers can run their own consultancies, perhaps specialising in a particular field.

Employer
- national and provincial environmental agencies
- municipalities
- big mining and forestry companies
- self-employment - most environmental managers run their own businesses and work in the private sector

Career 31: Environmental Practices Inspector

Environmental compliance inspectors work for government departments to protect and preserve our environment and the public by ensuring that communities, individuals, businesses and provincial and local governments comply with laws and regulations that are intended to prevent or reduce pollution.

Environmental practices inspectors examine places of business, scrutinize permits, licences and records to ensure compliance with relevant national and municipal environmental practice requirements. They have to prepare, organize and maintain inspection records and produce reports summarizing requirements and regulations. Some examples of tasks that they perform are to:

- investigate complaints of illegal dumping, pollution, nuisance to neighbouring premises, community health and safety complaints, problems relating to pesticides, product quality etc., from individuals or businesses
- inspect water and waste treatment facilities to make sure they are in compliance with standards and regulations
- be expert witnesses and testify in court about environmental violations
- make sure that a landfill is processing rubbish in compliance with local environmental regulations
- monitor follow-up actions in cases where violations were found, and review compliance monitoring reports
- evaluate label information for accuracy and conformance to regulatory requirements.

Environmental practices inspectors work in a variety of contexts, often outdoors. For example, in fisheries, they go out with the fishing boats to check their catch, as it is caught, as well as release any dolphins, turtles and sea birds that may be trapped in nets and fishing lines. They may only return home after several days at sea. They may need to verify fishing and bait collecting licenses, and check the quality of effluent pumped out from factories and municipal sewage works, as well as air quality in the vicinity of factories. They also need to do administrative work in an office setting. Travel may be required for this occupation.

Purpose Orientation
- be analytical and detail-oriented
- have the ability to collect, compile, evaluate and interpret data within the context of pollution regulations
- be able to work independently and within teams
- have excellent written and oral communication skills

Good technical knowledge is necessary for this job, in particular knowledge of environmental

laws and requirements. Technical skills to operate equipment may be required. Social skills are essential, as the inspector must be able to work under adverse circumstances, with people who may be very negative about the work that they are doing.

School Subjects
Advanced Level Certificate meeting degree requirements for a degree course

Each University or College has its own entry requirements.

Compulsory Subjects: Mathematics (some institutions require Physical Sciences and / or Life Sciences)
Recommended Subjects: Physical Sciences, Life Sciences, Geography

Training
Degree: the minimum requirement for this occupation is a bachelor's degree in biology, chemistry, engineering, environmental sciences, environmental law, or a related subject.

Postgraduate: a post-graduate degree is recommended for advancement into senior positions. Some positions might require registration with a professional association.

It is beneficial to have a working knowledge of environmental management systems, occupational health and safety systems, waste / wastewater legislation, statistics, and accounting procedures.

Possible Career Paths
A junior-level environmental compliance specialist is responsible for monitoring facility operations and preparing reports.

The responsibility of an intermediate-level environmental compliance specialist advances from monitoring facility operations to analysing reports in order to identify cases of non-compliance and the appropriate enforcement. Other responsibilities include managing overall reporting and conducting internal audits.

A senior-level position requires establishing working relationships with regulatory authorities, and an integrated practice and knowledge of environmental regulations, reporting requirements, standards and codes.

Employer
- municipalities, big and small
- government departments, national or provincial
- local authorities

Career 32: Environmental Restoration Planner

Environmental restoration planners collaborate with field and biology staff to supervise the implementation of restoration projects and to develop new products. They process and synthesise complex scientific data into practical strategies for restoration, monitoring or management..

Environmental planners can be involved in all aspects of environmental restoration or protection projects, from cost and scope estimation, to design and implementation, including supervision of people and budgets. Their projects may focus on restoring the environment or mitigating the negative environmental impacts of other projects or facilities. Whatever the project, their aim is to create a comprehensive plan for the effective environmental management of an area.

Environmental planners collect and analyse data to determine specific environmental conditions and restoration needs. They then develop natural resource management plans using their knowledge of environmental planning as well as government environmental regulations. Sometimes they may also supervise and provide technical guidance, training, or assistance to employees working in the field.

Environmental planners may also create diagrams to communicate plans, often with geographic information systems (GIS), computer-aided design (CAD) programs, or other mapping or diagramming software. They might also conduct environmental impact studies to examine the ecological effects of pollutants, disease, human activities, nature, and climate change on a specific area.

They may develop environmental management or restoration plans for sites with power transmission lines, natural gas pipelines, fuel refineries, geothermal plants, wind farms or solar farms.

New environmental awareness has resulted in a greater focus on waste minimization, resource recovery, pollution prevention and consideration being given to the environmental effects during product development. This shift in focus to preventive management will provide many new opportunities for environmental scientists in consulting roles.

Some fulfilling and satisfying aspects of this career
- protecting the environment by preserving and encouraging healthy ecosystems.
- challenges and variety of work
- working outdoors some of the time

Some demanding and challenging aspects of this career
- frustration when recommendations are not followed

-annoyance with the lack of awareness and concern of the general public

Purpose Orientation
- pay attention to detail
- have good observation skills
- have the ability to integrate data from many sources and test hypotheses rigorously
- have an open and inquiring mind
- have good oral and written communication skills
- enjoy synthesizing information, analysing data, developing models and finding innovative solutions to problems

School Subjects
Advanced Level Certificate meeting degree requirements for a degree course

Each University or College hase its own minimum entry requirements.

Compulsory Subjects: Mathematics, Physical Sciences
Recommended Subjects: Life Sciences, Geography

Training
A BSc degree in Environmental Science, Natural Resource Management, or other related field.

Employer
- government
- research organisations

Career 33: Environmental Social Science Researcher and Assistant

Social scientists and conservationists who are interested in the environment do research that is focused on the relationships and interaction between people and the environment. They may also be consulted on the social impacts a new development might have.

They study a very wide range of topics in a variety of environments, depending on their interests and the discipline or major subjects in which they have specialised. For example:

- environmental psychologists may study the effects on the mood and behaviour of people when trees are planted in their neighbourhood or when a dump is sited where they live
- community conservationists work with communities to foster nature conservation values within a community - conservationists work / liaise between protected areas and local communities to foster reciprocal relations and conservation values, to support biodiversity conservation and the sustainable use of natural resources
- anthropologists study, for example, how rural communities use /wetlands during times of drought or unemployment / natural resources as part of their livelihoods
- political scientists might write or study the effect of a new law giving responsibility for historians study interactions between people and their environment in the recent past
- archaeologists study the distant past, using artefacts and sophisticated techniques such as carbon-dating to determine the relations between ancient people and their environment such as the food they ate and what substances they used to make decorations.

Social scientists share their findings with other researchers towards improving community and conservation practice. They also try to influence government policies and how communities manage their environments. To do this, they write policy briefs, scholarly and popular articles, present talks, and speak to the media.

Social scientists may work indoors, reading or studying artefacts, or outdoors collecting material for their studies. Scientists should be able to work long hours on their own, reading, writing and conducting their experiments. They also have to be able to work in teams with other experts, including, for example, natural scientists, educators, policy makers or biodiversity managers.

Scientists may travel, both to do their research or to present their findings to stakeholders, policy makers and scientists locally and around the world. Social science research assistants help to collect data, for example doing interviews in the field, or assisting with putting data together and looking for particular information, patterns and themes in the data.

Purpose Orientation

- have a passion for their subject, but also for making a contribution to society's understanding of nature and society, and the best ways to manage our environment

- be able to get on well with people from all walks of life as they often interview or observe people
- able to work with a variety of research methods: some disciplines, such as archaeology have very specific research techniques
- have good observational skills and deep curiosity
- be thorough about details and the accuracy of information
- think conceptually, analytically and creatively and enjoy problem-solving
- have computer skills which are needed to capture, manage, analyse and present findings

School Subjects
Advanced Level Certificate meeting degree requirements for a degree course, where appropriate

Each University or College has its own entry requirements.

Compulsory Subjects: None
Recommended Subjects: Life Sciences, History (for those who wish to go into cultural heritage aspects), Languages, Geography (highly recommended)

Training
Degree: Most universities have faculties with a number of options for study in the social sciences. Subjects from a variety of departments may include general or traditional social science options such as Geography or Sociology, with an Environmental Management option.

Some social scientists study Geography and Environmental Management as a first degree (BA or BSc).

Often science requires in-depth knowledge about both the chosen topic and the methods of doing research, and this only develops during further studies (BA or BSc Honours, MA, MPhil or MSc and PhD).

Possible Career Paths
Possible career paths include research specialisation, teaching and conducting research at a university, where one could end up as the head of department; policy formulation and oversight or programme management in a government department; policy advisors to government; or running a consulting business.

Employer
- in universities, where they continue to carry out research
- teach their subject in research institutions, museums, development agencies and NGOs, which study the ways in which rural communities can be assisted to better look after their water and wetlands
- self-employment, set up a consulting business

Career 34: Farm Foreman Manager

Farm managers or foremen are responsible for the general maintenance and management of the farm. Managers plan, organize and supervise activities on farms.

The nature of the work differs according to the type of farming. On crop farms, managers or foremen supervise the planting, fertilising, spraying, cultivating and harvesting procedures of crops. On livestock farms, they supervise the care-taking of animals and the control of illnesses.

Farm managers and foremen are also responsible for the maintenance of tractors and other farming implements.

Some fulfilling and satisfying aspects of this career
- working outdoors
- working relatively independently
- living in rural areas away from urban congestion
- developing and using a wide range of skills, from mechanical to animal husbandry
- working with animals and/or plants

Some demanding and challenging aspects of this career
- working in bad weather conditions
- long irregular hours
- coping with natural disasters, such as floods, drought, insect plagues and animal diseases

Purpose Orientation
A farm foreman / manager should:
- enjoy working outdoors, in all weather conditions;
- like to work with plants and/or animals;
- be practical and hard-working;
- have diligence;
- have mechanical aptitude;
- have organisational ability;
- have the ability to endure isolation and limited social contact;
- have good health and physical strength and stamina;
- be independent, responsible and self-disciplined.

School Subjects
No minimum qualifications are required but functional literacy is neccesary.

Compulsory Subjects: None
Recommended Subjects: Agricultural Sciences

Training
Degree: BSc (Agric) and other agricultural degrees

Diploma: Various diplomas are offered by different universities of technology

Agricultural colleges offer diploma and certificate courses, which cover the most important branches of farming in the country; emphasis is placed on the agricultural situation prevalent in the area served by the specific college.

Some farm foremen receive in-service training, under the supervision of senior farm foremen / managers or farmers / landowners.

Employer
- large farming corporations
- owners of large farms
- department of Agriculture
- department of Health
- department of Lands
- department of Forestry
- self-employment, with enough experience, initiative and capital, can start own farming enterprise

Career 35: Farm Maintenance Worker

Farm maintenance workers work under the supervision of farmers or farm managers or foremen. The nature of the work of farm workers differs according to the type of farming.

On crop farms, farm workers are responsible for ploughing, planting, cultivation, pruning, irrigation, fertilising and spraying of crops. On livestock farms, farm workers care for, mark or brand and dip animals. They may be involved with the processing of meat, dairy products and wool. Some farm workers' duties include maintenance of tractors and other farming implements, and/or the construction and maintenance of farm buildings and fences.

Some fulfilling and satisfying aspects of this career
- working outdoors
- living in rural areas away from urban congestion
- developing and using a wide range of skills, from mechanical to animal husbandry
- working with animals, plants and/or machinery

Some demanding and challenging aspects of this career
- working in bad weather conditions
- long irregular hours
- physically very tiring work
- coping with disasters, such as floods, drought, insect plagues and sick animals

Purpose Orientation
A farm worker should:
- enjoy working outdoors;
- like to work with plants, animals or machinery;
- be practical and hard-working;
- have good health and physical strength and stamina;
- be responsible and have self-discipline.

School Subjects
No minimum qualifications are required.

Compulsory Subjects: None
Recommended Subjects: Agricultural Sciences

Training
Agricultural colleges offer basic courses, which cover the following three categories:

- Agricultural and Horticultural Training
- Mechanical and Building Training

- Business and Informal Training

At agricultural colleges, emphasis is placed on the agricultural situation prevalent in the area served by the specific college. Agricultural colleges include:

Farm workers may receive in-service training under supervision of farmers, farm managers or foremen.

Employer
- farm owners
- tenant farmers
- large farming corporations
- department of Agriculture
- department of Health
- department of Land Affairs

Career 36: Farmer

Farming covers the production of almost all kinds of animals, crops, fruits and vegetables suitable for a moderate to subtropical climate. Farmers are responsible for most of the production of a country's foodstuffs either through crop or stock farming. Another important responsibility of farmers is the conservation of the country's natural resources.

Farmers combine agricultural and business methods in operating small or large farms. Farmers' objectives are to make farming activities productive, profitable and professional.

The nature of the work differs according to the size and type of farm. The topography, climate and vegetation of an area determine the type of farming practised. On small farms, farmers may perform the actual labour, as well as plan and direct farming operations.

With crop farming, farmers perform a wide range of duties, such as determining land use, planting, fertilising, spraying, cultivating and harvesting procedures as well as marketing.

On livestock farms, farmers take care of animals. The correct breeding or incubation programme as well as feeding programmes, need to be followed. Pastures have to be planned and controlled in such a way that enough grazing will be available for the animals. Animals must also be vaccinated against illnesses. Wool, meat and dairy products need to be processed and marketed.

Farmers are also employers. The number of labourers each farmer employs is in direct proportion to the size and profitability of the farm and the degree of mechanisation. Farmers need to be well informed on all legislation that regulates labour relations in agriculture.

Farmers evaluate existing practices and look at methods for improvements. They maintain financial records, purchase supplies, determine labour needs and hire and supervise workers.

Some fulfilling and satisfying aspects of this career
- working outdoors
- working independently
- living in rural areas away from urban congestion
- developing and using a wide range of skills, from mechanical to business
- working with animals and/or plants

Some demanding and challenging aspects of this career
- working in bad weather conditions
- long irregular hours
- coping with natural disasters, such as floods, drought, insect plagues and animal diseases
- losing crops or livestock

Purpose Orientation
A farmer should:
- enjoy working outdoors, in all weather conditions
- like working with plants and/or animals
- have perseverance, diligence and patience
- have organizational ability
- have good planning, analytical and problem-solving skills
- have good leadership qualities and interpersonal relationships
- have good health and physical strength, stamina and agility
- have ability to endure isolation and limited social contact
- be independent, responsible and self-disciplined
- have mechanical aptitude and able to work with computers

School Subjects
Advanced Level Certificate meeting degree requirements for a degree course
Ordinary Level Certificate meeting diploma requirements for a diploma course

Each University or College will have its own minimum entry requirements.

Compulsory Subjects: Mathematics, Physical Sciences - for degree course
Recommended Subjects: Life Sciences, Geography, Accounting, Agricultural Sciences

Training
Formal training in agriculture is available on four different levels, namely schools, agricultural colleges, universities of technology and universities.

Schools: Certain secondary schools offer Agriculture as a formal subject. There are also special agricultural schools where the students are obliged to take one or more agricultural subjects. These schools usually have a farming unit with enough agronomic and animal material for demonstration as well as for training purposes. At most agricultural schools, the choice of subject is such that an exemption can be obtained.

Degree: BSc (Agric) and other agricultural degrees
Diploma: Various diplomas are offered by different universities of technology

Employer
- large farming corporations
- owners of large farms
- department of Agriculture
- department of Health
- department of Land Affairs
- universities, universities of technology and agricultural colleges
- self-employment, with own farm.

Career 37: Farrier

Farriers inspect, trim and shape horses' hooves and make, fit and nail horseshoes or, in the case of racehorses, racing plates.

Farriers observe horses' legs and hooves while the animal is stationary as well as in motion to check for irregularities, interference, peculiarities in gait or abnormalities in the size and shape of hooves. They consult with horse owners or trainers to decide on the type of shoe required, then remove worn or faulty shoes and note wear patterns and any foreign bodies, bruising, infections or deformities.

They examine, clean, trim and shape hooves using knives, hoof cutters and rasps. Then then measure hooves, make a template of each hoof on a piece of cardboard and estimate the length of metal required for the shoes. Metal is selected and cut according to the type, size and weight of the shoes and use of the horse, and suitable nails chosen.

They hold shoes against hooves to find out the amount of shaping required, and then heat shoes in a forge, shape them on anvils and hammer them to size. Once a shoe is ready it is placed and nailed to the hoof and checked carefully so that clips and clenched nails are smooth and lined up with the walls of each hoof.

Farriers may remove steel shoes from horses before they race and replace them with light aluminium shoes or 'tips' and after the race replace these again with the steel shoes. Some farriers work in the areas of corrective or surgical shoeing.

Farriers spend a great deal of time travelling to attend to horses, mainly in country or outer metropolitan areas. Weekend and after-hours work is often necessary. Farriers must work very quickly and have the ability to handle horses, as they may be unpredictable or agitated. Farriers usually wear some form of protective equipment.

Some fulfilling and satisfying aspects of this career
- opportunity to become self-employed
- working with horses
- working with your hands
- working outdoors

Some demanding and challenging aspects of this career
- possibility of injury on the job, for example being kicked by a horse
- working in all kinds of weather conditions
- physically taxing work

Purpose Orientation

- physical fitness and strength
- good eyesight and hearing
- ability to handle horses
- awareness of personal and industrial safety
- good eye-hand coordination

School Subjects
Ordinary Level Certificate
Some employers prefer higher qualifications.

Compulsory Subjects: None
Recommended Subjects: Mechanical Technology, Mathematics

Training
Apprenticeship training

Employer
- iron and steel manufacturers
- railways
- mining industries
- machinery manufacturers
- small repair shops
- stud farms, horse trainers, race track stables and horse owners
- self-employment

Career 38: Fishing Hand

Fishing hands or fishermen on a commercial fishing vessel or trawler usually operate as part of a crew that catches fish with different types of nets and prepares and processes the fish for sale. Deep-sea fishermen need to provide for long stays at sea and be able to operate electronic equipment for communications and navigation. Individual fishermen usually work from small boats relatively close to land and return home in the evenings.

Big boat fishermen use heavy nets and need to anchor these securely. The nets are hauled in using mechanical winches and the catch is usually dumped on board, where it is sorted, cleaned and prepared for processing.

Other duties include repairing fishing nets and gear, observing instruments for sighting schools of fish, being on watch duty and cleaning the vessel.

Fishermen who work in the sport fishing industry specialize in line fishing. They work on vessels chartered by tourists and holidaymakers for fishing trips ranging from a few hours to a few days. These types of fishermen assist people who have chartered the vessel by locating game fish, baiting hooks, hauling and gaffing fish, cleaning, eviscerating and storing fish, navigating and cleaning the vessel.

One of the drawbacks of this industry is that the work is seasonal. Many fishermen take on other work in the low season, such as working in fish-processing plants or fishing-tackle retailers.

Some fulfilling and satisfying aspects of this career
- working outdoors and in a relatively stress free and relaxed environment
- either working alone or with people

Some demanding and challenging aspects of this career
- working in all types of weather conditions
- seasonal work
- having to be away from home for periods of time
- not finding fish or only netting a small catch
- facing dangers at sea

Purpose Orientation
A fisherman should:
- be in good health;
- have physical strength;
- have coordination and mechanical aptitude for operating and repairing fishing equipment;
- have perseverance, working long hours at sea;

- tolerate being away from the family for long periods;
- be able to work as part of a crew;
- able to withstand cramped conditions for long periods;
- be flexible / versatile to be able to assume any other crew member's duties at a moment's notice.

School Subjects
No specific requirements.

Compulsory Subjects: None
Recommended Subjects: None

Training
In-Service Training:
The fisherman is trained on the job to effectively perform his duties.

Employer
- Commercial fishing companies
- Charter companies
- Self-employment - fishing offers good entrepreneurial possibilities. The fisherman with the necessary capital for a vessel and equipment, can open up his own commercial fishing company or charter company.

Career 39: Forestry Scientist/Silviculturist

Foresters plan and manage the growing, protection and harvesting of trees and help to manage their utilisation. They can choose to enter one of the following areas of activity in forestry:

Management: The majority of foresters are placed at forests or plantations where they initially serve as assistants and later as managers. Their duties include raising of seedlings in a nursery and planting of trees. They also coordinate and assist with the pruning, thinning and felling of trees, the sawing of felled trees into logs and their loading. They burn firebreaks and protect the forests against fire and damage. They may have to maintain roads, erect buildings and maintain telephone lines.

Conservation: Conservation foresters are responsible for conserving the fauna and flora, as well as the soil and water resources. They also manage and plan recreational activities like hiking and picnicking in forest areas.

Research: Research foresters conduct research to ensure the preservation of trees and specialises in growth modelling, forest genetics, forest thology, conservation and ecology.

Extension foresters advise farmers and educate the public about the importance of trees.

Areas of specialization:

Silviculture involves tree breeding, forest tree seed, nursery practice, establishment and tending, forest nutrition and management of ectomycorrhizal fungi.

Forest Soil Science involves soil classification, soil manipulation and site evaluation.

Forestry Finance includes: project selection, land and plantation valuation, optimal financial rotations and inflation economics. Other areas of specialization include growth and yield science, forest biometrics and the modelling of plantation development.

Forest Engineering is concerned with the environmental, social, physical and economic impacts of harvesting. This includes the management of the total supply chain from felling to mill delivery. The effect of harvesting methods and systems are analysed with regard to the impact on wood procurement cost and wood and fibre quality as well as ergonomics. Other factors are access development, forest road construction and network management.

Foresters work mostly out of doors and are sometimes subject to considerable stress, especially during fast-changing climatic conditions and due to the steep and mountainous nature of most state forests..

Some fulfilling and satisfying aspects of this career
- working outdoors
- living close to nature
- caring for fauna and flora

Some demanding and challenging aspects of this career
- coping with fires, floods and other conditions that may destroy forests and wildlife
- working long hours during emergencies
- working in isolated areas
- working outdoors in adverse weather conditions
- having to do paperwork in the office

Purpose Orientation
- enjoy working outdoors and living close to nature
- alert, careful and responsible workers
- able to adjust to living in isolated and distant surroundings
- physical fitness, strength and stamina
- good coordination
- able to communicate well with fellow foresters and labourers
- practical and versatile
- good observation skills and an enquiring mind

School Subjects
Advanced Level Certificate meeting degree requirements for a degree course
Ordinary School Certificate meeting diploma requirements for a diploma course

Each University or College will have its own minimum entry requirements.

Compulsory Subjects: Mathematics, Physical Sciences
Recommended Subjects: Life Sciences, Economics, Agricultural Science

Training
Degree: 4-year BSc Forestry degree, B.Tech or a course in Wood Science.

Diploma in Forestry.

Employer
- city councils
- timber growing organizations
- sawmills and timber preservation organizations and private forestry companies

Career 40: Fruit and Vegetable Canning Industry

The fruit and vegetable canning industry offers a wide variety of career opportunities, from the farmer that grows the fruit and vegetables, to the delivery man who delivers the canned products to the retailer.

Production: Production such as canned fruit and vegetables, tomato sauce, jam, achar and flavouring agents are manufactured by canning corporations. Workers in the production division are responsible for the preparation of the products, so that they can be canned and preserved. This includes, among other things, the sorting and finishing of the fruit and vegetables, The machines which are used in the production processes, operate for 24 hours a day and therefore the workers must work shifts. The production manager must monitor the different processes.

Technical division: The technical division is responsible for product development, quality control, industrial and project engineering and purchases. Products must be extended, developed and improved. The products must also meet certain quality standards. Industrial engineers ensure that the labour, materials and energy in factories are optimally used. Project engineers develop new facilities and processes.

Marketing: The marketing personnel are responsible for advertisements, promotions, product training and commercial support. Marketing personnel include clerks, accountants, bookkeepers, liaison officers and marketing mangers, to name but a few.

Sales: Sales personnel at sales houses throughout the country, are in close contact with the different consumers.

Distribution: The distribution must ensure that the final product reaches its destination safely and as soon as possible. Personnel needed include drivers, route planners and conductors. Workers keep count of all the goods that enter and leave the warehouses.

Finance and administration: This division uses sophisticated computer networks. Personnel such as accountants, auditors, secretaries and legal advisers are employed.

Manpower: The manpower division is responsible for personnel affairs such as training and development.

Some fulfilling and satisfying aspects of this career
- satisfaction of ensuring that good quality food reaches the consumer
- relatively stress free environment
- possibility of promotion
- developing a range of skills

- variety of different types of work

Some demanding and challenging aspects of this career
- work may be very repetitive
- sometimes standing for long hours

Purpose Orientation
- must have mechanical insight
- good manual dexterity.
- should not be colour-blind
- be neat and careful of hygiene

School Subjects
Advanced Level Certificate meeting degree requirements for a degree course, for workers in senior supervisory positions, for example, industrial engineers.

Each University or College will have its own minimum entry requirements.

Compulsory Subjects: None
Recommended Subjects: Depends on career with in industry,. Physical Sciences and Life Sciences for workers in senior supervisory positions.

Training
Workers in the canning industry receive in-service training.

Employer
- any fruit and vegetable canning company

Career 41: Grain Grader

Grain graders are responsible for the grading, storage and distribution of grain.

Grain is marketed according to its class and grade. To determine the quality of the grain, grain graders examine representative samples of all grain deliveries and grade them. Properties that are analysed include: moisture, protein, siftings, hectolitre mass, insufficient seeds, infections of mould, harmful seeds, foreign materials and grain insects. Certain loads may be rejected after analysis.

Loads of grain that have been accepted, are sorted into different classes and grades, and the storage of the grain is supervised to ensure that the different grades and classes are stored separately.

Grain graders often work in silo complexes, where they are concerned with the determination of the mass of grain received or dispatched, the storage and fumigation of grain and the hygiene of the silo complex. Grain graders are also sometimes responsible for the various administrative tasks necessary in running silos or grain depots.

Grain graders usually work in grading rooms, where all the necessary grading equipment is available. If they work for co-operatives, grain-dealers or seed growers, they will work mainly in rural areas and if they work at a mill or other grain processors, they are more likely to be operative in urban areas.

Conscientious grain graders can be promoted to depot managers, inspectors or product managers. Specialization within the food processing industries is also possible.

Some fulfilling and satisfying aspects of this career
- working with agricultural produce
- possibilities of promotion

Some demanding and challenging aspects of this career
- allergies to certain grains
- dealing with grain suppliers who do not agree with your grain grading

Purpose Orientation

A grain grader should:
- be honest and reliable;
- be impartial;
- have a meticulous approach;
- be dedicated;
- have good communication skills.

School Subjects
Advanced Level Certificate.

Compulsory Subjects: None
Recommended Subjects: None

Training
Employers offer basic in-service training as well as a number of short courses, which will assist grain graders to achieve proficiency. Short courses may include: grading, grain managing, fumigation, spraying, first aid and occupational safety.

Employer
- Co-operatives
- Grain processors
- Corn-chandlers
- A conscientious grain grader can be promoted to depot manager, inspector, chief of grain or product manager.

Career 42: Grassland Scientist

Grassland science includes all aspects of the conservation, improvement and utilization of natural and established pastures.

Grassland scientists answer questions such as how often, how severely and at what time of the year should pasture plants be stripped of their leaves, how many animals can be kept on a certain pastureland and whether it is necessary to put up fences and make camps.

Pasturelands are becoming more and more important due to the increasing demand for food and raw materials, not only because of a weak economy but also because plant topping forms the basis of soil conservation. Besides natural grasslands, cultivated grasslands play an important role in stabilizing and enhancing animal production.

Grassland scientists have a thorough knowledge of the ecological and physiological principles of pasture utilisation and the practical application of management principles, aimed at the maintenance, effective utilization and recovery of natural and cultivated pastures.

The physical and biological planning of a farm must be done in accordance with the principles of grassland science. Pasture programmes for the different livestock must be planned and implemented.

Grassland scientists continually search for additional forage species, which are suitable for local conditions as cultivated pastures. They also try to improve indigenous material and cultivate new varieties.

Some satisfying aspects of this career
- working both outdoors and indoors
- challenge of finding solutions to ecological problems
- making a difference in animal nutrition

Some demanding aspects of this career
- working outdoors in adverse weather conditions
- failures in research projects such as new grass hybrids
- frustration when trying to improve awareness, such as of how the overstocking of goats, for example, causes desertification

Purpose Orientation

A grassland scientist should:
- love of nature and the outdoors
- interest in ecology and conservation

- able to communicate well
- inquisitive and problem-solving skills
- aptitude for natural sciences

School Subjects
Advanced Level Certificate meeting degree requirements for a degree course

Each University or College will have its own minimum entry requirements.

Compulsory Subjects: Mathematics, Physical Sciences
Recommended Subjects: Life Sciences, Geography

Training
Degree: Bsc in Agriculture

Subjects include Ecology, Taxonomy, Genetics, Pasture Evaluation Techniques, Applied Field Management and Plant Physiology. Microbiology and Statistics are also recommended.

Diploma in Nature Conservation

Employer
- Department of Agriculture
- National Parks Board
- cooperatives
- manufacturers of fertilizers
- seed growers
- mining companies
- commercial banks
- educational institutions.
- self-employment, as private consultant

Career 43: Guide Dog Trainer

Guide dog trainers train dogs to guide people who are partially or wholly visually impaired, also known as blind people. After training a guide dog, the trainer needs to teach the blind person how to use the dog.

Guide dog trainers choose a team of twelve-month old puppies - usually eight - for training. The pups are put through a training programme and are then assessed over a period of from four to six months. Guide dog trainers then train the dogs to guide visually impaired people, getting the dogs used to all kinds of places of work and living conditions. Training lasts for up to six weeks. Blind people trained at the guide dog centre usually receive a further three to five days of follow up instruction after they return home.

Guide dog trainers need to be physically healthy and strong, and free from leg, back, muscular, skeletal or foot disorders, because young dogs often get excited, especially when they begin training and may jump up all over the trainee.

Some satisfying aspects of this career
- being able to help visually impaired people
- meeting people from all walks of life
- satisfaction of seeing the result of your work when the dog and it's master work well together

Some demanding aspects of this career
- frustration and exhaustion when dogs do not respond to training
- having to work under time pressure sometimes
- having to work long hours, depending on the dog's progress

Purpose Orientation

Guide dog trainers need to behave;
- enjoy working with animals
- aptitude for handling dogs
- patient and kind, firm, emotionally stable and mature
- physically strong and fit
- desire to work with visually impaired people
- able to communicate well

School Subjects
No minimum requirements

Compulsory Subjects: None

Recommended Subjects: English, Other Languages, Life Sciences

Training
Guide dog trainers receive practical in-service training under the supervision of experienced trainers.

Employer
- dog units in the Police Force and other defence force divisions
- self-employment is possible

Career 44: Herpetologist

Herpetologists are zoologists who specialize in the study of reptiles and amphibians, for example snakes, lizards, crocodiles, and frogs. Herpetology can be split into two broad categories:

- *Basic herpetology*: the study of reptiles and amphibians for its own sake

- *Applied herpetology*: the information gained in basic herpetology, applied to a particular situation

Basic herpetologists study the origin of these animals, their interrelationships with other species, how they are affected by the environment, their behaviour, growth and development, genetics and distribution. They sometimes also work in museums as taxonomists where they are responsible for naming and classifying species.

Applied herpetologists work as curators of reptile parks or in the reptile sections in zoos, and in other positions managing the breeding of reptiles and amphibians.

This work may also entail working in positions which require educating the public with regard to these species.

As this is a highly specialized field the advice of herpetologists is often sought by the media or by medical teams in the treatment of snakebite victims. This field does offer some entrepreneurial possibilities with regard to writing articles and appearing on nature conservation programmes on television, but it is unlikely that this would be a full-time option.

Some fulfilling and satisfying aspects of this career
- working both indoors and outdoors
- being consulted for your knowledge
- working with nature in your field of interest

Some demanding and challenging aspects of this career
- possible eyestrain from using microscopes
- the dangers of dealing with poisonous creatures

Purpose Orientation
A herpetologist should:
- love wild animals and have concern for their conservation, especially reptiles and amphibians;
- be concerned about conservation;

- have patience;
- be responsible;
- be committed to educating the public about these species;
- be willing to work long and unusual hours;
- obtain the highest possible qualification (competition for the limited availability of jobs is intense).

School Subjects
Advanced Level Certificate meeting degree requirements for a degree course
Ordinary Level Certificate meeting diploma requirements for a diploma course

Each University or College will have its own minimum entry requirements.

Compulsory Subjects: Mathematics and Physical Sciences
Recommended Subjects: Life Sciences

Training
Degree: BSc (Zoology) followed by BSc Honours (Herpetology).

Post-graduate studies are essential for basic herpetology and senior positions in applied herpetology.

Diploma in Nature Conservation.

Diplomas will only qualify you for assistant positions in zoos and reptile parks, most of which provide in-service training for university graduates.

A B Tech degree in Nature Conservation could lead to better positions

Employer
- Reptile parks
- Zoos
- Crocodile farms
- National Parks
- Museums
- Universities and universities of technology
- Manufacturers of snake-bite serum
- Self-employment, can open a reptile park, zoo or crocodile farm but all these ventures require considerable start-up capital.

Career 45: Horse stud manager

Horse stud managers are responsible for the housing, breeding, health, training and selling of horses within a horse stable and stud system. They need to be able to use their knowledge to deal with and solve problems in a scientific manner.

Horse managers study records of bloodlines and the physical appearance and performance characteristics of horses to determine breeding combinations before selecting horses suitable for mating. They maintain breeding records, dietary and other statistical information. They select and arrange purchase of bloodstock, mate mares with selected stallions and assist with foaling.
They need to ensure that horses are exercised and supervise the training of horses for competitions. They inspect horses for disease, illness and injuries and secure the services of a veterinarian when necessary.

They also supervise and manage equipment, facilities, pastures and staff, as well as carry out administrative tasks such as marketing, budgeting, planning and management of physical and financial resources.

Horse managers may specialize in the study and practice of riding and horsemanship (equitation), horse handling, instructional skills and managing riding schools for people at different levels of capability. Others are involved in the management of breeding programmes.

Some fulfilling and satisfying aspects of this career
- working with horses and people
- working both indoors and outdoors
- being in a rural setting

Some demanding and challenging aspects of this career
- working long hours and after hours in all kinds of weather
- keeping up with and adapting to new scientific and technological developments
- having to start at the lowest position of the equine industry and work your way to the top

Purpose Orientation
The horse-stud manager should:
- love animals, especially horses;
- have a placid temperament and calm way of working with horses;
- have the ability to get along well with other people in many different work situations;
- ability to organize and manage;
- be punctual and accurate;
- enjoy working outdoors;
- physically fit and strong.

School Subjects
Advanced School Certificate meeting diploma requirements for a diploma course

Each University or College will have its own minimum entry requirements.

Compulsory Subjects: None
Recommended Subjects: Life Sciences, Physical Sciences, Mathematics

Training
Diploma in Equine Science

Employer
- private horse-breeders
- commercial stables
- self-employment, with enough experience and capital, can start own stud farm

Career 46: Horse Trainer

Horse trainers train horses for racing, trotting, harness or riding. They advise and consult with owners and direct stable staff and jockeys / drivers.

Trainers need to handle a horse gently and make it accustomed to the bridle, saddle and other riding gear. Horses are taught to respond to commands made by legs or reins and commands.

Horse trainers may also teach learner jockeys, drivers and riders, horse riding techniques and horse handling methods. They plan, supervise and carry out training programmes for horses and select race programmes to achieve the best placing for a horse. They attend race meetings or other horse-related events.

They also need to advertise their services to attract clients and employ and manage staff in accordance with relevant laws. They have to keep accurate records of accounts and use correct credit procedures.

They supervise and direct stable staff, jockeys, drivers of a sulky and other workers. Horse trainers sometimes get special permission to organize the breeding of horses and then they may need to help mares when they deliver their foals.

Horse trainers are also responsible for grooming, exercising and feeding the animals. They either do this themselves or they supervise assistants or stable hands.

Horse trainers usually specialize in either thoroughbreds for galloping races, standard breeds for pacing or trotting races or performance horses for events, show jumping and dressage.

Horse trainers may be required to work long hours. Much of their work is carried out very early in the morning and they may continue to work all day.

Some fulfilling and satisfying aspects of this career
- working outdoors and with the animals
- helping animals in distress
- seeing how animals respond to teaching is a rewarding factor
- training an animal can also be emotionally satisfying

Some demanding and challenging aspects of this career
- frustration when animals do not respond to training
- having to work long hours in all kinds of weather conditions

Purpose Orientation

- keen interest in and love of animals, particularly horses
- extremely patient and kind
- friendly and caring
- managerial traits
- physically strong and fit

School Subjects
No set level of school required
It is suggested that you progress as far as you can at school

Compulsory Subjects: None
Recommended Subjects: Life Sciences and Science

Training
Diploma in Equine Science

In-service training is usually offered in the relevant areas of interest. These may include circuses, racecourses, stables or the armed services.

Employer
- circuses
- racecourses
- stables
- armed services
- self-employment

Career 47: Horticulturist

Horticulturists are professionals involved in the growing, selling, and maintenance of plants for indoor and outdoor use. Some specialize in plants indigenous to Southern Africa. They seek to beautify cities, towns or suburbs and provide better recreation facilities. It requires a lot of research in the field to understand the conditions under which plants grow.

Horticulturists' work can be divided into four different spheres:

Commerce: plants are propagated and seeds produced for marketing by nurseries and in greenhouses or hothouses.

Parks and decorative areas: a park administrator concerned with layouts and cultivation of plants in landscapes, parks and public gardens and also with the beautifying of areas such as pavements and entrances of towns and cities, areas adjacent to freeways and railway stations.

Conservation: Horticulturists / Specialist Horticulturists / Curators of Botanical Gardens work in association with scientists and develop plant collections from all over Southern Africa to get to know how to conserve them, grow them and develop an appreciation for indigenous plants.

Supplementary products: as researchers, advisers, or salespeople of chemicals, fertilisers and horticultural products / elements.

Research: involved with the development of improved varieties of plants. Horticulturist scientists, those with university degrees in horticulture, are the most likely to work for various agricultural research institutes conducting research on vegetables, fruit and flowers as well as on grape and wine preparation.

They also work on environmental and pest control and some work on improving and cultivating plant varieties, hybrids.

Horticulturists often work with engineers, landscape architects, environmental conservationists and town planners. They could provide plant decorations for functions and offices or be involved in the creation of recreational areas such as botanical gardens, nature reserves and hiking trails, where people can relax or exercise, and also for research, conservation and the education of the public. They may contribute to the conservation of the environment through the provision of green zones, the establishment of vegetation in certain areas and soil stabilisation.

Horticulturist work mainly outdoors, at research institutes, production farms, nurseries, parks and botanical gardens, and in conservation areas where they might propagate rare and endangered plants, including those used for traditional healing.

Some fulfilling and satisfying aspects of this career
- working with nature and plants
- challenge and variety of the work
- working outdoors at least some of the time

Some demanding and challenging aspects of this career
- long periods of seemingly unsuccessful research
- having to obtain advanced education
- continue studying to keep abreast of the latest developments within this field

Purpose Orientation
A horticulturist should:
- have an inborn love of nature;
- enjoy working outdoors;
- be creative and know how to arrange trees, shrubs and flowers in a landscape and to blend colours and shapes;
- be responsible and interested in conservation;
- have technical abilities;
- be patient and have perseverance;
- be able to make decisions independently;
- be able to foresee horticultural activities over a whole year and to plan accordingly.

School Subjects
Advanced Level Certificate meeting degree requirements for a degree course
Ordinary Level Certificate meeting diploma requirements for a diploma course

Each University or College has its own entry requirements.

Compulsory Subjects: Mathematics (some institutions require Physical Sciences and / or Life Sciences)
Recommended Subjects: Life Sciences, Physical Sciences, Agricultural Science

Training
Degree: BSc (Agric) degree

Employer
- Large fruit, vegetable and flower farms
- Department of Public Works
- Public corporations and semi-state institutions
- Nurseries and botanical gardens
- Manufacturers of pesticides, fungicides and fertilisers
- Municipalities
- Universities and universities of technology
- Research institutes
- Self-employment, with enough experience and capital, can start own horticultural enterprise

Career 48: Ichthyologist

An ichthyologist is a zoologist specializing in the study of fish.

Ichthyology or fish research offers a very rewarding lifestyle and most people involved in this field love their work. The daily routine of the ichthyologist is very varied, involving field study, laboratory work, reading research literature, writing up research results and lecturing. Researchers usually work fairly independently, setting their own goals, and the personal reward of making new discoveries about fish and their role in the environment is immense. Most ichthyological work is physically demanding and involves the collection of fish. In certain fields, such as taxonomy and fisheries sciences, the amount of time spent in the field is relatively small and the work is usually performed in a team with others. This makes it possible for disabled persons to enter these fields of work and make a contribution.

Within the field of ichthyology there are a number of focus areas:

- *Aquaculture*: the study or practice of fish farming and management

- *Fisheries science*: the study and management of harvesting fish for human consumption

- *Conservation*: the conservation of natural fish populations

Opportunities in fish research, because of the specialized nature of this field of study, tend to be limited to the universities and museums. Only the most highly motivated and productive researchers are successful. For this reason, many honours and masters graduates move into related or even totally different fields.

Fish farming (aquaculture) is a rapidly growing industry. At present, trout, catfish, tropical fish, oysters and mussels are farmed commercially in South Africa and most enterprises are small businesses run by the owner or a manager.

A BSc degree in Ichthyology would also qualify a person to work or study further in the following related fields: teaching, environmental education and aquatic environmental management.

Some fulfilling and satisfying aspects of this career
- making new discoveries
- working outdoors a good deal
- working in your special field of interest

Some demanding and challenging aspects of this career
- sometimes having to work long hours

- working in all kinds of weather
- the stress when disease strikes a fish population

Purpose Orientation

An ichthyologist should:
- love nature and have sufficient interest in fish to want to follow a career in this field
- be able to work independently
- have capacity for independent and original thought
- have practical aptitude, to use equipment and perform experiments
- have entrepreneurial skills to develop a successful aquaculture business

School Subjects
Advanced Level Certificate meeting degree requirements for a degree course

Each University or College will have its own minimum entry requirements.

Compulsory Subjects: Mathematics, Physical Sciences
Recommended Subjects: Life Sciences

Training
Degree: BSc majoring in Zoology

Postgraduate study: Honours degree in Ichthyology, Fisheries Science or Aquaculture

Further study: MSc or PhD is required to secure research positions. However, many honours and masters graduates use their qualifications to enter aquaculture and fishing industries.

Employer
- Universities
- Museums
- Department of Environment and Tourism
- Sea Fisheries Research Institute
- Private fish farmers
- Fish harvesting companies

The following self-employment possibilities exist:
- Fish farming e.g. trout, catfish, tropical fish, oysters and mussels
- Private consulting on ichthyological, conservation and management matters.

Career 49: Labourer

The main responsibility of labourers is to assist a supervisor and carry out instructions accurately. The work of labourers is largely of a physical nature and varies from one industry to another:
Farm labourers assists in the feeding of animals, ploughing and planting. The food industry employs labourers to assist with a wide variety of kitchen tasks, including cleaning and baking.

Labourers may work as assistants or general handymen, under the supervision of qualified tradesmen, where tasks include passing equipment, tending to tools and assisting with the building of structures.

Labourers can also be employed to do domestic cleaning inside or outside buildings. A labourer can work in practically every industry in which there are tasks that require physical strength and no other qualification or skills.

Some fulfilling and satisfying aspects of this career
- working with your hands
- using your physical strength
- developing a range of skills
- the possibility of promotion, for example to supervisor level
- the variety of different types of work to choose from

Some demanding and challenging aspects of this career
- sometimes having to work in bad weather
- working over-time
- doing physically tiring work
- limited promotional prospects, without further education or training

Purpose Orientation
A labourer should:
- be in good health;
- have strength and stamina;
- be reliable and have integrity;
- be willing to work outdoors in all types of weather;
- able to follow instructions;
- be able to work independently if required to do so.

School Subjects
No specific requirements.

Compulsory Subjects: None
Recommended Subjects: None

Training
A labourer usually receives in-service training.

Employer
- Farms
- Building industry
- Food industry
- Businesses
- Buildings
- Schools
- Shopping centres
- Hostels
- Care centres
- Hotels
- Trade industry

A labourer can work in practically every industry in which there are tasks which require physical strength and no other qualification or skills.

Career 50: Meteorological Technician

Meteorological technicians are responsible for the collection of meteorological information. Their work includes the rendering of meteorological advisory services, the operating and maintenance of a weather observation network and research and training.

Except for a few specialists, technicians render almost all of the climatological services at the Weather Bureau. Before any meteorological forecast can be made, the technician must collect a large amount of meteorological information.

Observations are made of different elements such as temperature, atmospheric pressure, visibility and clouds. Various aids such as computers, radar and automatic weather stations are used to make these observations. Meteorological instrument technicians are responsible for the maintenance of this apparatus.

After a meteorological technician has checked all the information, it is sent to the most important weather offices with the use of meteorological codes. Sometimes observations are sent directly to air navigation and marine offices. Weather offices at all the major airports are manned by meteorological technicians who provide numerous flight forecasts daily to air navigation. Forecasts are also provided to agriculture, industry and the general public. Records are kept of all observations and added to a computerized data bank.

Meteorological technicians may work in weather stations at airports or at stations in isolated areas. They work shifts and some weather offices are open for 24 hours every day. Meteorological instrument technicians are responsible for the installation, maintenance and development of electronic and sophisticated equipment such as electronic airport systems and weather radar.

Some fulfilling and satisfying aspects of this career
- working both indoors and outdoors
- the challenge of trying to predict the weather

Some demanding and challenging aspects of this career
- working shifts and long hours
- making the wrong weather predictions
- stress of meeting deadlines

Purpose Orientation
A meteorological technician should:
- have mathematical and scientific aptitude;
- have good observational skills;
- work accurately;

- be responsible;
- be attentive;
- work independently.

School Subjects
Advanced Level Certificate meeting degree requirements for a degree course
Ordinary Level Certificate meeting diploma requirements for a diploma course

Each University or College will have its own minimum entry requirements.

Compulsory Subjects: Mathematics, Physical Sciences
Recommended Subjects: Geography

Training
Degree: BSc with appropriate subjects that include Geography, Geoinformatics and Meteorology.

Employer
- Department of Environment
- Airports
- Weather ships

Career 51: Meteorologist

The three main objectives of the Meteorological Department are the operation and maintenance of a weather observation network throughout the country, the provision of meteorological advice services and research and training.

With rapid technological development, equipment of an increasing degree of sophistication such as meteorological satellites, automatic weather stations and powerful electronic data processing systems is being used to capture and process meteorological data.

Meteorologists are responsible for management to ensure that the Weather Bureau keeps pace with scientific and technological developments, that high standards are maintained and that staff receive the necessary training.

Meteorologists must therefore be well-trained academically and conversant with meteorological practice. Research is also an important task of meteorologists and when properly equipped, they can research on the microphysics of clouds, the artificial stimulation of rainfall and hail suppression.

Meteorologists are responsible for the operation of computerized prognostic systems. This involves some research and development of new numerical models. Meteorologists must therefore have a sound knowledge of electronic data processing techniques.

All meteorological data is stored in a computerized data bank. Before data is added to the data bank it is subjected to quality controls. Meteorologists are responsible for the operation of the data bank and for the design and maintenance of the system software.

Meteorologists can also specialize in one of the following fields in meteorology: dynamic and synoptic meteorology, numerical weather prediction, physical meteorology, or microphysics of clouds and climatology. Meteorologists carry out their duties in well-equipped offices and do a certain amount of research in laboratories.

Areas of specialization include:

- dynamic and synoptic meteorology
- numerical weather prediction
- physical meteorology and the microphysics of clouds
- climatology

Meteorologists work indoors in offices or weather stations often surrounded by atmospheric, land and water maps, charts and models, modern weather recording and evaluating equipment and computers.

Meteorological Technician

Meteorological technicians are responsible for the collection of meteorological information. Their work includes the rendering of meteorological advisory services, the operating and maintenance of a weather observation network and research and training.

Except for a few specialists, technicians render almost all of the climatological services at the Weather Bureau. Before any meteorological forecast can be made, the technician must collect a large amount of meteorological information.

Observations are made of different elements such as temperature, atmospheric pressure, visibility and clouds. Various aids such as computers, radar and automatic weather stations are used to make these observations. Meteorological instrument technicians are responsible for the maintenance of this apparatus.

After a meteorological technician has checked all the information, it is sent to the most important weather offices with the use of meteorological codes. Sometimes observations are sent directly to air navigation and marine offices. Weather offices at all the major airports are manned by meteorological technicians who provide flight forecasts daily to air navigation. Forecasts are also provided to agriculture, industry and the general public. Records are kept of all observations and added to a computerized data bank.

Meteorological technicians may work in weather stations at airports or at stations in isolated areas. They work shifts and some weather offices are open for 24 hours every day. Meteorological instrument technicians are responsible for the installation, maintenance and development of electronic and sophisticated equipment such as electronic airport systems and weather radar.

Some fulfilling and satisfying aspects of this career

- the challenge and variety of the work
- knowing that others rely on the information you provide

Some demanding and challenging aspects of this career

- working nights
- weekends and holidays
- occasional frustration involved in research, or of trying to predict weather conditions
- having to continue with further studies throughout your career to qualify for promotion

Purpose Orientation

A meteorologist should:

- be curious and imaginative;
- be able to communicate clearly in both speech and writing;
- have good judgement;
- be responsible;
- be able to concentrate well, even under stress;

- have a mathematical and scientific aptitude.

School Subjects
Advanced Level Certificate meeting degree requirements for a degree course

Each University or College will have its own minimum entry requirements.

Compulsory Subjects: Mathematics, Physical Sciences
Recommended Subjects: Geography, Life Sciences

Training
Degree: BSc with appropriate subjects that include Geography, Geoinformatics and Meteorology.

Practical training: candidates must undergo practical training under the supervision of a senior officer at the Weather Department. Training consists of weather observation, operating meteorological instruments and weather forecasting.

Post-graduate study: BSc Honours degree with Applied Mathematics, Mathematics, Physics or Mathematical Statistics is required to become a professional meteorologist.

Employer
- weather Department
- department of Environment and Tourism
- weather stations
- department of Agriculture
- universities
- forecast offices of airports and air force stations

Career 52: Microbiologist

Microbiologists study the basic anatomy, genetics and physiology of micro-organisms, such as bacteria, fungi and viruses, as well as the vital interaction between micro-organisms and the environment. They apply this knowledge to manipulate micro-organisms both ecologically and industrially, to improve the quality of life and to diagnose and control micro-organisms which contaminate human beings, animals and plants.

Micro-organisms are found everywhere, from places such as Antarctica, to the volcanic pipes on the bottom of the ocean with temperatures of 268 degrees centigrade, the saltpans in Namibia, the bloodstream of animals, and swamps where the only source of food is carbon dioxide. Even though they are very small and usually invisible to the naked eye, micro-organisms play vital roles in biological activities in our environment as they interact with human beings and animals, either detrimentally or beneficially.

In the medical world, microbiologists are involved in the quick and accurate location and identification of pathogenic micro-organisms. They develop effective vaccines and methods of preventing epidemics of dangerous diseases.

Microbiologists are involved in various activities such as:

- finding solutions for fresh water pollution
- the identification of pathogenic micro-organisms
- prevention of food decay
- microbiological processes in the industry where micro-organisms are used in the manufacture of chemicals
- the control of unwanted microbe activities which can cause losses, for example the degradation of aviation fuel, the corrosion of iron tubing and the breaking down of textile products
- micro-organisms are also used in the production of antibiotics

Areas of specialization include:

- Environmental Microbiology
- Genetics
- Immunology
- Medical Microbiology
- Mycology
- Virology
- research
- teaching
- administration

- Laboratory Direction (Supervision)
- Product and Process Control

Microbiologists work in laboratories in a wide range of employment areas. Laboratories are equipped with microscopes, dyes, stains, beakers, test tubes and other laboratory and testing equipment. Special care must be taken to keep the work areas sterile, and safety precautions must be taken when working with disease-causing organisms. Some microbiologists work in specially designed areas. Others work in areas which house laboratory equipment and animals. The actual setting depends on the size, type, location and financial resources of the employer.

Some fulfilling and satisfying aspects of this career
- working with other scientists
- being part of a research or medical team
- doing research in your area of interest
- knowing one's work is likely to help others

Some demanding and challenging aspects of this career
- having to work long hours when doing research or running tests
- the frustration of unsuccessful research or test results
- the possibility of infection
- having to keep up with the latest advances in the field by continually reading professional journals and attending conferences and lectures

Purposeful Orientation

A microbiologist should:
- be imaginative and curious;
- have good judgement;
- be alert;
- be precise and methodical;
- work well with details;
- be patient and have perseverance;
- be able to work independently and as part of a team.

School Subjects
Advanced Level Certificate meeting degree requirements for a degree course
Ordinary Level Certificate meeting diploma requirements for a diploma course

Each institution will have its own minimum entry requirements.

Compulsory Subjects: Mathematics, Physical Sciences
Recommended Subjects: Life Sciences

Training
Degree: BSc Microbiology, and supporting majors such as Chemistry, Biochemistry, Physics, Biology, Mathematics and Statistics.

Diploma in Microbiology

Post-graduate study: advanced study is required for teaching posts at universities and for research and administration.

Employer
- Hospitals, clinics and other health care facilities
- Medical schools
- Medical research councils
- Agricultural research organisations
- Food, fermentation and pharmaceutical industries
- Department of Agriculture
- Department of Health
- Department of Water and Forestry
- Department of Trade and Industry
- Universities and universities of technology
- Practising pathologists

Career 53: Miller

Millers are responsible for the processing of different types of grain, particularly wheat and maize.

The wheat milling process consists of three stages, each with its specific type of machinery. The breaking, scraping and reduction processes take place during these stages. The process of maize milling is much the same as that of wheat, but not as many production stages are required. To ensure that the correct standard and quality are maintained, millers are required to test the products.

In addition millers supervise the work of mill workers. Today the milling process is highly mechanized. The task of millers consists chiefly of setting milling machines and supervising their operation. It is important that millers obey all the relevant health regulations. This will ensure a food product of the highest quality.

The wheat milling process consists of three stages:

- *Control process*: roller-mills with grooved rollers that rotate at different speeds and directions are used to crack the wheat-kernel open to remove as much of the bran from the endosperm (the flour) as possible

- *Scraping process*: here the pieces of bran that cling to the endosperm are removed

- *Reduction process*: the semolina in the endosperm is refined by means of smooth roller-mills and the remaining pieces of bran and seed are removed. The endosperm is then graded by sifting machines. If it is still not fine enough, the process is repeated

The procedure of maize-milling is basically the same as described above, except that the machines are set differently because the kernels are much bigger than wheat-kernels. The final products of maize milling aremealie-meal, samp, mealie rice and grits.

Millers usually work indoors in the machine rooms of commercial grain mills. Working conditions are, of necessity, clean. The machines usually make a lot of noise and ear-guards are worn.

Some fulfilling and satisfying aspects of this career
- good working conditions
- good remuneration
- favourable prospects in the milling industry

Some demanding and challenging aspects of this career
- the noise of the machines
- irritation of the nasal passages caused by fine particles of flour drifting in the air

Purpose Orientation

A miller should have/be:
- certain amount of mechanical insight and technical ability
- interest in different grains and laboratory work
- alert, neat, accurate and careful worker
- communicate well with others
- sense of responsibility
- manual dexterity
- good eye-hand coordination
- good vision and colour discrimination
- good health and relatively strong

School Subjects
Ordinary Level Certificate.
Some employers prefer higher qualifications.

Compulsory Subjects: Mathematics, Science
Recommended Subjects: None

Training
Apprenticeship training.

Employer
- Milling companies throughout the country

Career 54: Natural Resource/Environmental Economist

Economists are social scientists who specialise in Economics, which they may combine with Ecology, Environmental Sciences or Agricultural Sciences, to specialise as natural resource, agricultural and/or environmental economists.

This is a scarce skill and this career is in high demand.

Resource and environmental economists attribute value to natural resources such as land, freshwater, forests, grasslands, marine resources, agricultural produce and air.

Depending on the particular field entered, there is an enormous amount of data to assimilate, and market research facts and figures to digest. In order to make accurate assessments of problem areas, travelling might be necessary in some cases to see what could be done to improve matters.

A particularly satisfying aspect is that this is a relatively new field, therefore many of the studies undertaken by resource and environmental economists are of a ground-breaking nature. Innovative new methods to quantify ecosystem benefits need to be developed. However, in a new field, there are usually not enough projects focused specifically on natural resources and the environment only. Natural resource economists may, at times, find themselves being involved in more general socio-economic studies, and therefore a more holistic, systems perspective is often valued in the profession.

Some fulfilling and satisfying aspects of this career
- challenging and in-demand career
- relatively new field
- normal office hours
- dealing with interesting problems
- pleasant conditions and working with people who have similar interests

Some demanding and challenging aspects of this career
- dealing with people who have no concern for the environment

Purpose Orientation
- broad interest in social and economic matters, trade and industry
- creative, thorough and analytic approach to problem-solving
- accurate and objective
- enjoy both detailed and systematic work
- mathematical ability
- ability to communicate easily and effectively both in writing and in speech
- ability to work with larger multi-disciplinary teams on complex problems
- able to think clearly and logically
- able to analyse and interpret information
- have abstract reasoning ability

School Subjects
Advanced Level Certificate meeting degree requirements for a degree course

Compulsory Subjects: Mathematics
Recommended Subjects: Economics, Life Sciences, Geography

Training
Degree: The following degrees with Economics, Econometrics (economic modelling), Business Economics or Statistics as major subjects can be obtained after 3 years' of full-time study or 4 years' part-time study:
BCom
BEcon
BEconSc

The inclusion of environmental subjects such as Geography, Ecology or Environmental Science is recommended.

There are universities that offer a BA degree with Economics as a major subject. Specialised courses such as BSc (Agriculture) and BSc (Animal Science) have Agricultural Economics and Economics as major subjects.

Postgraduate: study is recommended for promotion and in order to qualify for research, administrative positions and permanent teaching positions in universities and universities of technology.

Possible Career Paths
Possible career paths include research specialisation, teaching and conducting research at a university, where one could end up as the head of department, school or faculty; policy advisors to government; or running a consulting business, possibly with partners who specialise in complementary fields such as the natural sciences or policy analysis.

Employer
- work for government, e.g. in the ministry of agriculture.
- consult to government, e.g. the departments of environment or water.
- teach and conduct research in university departments of economics.
- self-employment, set up a private consulting firm from where they could work for a variety of clients.

Career 55: Natural Science Researcher

Natural science researchers specialise in one of the natural sciences and study animals (zoologists), or plants (botanists), or the interactions between them (ecologists) in different ecosystems, for example coastal dunes, rivers, forests or deserts. Scientists are usually very passionate about their work, particularly when they develop an extreme fondness for the ferns, frogs or fruit flies being studied.

Natural science researchers should not only have a passion for their subject, but also for making a valuable contribution to society's understanding of nature, and our ability to protect nature for everyone's benefit. Scientists publish their research in scientific papers but may also use their findings to inform the management of natural areas, government policy- makers and the general public. To do this they also present talks, produce popular articles and policy briefs.

Scientists typically work long hours on their own, reading, writing and conducting their experiments. However, they frequently also have to work in teams with those in other fields of expertise, including, for example, social scientists, educators, policy makers or biodiversity managers. Scientists often travel widely, both to do their research or to present their findings to other scientists around the world.

Research assistants usually work under the supervision of a researcher who typically designs and leads the study, analyses the data and presents the results. Research assistants focus mostly on collecting data and maintaining equipment.

Some research is conducted in the laboratory (for example in aquariums or in test tubes), but most research is conducted outdoors. This might include research from a boat, research on remote islands, in nature reserves or in city parks and even in canals! To some extent researchers can choose whether they spend time in rugged outdoor conditions, or carry out more indoor work.

Some fulfilling and satisfying aspects of this career
- may travel to do research or present papers
- being able to work outdoors for much of the time
- contributing to knowledge of the environment

Some demanding and challenging aspects of this career
- spending many hours working alone

Purpose Orientation
- must understand the process of doing scientific research
- be comfortable with figures and information technology
- must be able to work with technical apparatus
- be precise, thorough about details and the accuracy of information
- think analytically but often also creatively
- need good computer skills to capture, manage, analyse and present their data

School Subjects
Advanced Level Certificate meeting degree requirements for a degree course.

Each University or College has its own entry requirements.

Compulsory Subjects: Mathematics (some institutions require Physical Sciences and / or Life Sciences)

Recommended Subjects: Physical Sciences, Life Sciences

Training
Degree: BSc degree in a Science Faculty at a university or university of technology. This is a 3 or 4 year degree, depending on the university.

Post-graduate: Often students choose to follow this with an Honours degree, which can take 1 or 2 years. Ideally, they would go on to complete a Masters degree (MSc, also 1 to 2 years) followed by a PhD (typically 2 to 3 years), to give them the in-depth knowledge needed to be really knowledgeable in their field.

Possible Career Paths
Scientists can choose a number of fields in which to specialise. As post-graduates, they can continue to do research and also train others in a university or a research institute. They may become managers of protected areas such as national parks, or senior managers of companies, government departments or organisations. They can also set up their own businesses and consult to government and industry. A strong background in the sciences can give an individual credibility and valuable skills, including the ability to keep learning and contributing to knowledge production.

Employer
Scientists that focus on plants, animals and ecosystems, work in a variety of organisations, including:
- national Parks
- weather Service
- research institutes
- universities where they will teach others about their field and how to do research
- consulting firms and NGOs

Career 56: Ornithologist

Ornithologists are specialized zoologists who study the behaviour, ecology, physiology and classification of birds. They are also involved in the conservation of different bird species.

The nature of the work of ornithologists depends on the type of organization of employment:

Museums: ornithologists collect and display bird collections and give educational talks on birds, answer inquiries about birds, and identify birds donated to the museum. For the collection of birds, ornithologists work in close collaboration with conservation organizations and they need to be familiar with specific legislation applicable to the fauna and flora of the area in which they are working.

Nature conservation organizations: they carry out research on rare and economically important bird species. Birds are captured and then weighed, measured and marked. Aspects such as the density and fluctuation of bird populations are studied. They advise farmers on the needs and management of birds on their farms and are involved in controlling the export and import of birds. They also make an effort to encourage a sense of conservation in the community.

Universities: they give lectures and conduct research.

Ornithologists should not only be zoologists, but also need to know a good deal about Entomology, Botany and Ecology.

Some fulfilling and satisfying aspects of this career
- discovering new species may be exciting
- saving endangered birds

Some demanding and challenging aspects of this career
- working long hours
- travelling a great deal
- working in adverse weather conditions

Purpose Orientation
A ornithologist should:
- love nature especially birds;
- have an inquiring mind;
- be self-motivated;
- be willing to work for long periods in remote areas conducting research;
- have an aptitude for figures (for data processing).

School Subjects
Advanced Level Certificate meeting degree requirements for a degree course

Each University or College will have its own minimum entry requirements.

Compulsory Subjects: Mathematics, Physical Sciences
Recommended Subjects: Life Sciences

Training
Degree: BSc degree with Zoology as major subject and Botany or Entomology as second major. Geology, Mathematics and Statistics are recommended.

Post-graduate study: Honours degree in Zoology; Wildlife Management or Conservation Biology.

Employer
- Museums
- Universities
- National and Provincial Parks boards
- Zoological gardens

- Department of Agriculture

Career 57: Park Managers

Park managers are responsible for ensuring that land and all its natural resources under their protection, are maintained in good condition, as well as conserved for maximum biodiversity.

They need to apply the Protected Areas Act to maintain biodiversity for the public to enjoy, and enable researchers to study nature in a relatively undeveloped state. They also manage protected areas as resources to generate income from eco-tourism, for the benefit of neighbouring communities, as well as to serve as educational and job creation sites. To fulfil these functions, the park manager needs to be knowledgeable on a wide range of subjects.

Park managers also need 'people skills' as they manage teams of staff, and communicate with a wide range of stakeholders such as neighbouring farmers, or poor communities situated near the park who could be affected by wild animals that escape from the park, or those people who may want to collect firewood or thatching grass from within the park.

Similar skills are needed by the game farm manager, who might be running an eco-lodge, as well as hunting concessions, and might need to manage wildlife in such a way that it can be sold sustainably to generate additional income. They must be knowledgeable on a wide range of relevant subjects, such as biodiversity, ecosystems, veld management, burning and grazing regimes and wildlife diseases, as well as the policies and legislation that are applicable.

Park managers work in natural environments most of the time, but also carry out administrative tasks and seminars indoors.

Some fulfilling and satisfying aspects of this career
- working in beautiful environments
- meeting new people

ensuring the survival of wild animals

Some demanding and challenging aspects of this career
- working in various weather conditions
- financial aspects could be a problem

Purpose Orientation

- be good communicators
- have good planning, management, financial and business skills
- be organised, reliable, inspiring leaders
- be able to work well in multi-disciplinary teams
- have a passionate interest in conserving natural resources
- love outdoor life and animals
- have good health and physical fitness
- be practical and self-sufficient
- be able to use a firearm and shoot accurately
- be able to speak at least two languages fluently

School Subjects
- Advanced Level Certificate meeting the requirements for a degree course
- Ordinary Level Certificate meeting the requirements for a diploma course

Each University or College has its own entry requirements.

Compulsory Subjects: Mathematics, Physical Sciences (only for the degree course)
Recommended Subjects: Life Sciences, Geography

Training
Degree: Special BSc or BTech courses in Ecology or Nature Conservation

Diploma in Environmental Health or Nature Conservation

Post-graduate: BSc (Hons) (Environmental Management / Nature Conservation) followed by MSc and PhD.

BSc (Hons) with an ecological approach, preferably in some applied fields such as Mammalogy, Ornithology, Limnology or Ecobotany, depending upon the student's specific interest, particularly suited for the person interested in research.

Many park managers have completed MBA courses

Possible Career Paths
A diploma in nature conservation or a BSc in the natural sciences would be a good start, but must be followed up by practical experience before a person can take sole responsibility for managing a protected area. Often further study, such as an Honours, MSc. or MBA in business studies is also required, particularly to manage a large area or organisation.

Employer
- national Parks Board
- private game farms
- private game reserves
- government departments
- provincial conservation organisations
- large mining, chemical and industrial companies

A nature conservator or park ranger can work as a consultant in the private sector performing environmental impact studies.

Career 58: Park Ranger

The role of conservation is to manage natural resources for the benefit of society. The primary objective of the park ranger is to conserve and manage natural resources.

Park rangers perform a variety of tasks and functions depending on the needs of the area within which they find themselves. Their roles may include capturing game for relocation, culling overpopulated game to reduce numbers, researching the movement of game, and environmental impact studies.

One of the primary functions of park rangers is law enforcement and in ensuring that the parks or wilderness areas are protected for the benefit of all. They may also support research projects designed by scientists and are often also responsible for tourists, for instance, taking visitors on guided tours or presenting environmental education programmes.

Some park rangers become experts in one or more specific areas of conservation and may conduct work which requires extensive planning, reading, fieldwork and data analysis. Others may become more involved in developing publicity material and liaising with the public and the media. Depending on their kind of employment, the nature conservator may also be responsible for financial administration, management of personnel and labour relations.

Some fulfilling and satisfying aspects of this career
- working with animals
- the opportunity to specialize in your area of interest
- able to observe animals of many different types in their natural environment

Some demanding and challenging aspects of this career
- long and irregular working hours
- working outdoors in poor weather conditions
- having to live in remote areas, far away from schools, hospitals, shops and other amenities
- not very rewarding financially

Purpose Orientation
A nature conservator or game ranger should:
- have a passionate interest in conserving natural resources
- love outdoor life and animals
- have good health and physical fitness
- be practical and self-sufficient
- be responsible
- communicate well with people
- be able to use a firearm and shoot accurately
- be dedicated to the work
- be able to speak at least two languages fluently

School Subjects
Advanced level Certificate meeting degree requirements for a degree course
Ordinary Level Certificate meeting diploma requirements for a diploma course

Each University or College will have its own minimum entry requirements.

Compulsory Subjects: Mathematics, Physical Sciences (only for the degree course)
Recommended Subjects: Life Sciences, Geography

Training
Degree: Special BSc or BTech courses in Ecology, Nature Conservation Zoology and Botany.

Post-graduate: BSc (Hons) (Environmental Management / Nature Conservation) followed by MSc and PhD

BSc (Hons) with an ecological approach, preferably in some applied fields such as Mammalogy, Ornithology, Limnology or Ecobotany, depending upon the student's specific interest, particularly suited for the person interested in research.

BVSc.: Many veterinarians are active in conservation or wildlife management

BTech Hons in Nature Conservation followed by MTech and DTech, which are research qualifications.

Diploma in Environmental Health or Nature Conservation

Employer
- National Parks
- Private game farms
- Private game reserves
- Government departments
- Provincial conservation organizations
- Large mining, chemical and industrial companies.

A nature conservator or game ranger can work as a consultant in the private sector performing environmental impact studies.

Career 59: Pest Control Operator

Pest control operators protect people and property from rats, mice, common household insects such as flies and cockroaches, termites, mosquitoes etc. They might also inspect premises such as restaurants, hotels, food stores, hospitals and homes.

The work of pest control operators entails identifying pests that are causing problems and determining how to control them.

Pest control operators measure rooms to estimate how much pesticide to use and how much it will cost. In some cases, they cut openings into buildings to get to infested areas. They release poisonous gas through hoses and they set traps. Where necessary, they bore holes in walls and concrete around the perimeter of buildings to inject chemicals to kill termites; place poisonous bait in storm water drains to kill rats; and spray chemicals in drainage ditches to kill mosquitoes.

Some fulfilling and satisfying aspects of this career
- knowing your work helps protect people from pests
- working without supervision
- working in a variety of settings

Some demanding and challenging aspects of this career
- working overtime, especially during spring and summer months
- working at night to service stores and restaurants
- sometimes having to work in dirty and unpleasant environments
- fumes from pesticides that could be irritating
- possibility of injury on the job

Purpose Orientation
A pest control operator should:
- be honest;
- have respect for the law;
- be courteous and tactful;
- be able to work well without supervision;
- have manual dexterity;
- have mechanical ability;
- be in good health.

School Subjects
Ordinary Level Certificate.

Compulsory Subjects: None
Recommended Subjects: Physical Sciences, Life Sciences, Mathematics

Training
Training takes place in a pest control firm. The duration of the in-service training is usually four years.

Employer
- pest control firms
- government departments
- municipalities
- self-employment, with enough experience, capital and initiative, can set up own business

Career 60: Pet Shop Owner

Pet shop owners sell and take care of any companion animals, from hamsters to dogs. They usually also stock various animal foods.

Pet shop owners need to keep animal cages clean and see to it that the animals are properly fed. They need to have a broad knowledge about animals that could possibly make suitable pets. Pet shop owners also need to make sure all the animals are healthy, because disease may spread and cause havoc in their shops, for instance, when fish get white spot, they can die, and the condition is highly contagious.

Health inspectors visit pet shops to ensure that owners take good care of all their animals. If animals are ill-treated, pet shop owners are liable to lose their licences.

Pet accessories can include catnip, sandboxes, leashes, collars, aquatic plants, pictures, sawdust, books, food, toys and food supplements etc. Some pet shop owners also keep snakes and monkeys, but a special permit is needed to sell these animals.

Some fulfilling and satisfying aspects of this career
- being able to work with both animals and people
- working for yourself

Some demanding and challenging aspects of this career
- having the responsibility of caring for all the animals
- coping with sick animals and their noises
- having to ensure that your premises meet all municipal health regulations

Purpose Orientation

- previous experience in large-scale animal care is an advantage
- love of animals
- kind and caring
- responsible and self-motivated
- friendly and helpful
- enjoy working with people
- managerial and business skills

Training
No formal training is available for this career, but a general knowledge of business is recommended.

Employer

- pet shop owners
- self-employment, setting up own pet shop

Career 61: Plant Nursery Worker

The main responsibility of plant nursery workers is to keep the plants looking their best, and to maintain the nursery area so that customers feel that they have come to purchase beautiful and healthy plants for their gardens, in a relaxed and pleasant environment.

Plant nursery workers are initially trained to recognize and distinguish between different plants and their requirements.

Nursery workers are expected to perform duties such as:

- pulling out weeds
- clearing areas for planting
- ploughing or digging beds
- planting of seedlings in prepared beds
- watering seedlings and older plants regularly
- applying weed killer
- applying fertilizer and other soil nutrients
- applying pesticides
- pruning.

Experienced plant nursery workers are also expected to provide information and assist customers in selecting seedlings, plants, weed killers, fertilizers, soil nutrients and pesticides.

Some fulfilling and satisfying aspects of this career
- working outdoors with beautiful plants
- working with nature
- providing a service and bringing pleasure to others
- variety of work

Some demanding and challenging aspects of this career
- working in adverse weather conditions
- the physical work can be tiring
- dealing with difficult people

Purpose Orientation
A plant nursery worker should:
- love plants;
- have good health and physical strength;
- be willing to work outdoors in all types of weather;
- be able to remember names of different plants and their requirements;
- be polite and communicate well with customers.

School Subjects
No specific requirements.

Compulsory Subjects: None
Recommended Subjects: None

Training
The plant nursery worker is trained by the employer to meet specific requirements.

Botanical Gardens:
Informal workshops on garden maintenance and cultivating of indigenous plants.

Employer
- Commercial plant nurseries
- Botanical gardens
- Municipalities
- Self-employment, with enough experience, can start growing plants in own back yard and later develop this into a commercial nursery

Career 62: Production Manager

Production managers do the planning, organization, coordination and control of production. They must endeavour to produce as much as possible at the lowest possible cost. Their activities include the anticipation of production, factory layout, the drawing up of a production plan and quality standards.

Production managers are responsible for the effective managing of organizations' production line to ensure that the highest production standards, at the lowest costs, are maintained.

Production managers can specialize in various management fields such as personnel and financial management, work-study, training, quality control, marketing and distribution, administration and organization. The nature of the work depends on the type of institution worked for, as well as the individual's knowledge of chemical, metallurgical and other processes.

With reference to the long-term planning, production managers help with the selection and designing of the specifications of the services that are being rendered. They take part in decisions concerning the layout of the enterprise, the size and range of the product or service to be rendered, the design and organization of the work processes, work standards and compensations of the employees. Short-term planning includes decision-making on scheduling the production activities and the implementing thereof.

Production managers work mostly with the production system but they also do inspections to make sure that their orders are being implemented correctly. All these functions require production managers to work closely with other management personnel of the organization and stay in contact with the production workers in order to prevent any possible delay in production.

Some fulfilling and satisfying aspects of this career
- challenge and variety of tasks
- working with people
- good job opportunities

Some demanding and challenging aspects of this career
- having to work overtime on occasion
- dealing with difficult staff members

Purpose Orientation

A production manager should:
- be practical and enjoy solving problems;

- be able to make decisions on production matters;
- ability to work well with others;
- be willing to continue his education to keep up with the latest developments in the field;
- good mathematical ability
- ability to visualize three-dimensional objects

School Subjects
Advanced Level Certificate meeting degree requirements for a degree course
Ordinary Level Certificate meeting diploma requirements for a diploma course

Each University or College will have its own minimum entry requirements.

Compulsory Subjects: Mathematics
Recommended Subjects: Business Science

Training
Degree: BSc Industrial Engineering or BA, BCom and BAdmin with Industrial Psychology and Economics

Diploma in Production Management

Some technical engineering courses such as for production and industrial engineering technicians are also applicable for training as a production manager.

Employer
- factories
- food producers
- self-employment, with enough experience and capital, can start own manufacturing concern

Career 63: Professional Hunter

Hunters stalk, track and kill animals for their clients for money, or for the government. Some hunt with others, while others work alone using dogs to track and corner prey.

Hunters use poison or guns to kill predatory animals like hyenas. Some hunters collect animals for museums. All legal hunting activities are monitored and approved by government agencies. If hunters hunt without the necessary approval, they can be fined and even sent to jail.

Hunting and trapping are often confused. Trappers catch animals using scented camouflaged or baited traps, cages or nets. Some hunters skin animals to sell the skins and pelts. Hunters may be involved in wildlife management (relocation of animals), research activities (blood sampling etc.) and disease control (destruction of various animals that threaten animal and public health and safety).

Some fulfilling and satisfying aspects of this career
- working outdoors and camping
- ensuring the safety and survival of endangered wildlife
- ensuring the safety of the people in the hunting party

Some demanding and challenging aspects of this career
- strenuous work because you walk a lot
- can be potentially dangerous because of attacks, rock falls, snake bites, etc;
- hunting in all kinds of weather conditions

Purpose Orientation
- physically strong and fit
- courageous when facing danger
- enjoy outdoor life and camping
- self-motivated
- excellent knowledge of guns of all kinds
- good knowledge of flora and fauna

School Subjects
Contact the individual schools for information on criteria for selection and entry requirements.

Training
In-service training may be provided under the supervision of an experienced hunter.

Professional hunting schools may have specific selection or entry criteria.

Each country has legislation that guides the professional hunting industry. If you are interested in this career, familiarize yourself with your country's legislation.

Employer

- government
- wildlife organisations
- self employment.

Career 64: Soil Scientist

Soil Science deals with the origins, characteristics and the use of soils for purposes of sustained biological production, the retention of environmental quality, as well as promoting health in plants, animals and people.

For this reason, soil scientists are trained to identify and evaluate soil types for agricultural and non-agricultural uses, to determine the deficiencies of various kinds of soil and how these may be rectified. The process includes aspects such as soil-cultivation methods and practices, soil fertility and fertilizing, irrigation and drainage.

Soil scientists can specialize in various fields such as:

- soil formation - the processes whereby soil is formed
- soil classification - the classification of soil according to its properties
- soil mineralogy - the composition of the soil
- soil science - the biological, chemical and physical properties of the soil
- soil fertility - how many plant nutrients the soil contains and it can take up
- soil decay - through, for example, erosion or by becoming brackish

Thus, their work may involve: classifying soils according to standard types; conducting experiments on farms to determine the best soil type for different plants; analyzing soil to establish chemical and mineralogical relationships to plant growth; and/or investigating the effects of tillage, fertilization, crop rotation, environmental factors and pollution on different soil types.

Soil scientists are researchers, developers and advisors. They use their knowledge to ensure that good soil planning and management are applied. They make recommendations regarding soil fertilisation and the correct use of water.

Soil scientists are responsible for optimal soil utilisation. They must prevent soil decay and ensure that the natural soil fertility is maintained and improved. Farmland with good potential must be reserved for agricultural use.

Soil scientists work in the field as well as in the laboratory and use natural resource data banks, simulation models and computers. They work closely with other agricultural experts and with farmers, ensuring that available knowledge and research are utilized to improve soil-management practices.

Some fulfilling and satisfying aspects of this career
- sometimes working outdoors
- varied and interesting work
- educating people on soil conservation and utilization
- knowing that your work can make a difference, such as ensuring that designated sites are suitable for construction purposes and that soil erosion is being prevented

Some demanding and challenging aspects of this career
- working in adverse weather conditions

- travelling to and staying at remote and isolated sites
- being away for long periods of time

Purpose Orientation

A soil scientist should:
- want to help mankind through the practical application of scientific knowledge
- have good communication and persuasive skills
- have a love of nature and the outdoors
- be able to work independently and as part of a team
- have concentration skills and attentiveness
- be self-motivated and dedicated
- be prepared to work in all kinds of weather conditions and isolated areas

School Subjects
Advanced Level Certificate meeting degree requirements for a degree course

Each University or College will have its own minimum entry requirements.

Compulsory Subjects: Mathematics, Physical Sciences
Recommended Subjects: Geography

Training
Degree: The minimum requirement for a soil scientist is a 4-year BSc (Agric) or a 3-year BSc with Soil Science as major subject.

Post-graduate study: BSc Honours degree in Soil Science is recommended

Employer
- Agricultural Research Councils
- Research institutes and organisations
- Government Department of Agriculture
- Universities
- Agricultural co-operatives
- Fertilizer manufacturers
- Self-employment, can start own business and practice as an analyst, soil surveyor and development consultant to the agricultural industry, the construction industry, development cooperatives, commercial banks and landscape architects

Career 65: Taxidermist

Taxidermy is the preparing and preserving of skins of animals and stuffing and mounting them so as to represent the appearance of the living animal. The preparing of such material may be done for study collections in museums and universities or for display purposes in museums or private collections.

The collection of trophies and the preservation of animals are probably as old as man's history. The earliest preparation methods were mainly a matter of drying or embalming a dead biological object to restore it to what it looked like when alive. Possibly the oldest record of true taxidermy refers to birds which were mounted during the 16th century in Holland and a rhinoceros which was mounted in Italy in about 1600.

Taxidermists use their artistic abilities and knowledge of the technical processes to create preserved animals that look as life-like as possible.

Taxidermy methods have changed considerably through the ages. Extensive use is made of dermo-sculpture, which entails making a plaster of Paris mould, fitting the tanned damp skin over the cast, gluing it and keeping it in place during the drying process by means of pins and various methods of bandaging.

A recent advance in taxidermy is the freeze-drying method, where the animal is placed in a life-like position and frozen, the moisture is then vacuum-extracted from the frozen specimen which has been positioned in a lifelike posture. In this way neither skinning nor the making of an artificial body is necessary.

The frozen body remains, without shrinking, in its original form. This method is very successful in the case of invertebrates, reptiles and fish. It can also be combined with the more traditional methods of mounting birds and mammals in order to prevent shrinkage of, for instance, bird's feet or the fleshy parts on the head, lips and noses of small mammals.

Another successful method of preserving fish, reptiles and invertebrates is to create plaster of Paris moulds, which taxidermists paint to look life-like.

Taxidermists need to draw extensively on nature to achieve realistic work, for example animal anatomy, natural poses and positions of animals and birds and natural looking skin colours. They are sometimes called upon to do fieldwork to collect animal and bird specimens, although they usually work indoors, in workshops or museums.

Some fulfilling and satisfying aspects of this career

- working on and seeing various specimens of a variety of animal species
- working in a relatively stress free environment

Some demanding and challenging aspects of this career
- working with dangerous chemicals
- having to endure the smell of chemicals
- working long hours

Purpose Orientation
A taxidermist should:
- have a love of nature and animal life;
- have good observation skills;
- be artistic talent and creative ability
- have good health
- be willing to work in hard and dirty conditions
- able to endure unpleasant odours
- not have any allergies, such as to fur

School Subjects
Ordinary Level Certificate meeting diploma requirements for a diploma course

Each University or College will have its own minimum entry requirements.

Compulsory Subjects: None
Recommended Subjects: Visual Arts

Training
Diploma in Museum Technology

Students take subjects such as Museology, Conservation Techniques, Display and Design, Museum Chemistry and Photography. Admission is restricted to persons who are part-time, permanent or contract workers at museum or approved related institutions. The duration of the course is three years.

Prospective taxidermists are also encouraged to take courses in sculpture, which will help them with their work, as all taxidermists must make their own unique designs.

Employer
- museums
- private institutions
- self-employment, with enough experience, initiative and capital, can start own business

Career 66: Taxonomist

Taxonomy is the discovering, naming, describing, and classification of all living organisms and fossils.

Taxonomists collect plants, animals, fungi or micro-organisms, study them, and group them according to patterns of variation. They study these organisms in nature, laboratories, and in museums and herbaria where there are research collections. Several million species of animals and over 325,000 species of plants are presently known. It is estimated that between a few million and 30 million species await discovery. Many of them are in the sea, and marine taxonomy is a particularly scarce skill in Africa.

Having the correct name for a plant or animal is essential for accessing information about the species, for using it in any way, for conserving it or for controlling it if it's a problem species. Taxonomy is often referred to as a fundamental science because it is so important to all other fields of biology.

Topics studied:

- the scientific basis of classifications, to better understand evolution
- the ever-changing aspects of nature, such as the processes that lead to the development of new species or the ways that species interact
- the ways that human beings impact on the environment and on other species
- the screening of plants for compounds that can be used for drugs (bio-economics)
- the control of pests and diseases that affect plant and animal crops.

With a shortage of taxonomists around the world, the fields of biodiversity, evolution and conservation hang in the balance. There is a false impression that taxonomy is old-fashioned, like stamp-collecting, but the field has changed drastically recently and DNA analysis and computer programming are being used to assist in identifying species and for making information accessible on the internet. Being a taxonomist is both exciting - according to a learned professor, "There's no greater thrill than being the first human being to knowingly lay eyes on a new life form in the solar system" and rewarding because of the importance of the work.

Taxonomists spend time 'in the field', collecting specimens, or in a museum or herbarium studying preserved specimens. They then assess the material in the laboratory or an office. Microscopes, digital cameras and imaging systems, computers and databases and book resources are used for research. An important part of the research is writing up the results for publication in books or scientific journals.

Some fulfilling and satisfying aspects of this career
- the challenge and variety of the work
- being able to specialise in an area of interest

Some demanding and challenging aspects of this career
- the frustration sometimes involved in doing research

- having to work long hours during some stages of research

Purpose Orientation

- a keen interest in the living sciences
- excel at research and problem-solving
- have strong interpersonal skills, being able to function within a group environment, as well as to work independently
- be comfortable working outdoors and in a laboratory
- good powers of observation and attention to detail

School Subjects
Compulsory Subjects: Mathematics (some universities require Life Sciences and/or Physical Sciences)
Recommended Subjects: Physical Sciences, Life Sciences, Computer Studies

Advanced Level Certificate meeting degree requirements for a degree course

Each University or College has its own entry requirements

Training
Degree: 4 year degree in Zoology, Entomology, Botany, Biology, Microbiology, or a related field of study. They must also have completed course work within Mathematics and another science.

Although there are career opportunities for taxonomists with bachelor's degrees, most professionals have either a master's or doctoral (PhD) degree.

Undergraduate degrees can be obtained in Biology, Botany, Zoology, Entomology, Microbiology. Graduate students focus specifically on Taxonomy. They study Diversity, Population Biology, Genetics, Evolution, Ecology, Biogeography, Computers and Statistics.

Although there are career opportunities for taxonomists with bachelor's degrees, most professionals have either a master's or doctoral (PhD) degree. Undergraduate degrees can be obtained in Biology, Botany, or Zoology. Graduate students focus specifically on Taxonomy. They study Population Biology, Genetics, Evolution, Ecology, Biogeography, Chemistry, Computers and Statistics.

Possible Career Paths
Graduates may choose to work at a university or a research institute as a research assistant or technician, or pursue a master's and/or doctorate degree to become a researcher and perhaps eventually become a research manager or leader or even the head of such a facility. Many taxonomists have careers in universities. They teach theory and research skills to students, and continue to conduct their own research in their particular area of interest.

Employer
- universities with large plant collections often hire taxonomists as curators to maintain the collections and conduct research on them
- research institutions that have biodiversity collections, such as museums, and herbaria
- government agencies - public health, agriculture, wildlife management and forestry

- private industries - agricultural processors, pharmaceutical companies, oil companies and commercial suppliers of plants and animals.
- botanical gardens
- environmental impact assessment companies that do biodiversity surveys

Career 67: Tractor and Agricultural Machinery Mechanic

Tractor and agricultural machinery mechanics maintain, repair and overhaul farm machinery, equipment and vehicles such as tractors, harvesters, pumps, ploughs, planters and irrigation apparatus.

Apart from listening to and visual inspection of the equipment, these mechanics use electronic equipment to trace problems.

Tractor and agricultural machinery mechanics dismantle defective units and repair or replace parts using various tools. They reassemble, adjust and lubricate these parts to ensure that they operate efficiently. They install and repair farm irrigation systems and maintain farm electrical systems.

These mechanics need to be able to work with both petrol and diesel engines and may occasionally have to do welding. They often have to work very quickly since farmers cannot afford to have important machinery out of order for long.

Some fulfilling and satisfying aspects of this career
- variety of work settings and tasks
- working without supervision
- being able to solve problems

Some demanding and challenging aspects of this career
- sometimes having to work outside in the fields during bad weather
- possibility of injury on the job
- having to lift heavy components
- coming into contact with dirt, petrol, diesel, grease and rust
- sometimes having to travel long distances to make emergency repairs

Purpose Orientation
A tractor and agricultural machinery mechanic should:
- have mechanical aptitude;
- be able to work independently;
- have problem-solving ability;
- be meticulously accurate and careful;
- have manual dexterity;
- have good hearing and vision;
- have physical strength and stamina to be able to work with heavy machinery and components.

School Subjects
Ordinary Level Certificate.
Some employers prefer higher qualifications.

Compulsory Subjects: None
Recommended Subjects: Mechanical Technology, Electrical Technology: Engineeering and Graphic Design, Mathematics, Physical Sciences

Training
Apprenticeship training.

Employer
- Farm machine dealers, wholesalers and manufacturers
- Independent repair and maintenance workshops
- Repair and maintenance shops on large farms
- Self-employment, with enough experience, can practise this trade on a private basis or start own business

Career 68: Veterinary Nurse

Veterinary nurses work under the supervision of veterinarians in private practices, animal hospitals, animal shelters and at institutions where research on animals is conducted. They attend to animals, give them medicine according to prescription, assist with operations and take laboratory samples. Veterinary nurses must be able to identify, take care of and handle animals.

The veterinary nurse is usually required to combine general nursing duties with reception and basic administration work, which means making all the necessary enquiries regarding the animal's illness and completing the required documentation. This will usually be done on a computer. This information enables veterinary surgeons to diagnose the problem and prescribe the right medicine for each animal.

Veterinary nurses may be asked, for example, to do blood transfusions or to put bandages on wounds, to administer mouth hygiene or physiotherapy. They must care for all animals, including new born and old animals and must know which diet each animal needs.

They also nurse and treat animals with contagious diseases and need to take precautions to ensure that such diseases are not transmitted to other animals. They play an important role in the nursing of animal patients in intensive care units. They assist veterinary surgeons with a variety of genealogical examinations and procedures, for example with artificial insemination and with gestation examinations. Radiography forms a large part of their activities. They take X-rays of injured or affected parts.

Veterinary nurses prepare animal patients for anaesthetics, administer the necessary medication and monitor the patient while they are under anaesthetics. They assist veterinary surgeons when they operate. They prepare the instruments, the operation theatre and the animal patient. They hand instruments to the veterinary surgeon during the operation. After completion they see to it that the theatre is neat and the instruments are packed away, and that they are clean and sterile. They care for the patients until they come around after the anaesthetics.

Veterinary nurses accompany veterinary surgeons on ward rounds in the hospital, during which the progress of the patients is discussed. Veterinary nurses collect skin scrapings, dung samples, urine samples and blood smears for examination in the laboratory. They prepare samples and slides to examine.

At the request of veterinary surgeons, they might give advice to clients on de-worming or inoculation procedures of animal patients, as well as after-care that the clients must administer at home.

Some fulfilling and satisfying aspects of this career
- working with animals and people
- helping save animals' lives
- constantly meeting new people

Some demanding and challenging aspects of this career
- stress when an animal dies
- relatively low salaries
- working irregular hours

Purpose Orientation
A veterinary nurse should:
- have a scientific aptitude;
- love animals;
- be able to work with animals in a practical manner, without becoming distressed;
- have physical strength;
- be able to organize;
- be willing to work long and irregular hours;
- have reception and computer skills.

School Subjects
Ordinary Level Certificate meeting diploma requirements for a diploma course

Each University or College will have its own minimum entry requirements.

Compulsory Subjects: Mathematics, Physical Sciences
Recommended Subjects: Life Sciences

Training
Diploma: Veterinary Nursing – Dip VetNurs. taken over 2 years full-time.

Employer
- Veterinary practitioners
- Animal hospitals
- SPCA and other similar organizations
- Dairies
- Kennels
- Institutions that conduct research on animals
- Veterinary Science faculties
- Pharmaceutical firms
- Zoological gardens

Career 69: Veterinary Surgeon

Veterinary surgeons diagnose and treat sickness and injury in animals. Surgery on animals and the inoculation of animals against infectious diseases are also part of their work. The type of work performed by vets depends on the area in which they are specialized.

Veterinary surgeons, who are in private practice, mainly treat sick domestic animals. Some veterinary surgeons test dairy herds for tuberculosis and brucellosis, and inoculate animals against diseases. They perform autopsies to determine causes of death, inspect animals intended for human consumption, both before and after slaughtering. They also give advice on the care and breeding of animals. Large animal practitioners are primarily concerned with the diagnosis and prevention of diseases in large and small stock, with the main aim being the improvement in production of meat, milk and wool.

Although specialization in an aspect of practice (for example, horses) is becoming more common, many veterinary surgeons in rural areas work with both farm animals and pets. Other areas of specialization include poultry, dairy cattle, pigs, wildlife and exotic birds.

Veterinarians in general practice may treat various animal species or may specialize in pets in general or in a single species. Those employed by pharmaceutical companies are usually involved in the research and development of many products used in animal health care and with the registration of these products. With the increase in the number of game farms, the veterinary profession plays an important role in the capture and care of wild animals.

Research and development, consultation, teaching, technical writing, the prevention and control of animal diseases, agricultural education, community development, the sale or production of commercial products, or the rendering of technical services for commercial firms, are all fields in which the veterinary surgeon may be involved.

Veterinary surgeons are employed by universities to lecture, but are also expected to conduct research in their chosen fields. State veterinarians are employed to prevent and control animal diseases that threaten the livestock herds of the country, for example, foot and mouth disease. They are also involved in agricultural education and community development.

Some fulfilling and satisfying aspects of this career
- working with animals and with people
- helping animals
- the opportunity to specialize in your area of interest
- the variety of the work

Some demanding and challenging aspects of this career
- long and irregular working hours

- working outdoors in poor weather conditions
- the possibility of injury
- the danger of infection
- the expense of starting a private practice
- having to keep up with new developments in the field
- dealing with unpleasant people

Purpose Orientation

A veterinary surgeon should:
- have an aptitude and interest in the biological sciences;
- respect and love for animals and have an ability to work with them;
- have good powers of observation;
- have adequate coordination to be able to handle instruments;
- have good vision, hearing, stamina and health.

School Subjects
Advanced Level Certificate meeting degree requirements for a degree course

Each University or College will have its own minimum entry requirements.

Compulsory Subjects: Mathematics, Physical Sciences
Recommended Subjects: Life Sciences

Training
Degree: BVSc

Employer
- Large stock farms
- Zoos
- Agriculture
- Colleges and universities
- Pharmaceutical companies
- Medical Research Councils
- Self-employment, in partnership or private practice

Career 70: Veterinary Technologist

Veterinary technologists play an important role in the maintenance of animal health and productivity. Their tasks consist of diagnostic work to determine the cause of sickness or death of an animal. They also carry out technical and field studies in research where they work with a professional team of researchers, veterinary surgeons, other experts and scientists.

Veterinary technologists are employed in the production of biological products such as antigens for diagnostic tests and vaccines for the prevention of disease. In a research or diagnostic laboratory, veterinary technologists who are specifically trained to execute laboratory procedures, handle and inject animals, draw blood and take other samples to assist the veterinarian and other scientists trained in the fields of Microbiology, Parasitology, Chemistry, Biochemistry and Animal Science.

They must continually make the necessary observations and record such observations. Veterinary technologists and nurses always work with or under the supervision of veterinary surgeons. Technologists are now able to take initiative to run a private diagnostic or other laboratory, if they are trained in that specific field.

The work of veterinary technologists can primarily be divided in three categories:

- Diagnostic work, where specimens of animal tissue such as blood and organs, plants and feeds are subjected to a variety of tests to determine the cause of disease or death.

- Research, which is mainly problem-orientated and embraces studies on the causes of animal disease, the methods of transmission, the specific effects on normal physiological processes and the most effective ways of preventing or combating the diseases in animals. These studies are performed under the guidance and direction of professional scientists and veterinary surgeons.

- Preparation of veterinary biological products, such as antigens for diagnostic tests and vaccines for the prevention of disease, is largely the task of veterinary technologists. This involves large-scale cultivation of bacteria and viruses and a considerable amount of developmental work, particularly in the field of fermenter technology.

Veterinary technologists work in clean, orderly, well-equipped laboratories with only the best scientific apparatus at their disposal. Some tasks involving the handling of animals may take place out of doors in the open fields.

Some fulfilling and satisfying aspects of this career
- knowing your work will benefit the country
- being able to work in the medical field without a lot of education
- being able to specialize in your area of interest
- working with animals to some extent

Some demanding and challenging aspects of this career
- possibility of infection

- sometimes having to work irregular hours
- working in environments where unpleasant odours exist from time to time

Purpose Orientation
A veterinary technologist should:
- be accurate and methodical;
- be dependable;
- be observant and scientifically minded;
- have a flair for laboratory work;
- have manual dexterity;
- have normal colour vision;
- have good health and physical stamina.

School Subjects
Ordinary Level Certificate meeting diploma requirements for a diploma course

Each University or College will have its own minimum entry requirements.

Compulsory Subjects: Mathematics, Physical Sciences, Life Sciences
Recommended Subjects: None

Training
Diploma in Veterinary Technology.

For those interested in studying further: BTech, MTech and DTech degrees

Employer
- Government departments of Environment and Agriculture
- Private research and production organizations
- Veterinary pharmaceutical firms
- Medical and Agricultural Research Councils
- Self-employment, with enough experience and capital, can open own diagnostic or other laboratory

Career 71: Viticulturist

Viticulturists specialise in the management of vineyards and the production of grapes under a wide variety of natural conditions. They provide guidance to wine farmers on manipulation of their vineyards to obtain the best results and provide knowledge in the management of both table and wine grapes.

Viticulturists use plant science principles and processes, such as sunlight interception, to help with the preparation of the land as well as planting, trellising and pruning. They have to recognise and treat abnormalities in vineyards and determine when grapes are ready to be harvested. The correct handling, packing and transportation of table grapes is another field where the expertise of the viticulturist can be used.

A viticulturist can also take on the role of producer, wine-maker, consultant, researcher and marketing agent.

Some fulfilling and satisfying aspects of this career
- working outdoors much of the time
- tasting the results of your labour, either by eating good grapes or tasting good wine
- developing new and better grapes

Some demanding and challenging aspects of this career
- having to treat abnormalities in vineyards and trying to identify where problems are originating
- research can be time-consuming
- working with obstinate people

Purpose Orientation
A viticulturist should:
- love plants;
- like to work outdoors;
- have a knowledge of Chemistry and Microbiology;
- be willing to work long hours;
- be able to work with people.

School Subjects
Advanced Level Certificate meeting degree requirements for a degree course
Ordinary Level Certificate meeting diploma requirements for a diploma course

Each University or College will have its own minimum entry requirements.

Compulsory Subjects: Mathematics, Physical Sciences
Recommended Subjects: Life Sciences

Training
Degree: BSc Agriculture: Viticulture and Oenology is the recommended qualification for prospective viticulturists. All students are required to work on wine farms for at least one season.

Agricultural Colleges: Diploma in Viticulture

Employer
- Agricultural Research Councils
- Estate wine farms
- Co-operative wine farms
- Private wine companies

This career offers entrepreneurial opportunities as the viticulturist may act as a consultant or run their own vineyard.

Career 72: Weather Observer

Weather observers record weather conditions every day at scheduled times, compile the information into meteorological messages according to international codes and transmit it to different centres.

They measure temperature changes, humidity, atmospheric pressure, wind speed and wind direction twice a day. Precision instruments are used to make the observations and the weather observers must keep these instruments in excellent working condition.

The nature of the services rendered by the Meteorological Department makes it necessary to conduct observations 24 hours a day. Weather observers therefore have to work shifts.

Some fulfilling and satisfying aspects of this career
- working both indoors and outdoors
- the challenge of always making observations at precisely the same time.

Some demanding and challenging aspects of this career
- working shifts and long hours when instruments are faulty
- boredom with routine tasks
- working in adverse weather conditions

Purpose Orientation
A weather observer should:
- be reliable;
- work carefully and accurately;
- have scientific knowledge;
- be willing to do routine work.

School Subjects
ordinary Level Certificate

Compulsory Subjects: None
Recommended Subjects: Mathematics, Geography

Training
The Meteorological Department offers practical in-service training, which includes:

- learning about surface observations, upper-air observations
- maintenance of meteorological instruments
- automatic weather stations
- climatic data
- inspections of climatic stations

Employer
- The Meteorological Department

Career 73: Wildlife Veterinarian

Some veterinarians specialise in wildlife diseases and treatments. They work in the game farm industry and in nature conservation areas such as national parks, provincial nature reserves and game reserves.

This career has become increasingly in demand in recent years and will continue to do so.

Wildlife veterinarians need to carry out clinical procedures on the animals, do research, and are often also involved in the management of breeding projects. Their work includes having to rehabilitate injured animals. They also play a vital role in the prevention and treatment of serious diseases that affect game, such as foot-and-mouth disease and anthrax.

Africa's game and wildlife industry is a multi-million dollar business and animals are frequently bought, sold and transported from one part of the country to another, and sometimes to other countries as well. Wildlife veterinarians are indispensable members of the teams involved in game capturing and transportation, usually being responsible for darting the animals, often from a moving vehicle or helicopter. The capture may also require specialized procedures such as airlifting.

For example, some species of large game such as elephants may need to be moved from the herd to other suitable areas before their numbers grow too large. The wildlife vet must ensure that the animals are captured and moved with the minimum stress, so that they arrive at their destination alive and well enough to settle into their new surroundings. They then need to be introduced into their new habitat.

Most of the work is carried out by wildlife vets outdoors, working with the animals on game farms or in national or privately owned game parks. Some time may be spent in a laboratory, performing tests or doing research, in their surgery or in giving lectures at educational institutions.

Veterinary assistants may need to be on hand to prepare the darts, or to help to keep the animal cool when it is sedated. A veterinary assistant is a vital member of any veterinary team. Interacting with animals forms only part of a veterinary assistant's work, however. Veterinary assistants support licensed veterinarians in their daily tasks. As veterinary assistants gain experience they may take on more complicated tasks, such as administering medication under the supervision of a licensed veterinarian, but essentially they perform the following duties to ensure a comfortable, safe and sanitary environment:

- cleaning and maintaining holding areas
- clerical and administrative work
- feeding, exercising and grooming
- preparing and sanitizing surgery suites
- restraining and holding patients

Veterinary scientists conduct research into wildlife management and disease control.

Veterinary nurses are currently in high demand in many African countries. Veterinary nurses

work under the supervision of veterinarians in private practices, animal hospitals, animal shelters and at institutions where research on animals is conducted. They attend to animals, give them medicine according to prescription, assist with operations and take laboratory samples. Veterinary nurses must be able to identify, take care of and handle animals.

The veterinary nurse is usually required to combine general nursing duties with reception and basic administration work, which means making all the necessary enquiries regarding the animal's illness and completing the required documentation. This will usually be done on a computer. This information enables veterinary surgeons to diagnose the problem and prescribe the right medicine for each animal.
They are employed by private vets as well as reps in the pet food and pharmaceutical arena.

Purpose Orientation

- good practical skills
- excellent technical knowledge
- compassion for animals
- a steady and patient nature
- work well in a team
- aptitude and interest in the biological sciences
- good powers of observation
- have respect and love for animals and the ability to work with them
- good coordination to handle instruments
- good vision, hearing, stamina and health
- able to think and act quickly and calmly in response to the animal

School Subjects
Advanced Level Certificate meeting degree requirements for a degree course
Ordinary Level Certificate meeting diploma requirements for a diploma course (veterinary assistant)

Each University or College has its own entry requirements.

Compulsory Subjects: Mathematics, Physical Sciences

Recommended Subjects: Life Sciences

Training
Degree: BVSc - This is a 6-year degree course.

Veterinary Nurse: (see separate career)
Diploma: Veterinary Nursing - DipVetNurs. is taken over 2 years full-time, at the Faculty of Veterinary Science.

Possible Career Paths
It is preferable for new veterinarians to work in general practice for a couple of years before moving into the wildlife field.

So far as a wildlife veterinary assistant is concerned, there is a good chance that their special skills will enable them to work their way through the ranks more quickly than their clinic

counterparts, though the starting pay is traditionally lower than that of an assistant working out of a clinic. With further study later, a career as a veterinary technician can be pursued, then their job experience can be used to fulfil future internship requirements.

Employer

- National Parks

- Conservation Authorities

- Veterinary Research Institutions

- Private Practice

- Veterinary assistants and nurses are employed by private vets as well as reps in the pet food and pharmaceutical arena.

Career 74: Wind Energy Careers

Over the last two decades, research and investment in sustainable energy have increased dramatically. Wind power, meanwhile, has become one of the fastest growing sources of electricity generation in the world.

Wind energy is clean, environmentally inert and inexhaustible. The same thing can be said about solar energy, but in a windy area, the amount of energy available is very large compared to solar, according to an expert. "For the size of equipment, a modern wind turbine - typically 80 metres across, blade tip to blade tip - can generate a megawatt and a half to two megawatts at peak output," he says. "A similar sized solar panel array, which would be huge, would probably be five times as expensive in terms of how much area it's covering and produce a fraction of the power output."

The sector in wind energy that is likely to produce the majority of new jobs is manufacturing / installation / operation, but it tends to employ engineers mostly, as manufacturing engineers, plant managers and quality assurance personnel. However, these companies also specialise in wind energy analysis, design, testing and management. People with degrees in computer science, aerodynamics, atmospheric science or mathematics are likely to find positions in this industry. Since wind energy is an international industry, many of these positions may require travel.

The wind industry also offers opportunities in the service sector, for field technicians, installation technicians and operational maintenance experts. These jobs require a range of education and experience, in science or other fields. One area in particular, that requires scientific expertise is the environmental assessment of the proposed site for the location of the turbines which is studied to determine whether drinking water, plants or animals would be affected by a new wind-power facility. A bachelor degree in biology or environmental science would be a requirement for this job. Some of these positions also require extensive professional experience in the field concerned.

However, probably the most important kind of assessment work is resource assessment. Wind-resource assessors characterise the wind resource at a particular site, analysing wind patterns, predicting how much energy a wind farm at that location would be likely to produce, and providing technical information to support site-choice decisions. Such data is important to another group, the utilities and grid operation managers. Consequently, people in meteorology could also find a career in wind energy.

Some fulfilling and satisfying aspects of this career
- helping to produce energy that does not harm the environment
- rendering a service to the community

Some demanding and challenging aspects of this career
- may involve physically hard work, depending on career path chosen
- potentially dangerous working environment

Purpose Orientation

- a good communicator
- have manual dexterity
- physically fit and strong
- quick and efficient

School Subjects
Various careers with different requirements. For engineering or a scientific career, an Advanced School Certificate meeting requirements for a degree or diploma course.

Training
This field makes use of electrical, mechanical and computer engineers, MBAs, meteorologists, environmentalists, plant managers, marketing managers etc.

An internship with a wind company is probably the best way to enter the field.

Employer
- wind energy companies
- renewable energy companies
- utility companies