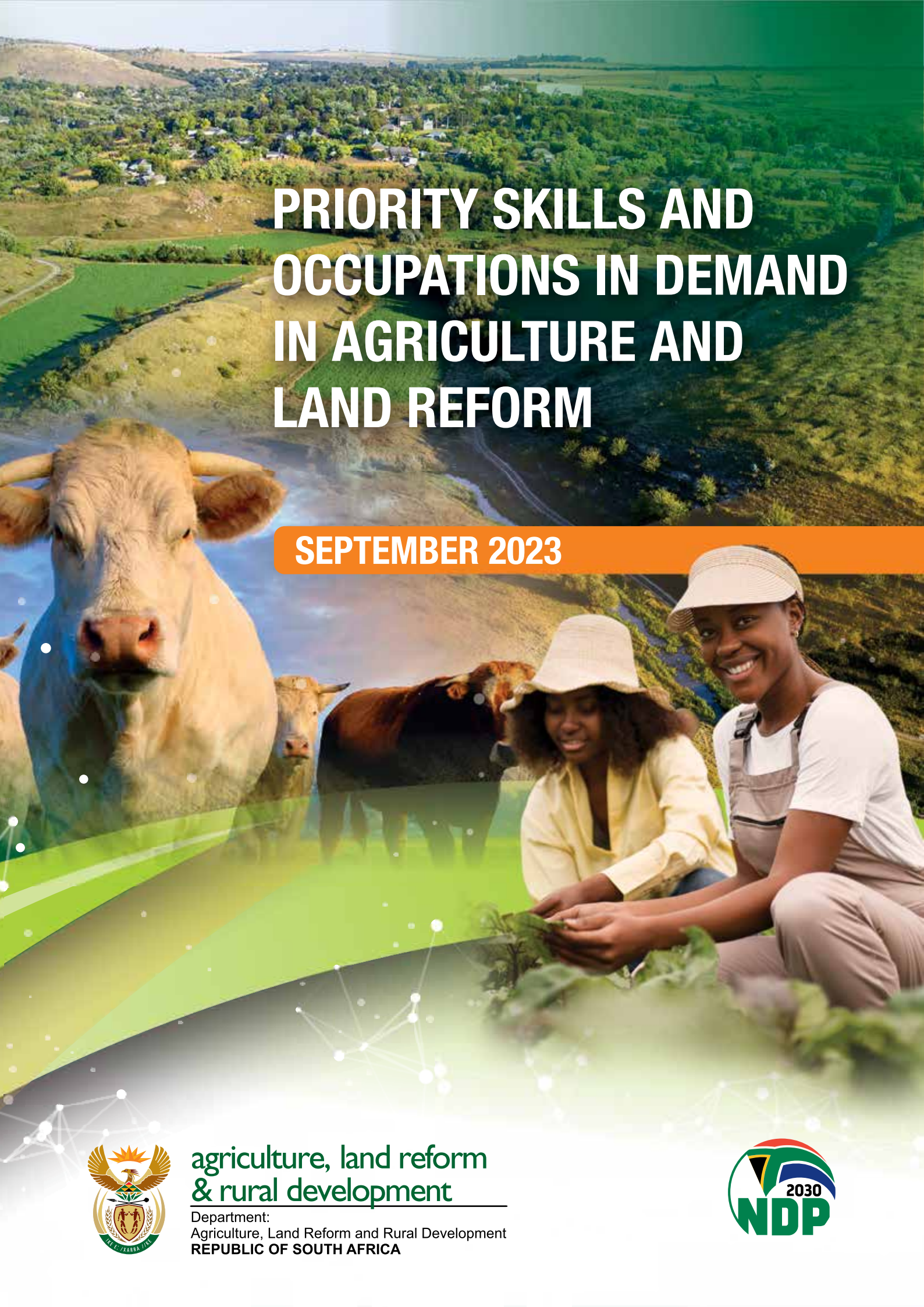


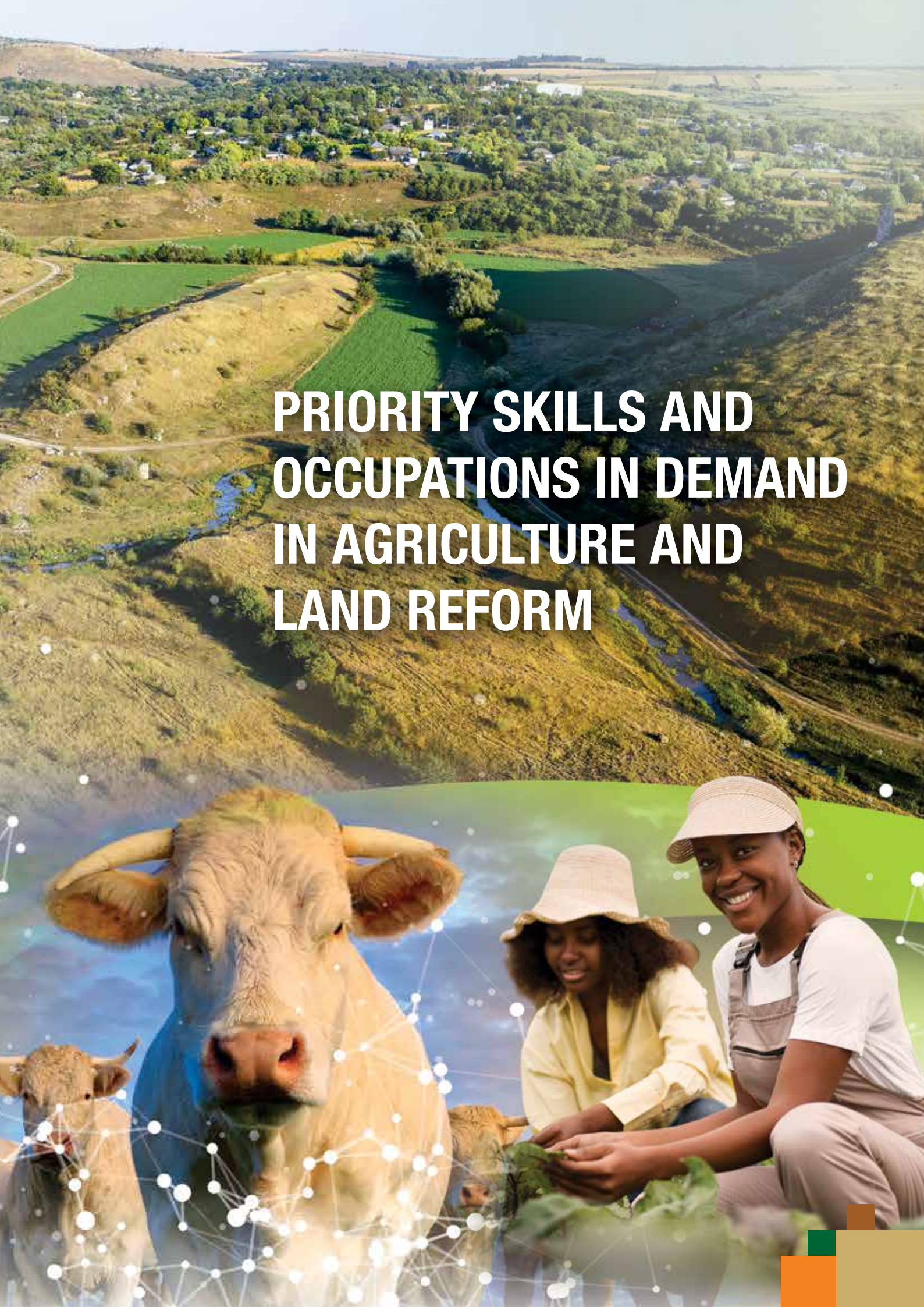
PRIORITY SKILLS AND OCCUPATIONS IN DEMAND IN AGRICULTURE AND LAND REFORM

SEPTEMBER 2023

agriculture, land reform & rural development
Department:
Agriculture, Land Reform and Rural Development
REPUBLIC OF SOUTH AFRICA

2030 NDP

PRIORITY SKILLS AND OCCUPATIONS IN DEMAND IN AGRICULTURE AND LAND REFORM



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EXECUTIVE SUMMARY

The Department of Agriculture, Land Reform and Rural Development (DALRRD) conducted a research study to investigate priority skills and occupations in demand in South Africa's agricultural sector, inclusive of agricultural land reform.

The deliverables of the project, as per the Terms of Reference, were:

- Conduct a literature review on current priorities of agriculture and land reform;
- Conduct a review of the current list of priority skills and occupations in agriculture and land reform, and align them to current sector priorities;
- Generate a national list of priority skills and occupations in demand in agriculture and land reform (including Organisation Framework of Occupations Code);
- Provide provincial and district breakdown of priority skills and occupations in demand in agriculture and land reform;
- Make a prevalence projection of each of the identified priority skills and occupations in demand for the next five years;
- Identify education and training providers in South Africa offering learning programmes (courses) for such skills;
- Investigate and identify entry requirements at various levels for those learners who want to pursue careers in the identified occupations in demand; and
- Indicate occupations in demand that require professional registration with various professional bodies.

A literature review was conducted followed by a survey of farmers and interviews with a range of stakeholder groups. Some study limitations were experienced, such as access to farmer contact details. AgriSETA has, however, done recent research in the identification of priority occupations, and the findings of that research have been included in this report. This, supplemented by other scarce skills research, such as work done by the Department of Home Affairs, and with findings from

this research. Consideration has also been given to the skills implications of national imperatives such as the National Development Plan (NDP) and the Agriculture and Agro-processing Master Plan (AAMP).

Key drivers of change in the sector were researched and the skills implications of these were identified. This was then linked to skills requirements, occupations in demand and priority skills. The most prominent drivers of change that have an impact on skills development include climate change, changes in technology (4IR) and land reform.

Provincial skills needs were identified and pulled through to district level.

The table below lists the priority skills and occupations in demand proposed for the DALRRD. This table includes the following:

- The name of the occupation;
- Skills priorities within that occupation;
- Motivation for the inclusion of that occupation on the list;
- skills development interventions that can develop a person for entry into such an occupation and providers; and
- An indication of whether the skills need is expected to grow or decline over a five-year period.

Skills needs and proposed DALRRD focus:

OFO Code (where applicable)	Occupation	Specific skills priorities to be supported	Motivation	Priorities	
131101 (extend to 6311** to include farmers)	Agricultural farm manager	Livestock farm manager; horticultural farm manager; vegetable farm manager; dairy farm manager; agronomy farm manager; mixed crop and livestock farm manager; arboriculture farm manager; field vegetable ornamental horticultural farm manager; and sugar farm manager.	Supported by AgriSETA SPOI list; Supported by DALRRD; Supported by literature review; and Supported by interviews focusing on land reform and smallholder farmers (who are generally mixed farmers).	613101 Mixed crop and livestock farmer, (but all specialisations can be supported, depending on the nature of the farming activity).	
	Nature of support	Agriculture management (NQF 5–7) supported by bursaries and learnerships at Universities TVET Colleges, ATIs; and Agriculture farmer (NQF 2–4) supported by learnerships and skills programmes at ATIs/ accr. private providers.		Growth rating	↑↑

OFO Code (where applicable)	Occupation	Specific skills priorities to be supported	Motivation	Priorities	
213202	Agricultural scientist	Companion animal nutritionist; plant pathology manager; pomologist; farming scientist; seed production horticulturist; agronomist, animal nutritionist, agricultural immunologist; plant/ seed breeder; seed product developer; animal husbandry scientist; plant production scientist; seed production agronomist; agrostologist; quarantine scientist; seed analyst; plant biologist; ecologist; toxicologist; plant physiologist; plant pathologist; and soil and plant scientists/ entomology.	Supported by AgriSETA SPOI list; Supported by DALRRD; Supported by literature review; Supported by survey results and interviews; and Supported by DHA. Entomology added–supported by DALRRD, interviews.	213 202 Plant pathologists 314 201 Seed production horticulturalist 312109 Entomology. (but due to the general shortage of agriculture scientists, all of the specialisations can be supported).	
	Nature of support	Agricultural scientist in any of the specialisations (NQF 5–10) supported with bursaries at universities.		Growth rating	↑↑
214905	Agricultural engineer	Biosystems engineer; biochemical engineer; gis and land use management engineer; natural resources engineer; crop production mechanisation engineer; agricultural product processing engineer; agricultural structures and facilities engineer; irrigation engineer; aquaculture engineer; and produce process engineer.	Supported by literature review; Supported by survey results; and interviews; Supported by DHA; and Supported by AgriSETA subsectors.	All specialities	
		Agriculture Engineering any of the specialisations (NQF 5–10) supported with bursaries at universities		Growth rating	↑↑

OFO Code (where applicable)	Occupation	Specific skills priorities to be supported	Motivation	Priorities	
312201	Production/ operations supervisor	Production plant supervisor; shift manager (production); beneficiation plant foreman; assembly supervisor; and manufacturing foreman.	Supported by AgriSETA SPOI list Supported by literature review Supported by survey results and interviews	312201 Production plant supervisor	
	Nature of support	Learnerships and skills programmes presented by accredited providers		Growth rating	↑
314201	Agricultural technician	Field production officer; animal breeding technician; agricultural research technician; poultry technical officer; irrigation technician agricultural technical officer; agronomy technician; agricultural laboratory technician; wool testing technician; artificial insemination technical officer; field crop technical officer; seed research technician horticultural technical officer; agricultural technical advisor; and agricultural sampling officer.	Supported by AgriSETA SPOI list Supported by literature review Supported by interviews Supported by DHA	312201 Agricultural Technician and all its specialisations	
	Nature of support	Technology Diploma at universities of technology, certificate programmes at ATIs, learnerships and skills programmes by accredited private providers.		Growth rating	↑↑
653306	Diesel mechanic	Diesel injector/ diesel fuel injection mechanic; diesel fitter-mechanic; diesel fuel injection technician; diesel electrical fitter; field service technician (diesel); and truck mechanic.	Supported by AgriSETA SPOI list Supported by interviews	653306 Diesel mechanic	
	Nature of Support	Apprenticeship at TVET colleges, which implement occupational programmes (NQF4).		Growth rating	↑↑

OFO Code (where applicable)	Occupation	Specific skills priorities to be supported	Motivation	Priorities
671202	Millwright	Machine tool millwright; electro mechanician/ millwright (electro mechanician); winder technician; and ground electro mechanician.	Supported by AgriSETA SPOI list Supported by Interviews	671202 Millwright
	Nature of support	Apprenticeship at TVET colleges, which implement occupational programmes (NQF4)		Growth rating ↑↑
734101	Agricultural mobile plant operator	Cotton picking machine operator; chemical applicator; farm equipment; machinery operator; agricultural mobile equipment operator; tractor driver; harvester operator; agricultural machine and equipment operator; rotary hoe operator; agrichemical spraying; and dusting operator.	AgriSETA SPOI list for commercial and smallholder/land reform interviews.	734101 Agricultural mobile equipment operator
	Nature of support	Skills programmes offered by ATIS and accredited private providers.		Growth rating →
Proposed additions to AgriSETA SPOI list				
213201	Agriculture consultant	Agricultural extension officer; farm economic techniques advisor; agriculture field officer; landcare officer; horticulture consultant; advisor; vegetable consultant; field husbandry consultant; advisor; animal husbandry consultant; advisor agriculture economic advisor; agriculture advisor; farm consultant/ advisor; floriculture consultant/advisor; orchard consultant; pasture consultant; and agriculture mentor.	Supported by literature review Supported by survey Supported by interviews	213201 Agricultural extension officer
	Nature of support	Bursaries for appropriate degree at university or diploma at ATI.		Growth rating ↑↑

OFO Code (where applicable)	Occupation	Specific skills priorities to be supported	Motivation	Priorities	
213301	Conservation scientist	Ecologist; water conservation scientist; marine ecologist; soil conservationist; conservation officer; animal ecologist conservancy advisory scientist; forestry conservationist fish and games officer; ecological researcher species protection officer; fisheries advisor	Supported by literature review; and supported by interviews.	213301 Water conservation scientist	
	Nature of support	Bursaries for degrees and post graduate degrees at Universities (NQF5–10).		Growth rating	↑↑
225101	Veterinarian	Veterinarian parasitologist; animal doctor; veterinary pathologist; and veterinary epidemiologist.	Supported by literature review; supported by DALRRD; and supported by interviews.	225101 Veterinarian	
	Nature of support	Bursaries for veterinarian studies (NQF 5–8) at university.		Growth rating	↑↑
263101	Economist	Economic forecaster; macro-economist; mineral economist; small business economist; environmental economist; research economist; industrial economist; econometrician; and agricultural economist.	Supported by literature review; supported by DALRRD; and supported by interviews.	263101 Agricultural economist	
	Nature of support	Bursaries for degree and post graduate degrees at Universities (NQF 5–10).		Growth rating	→
324101	Veterinary nurse	Artificial inseminator; veterinary assistant; animal nurse; and veterinary vaccinator.	Supported by literature review; Supported by DALRRD; and Supported by interviews.	324 101 Veterinary Nurse and all specialisations	
	Nature of support	Bursaries for studies at appropriate TVET colleges and ATIs.		Growth rating	↑↑
324102	Veterinary technician		Supported by literature review; and Supported by interviews.		
	Nature of support	Bursaries for veterinarian technology studies at University (NQF5–6).		Growth rating	↑↑

In addition to developing priority skills as per the proposed list above, there are various challenges in relation to smallholder and emerging farmers that have been identified. It is important to identify those issues that can be addressed by the department from a skills development perspective.

Key issue	DALRRD intervention
Farmers will need to be trained/skilled through programmes to make use of new technology.	• Skills programmes at a level that is accessible to farm managers; • Improved and expanded mentorship programmes; and • Improved extension services.
Reliance on the capacity of extension and advisory services.	• Bursaries for extension studies; • Support for continuous professional development programmes; • Forge partnerships with commodity organisations for skills transfer; and
	• Review and update training programmes in collaboration with providers of such training and farmers in the sector.
Lack of managerial and strategic skills.	• Skills programmes at a level that is accessible to farm managers; • Improved and expanded mentorship programmes; and • Improved extension services.

The table below lists national priorities and the potential skills development support that can be provided by the DALRRD:

Skills needs resulting from national imperatives

National priority	Source	DALRRD intervention
Research and the development of adaptation strategies.	NDP	Bursaries for research scientists and engineering studies
Expanding the college system with a focus on improving quality.		Assistance to ATIs through: • Upskilling of lecturers (bursaries and support of short courses—CPD); • Incentives to farmers to give lecturers exposure to the workplace; • Management development programmes for ATI management; and • Collaborate with ATI's and AgriSETA to update curricula. • Provide incentives to farmers to provide work experience to ATI learners.
Improved skills development and training in entrepreneurship.		Support increased and expanded mentorship programmes for smallholder farmers and land reform beneficiaries.
Training of a new cadre of extension officers.		• Bursaries for extension studies; • Support for continuous professional development programmes; • Forge partnerships with commodity organisations for skills transfer; and
Training of a new cadre of extension officers.		• Review and update training programmes in collaboration with providers of such training and farmers in the sector.

National priority	Source	DALRRD intervention
Provision of comprehensive farmer support.	AAMP	• Support increased and expanded mentorship programmes for smallholder farmers and land reform beneficiaries; • Bursaries for extension studies; and • Support for continuous professional development programmes forge partnerships with commodity organisations for skills transfer.
Research and development.		Bursaries: Agricultural scientist, engineers
Focus on the optimisation of the Skills Development Act's (SDA) enablers such as the Sector Education and Training Authorities (SETA), the Workplace Skills Plans (WSP) and the Skills Levy fund.		Improved collaboration between DALRRD and the AgriSETA

This report concludes with a section that provides career information on the identified occupations in demand:

- What the occupation broadly entails;
- Information on entry requirements and professional registration requirements for occupations in demand; and
- Information on training providers offering courses relevant to developing people for these occupations.

Final recommendations include that DALRRD support various skills development interventions to develop people for priority occupations, through provision of:

- bursaries;
- work experience or work integrated learning;
- skills programmes;
- short courses; and
- apprenticeships.

It is also recommended that joint research and joint planning between DALRRD and AgriSETA be considered to optimise resource utilisation and resource allocation.

Collaboration with training institutions should be considered to facilitate improved alignment between qualifications offered and industry needs.

Developing a cadre of new extension officers and the re-skilling and upskilling of existing extension officers are needed through provision of bursaries and CPD opportunities and expanded partnerships with commodity organisations is a cross-cutting need.

Mentorship offerings should be expanded in terms of duration and number of mentors providing mentorship to land reform beneficiaries and smallholder farmers.

Assistance can also be provided with the development of learning material that can address the skills needs of land reform beneficiaries and smallholder farmers.

ACRONYMS

4IR	Fourth Industrial Revolution
AAMP	Agriculture and Agro-processing Master Plan
ABE	Adult Basic Education
AgriSETA	Agriculture Sector Education and Training Authority
ARC	Agricultural Research Council
ATI	Agricultural Training Institute
ATR	Annual Training Report
CAGR	Compound Annual Growth Rate
CSIS	Centre for Strategic and International Studies
DALRRD	Department of Agriculture, Land Reform and Rural Development.
CASP	Comprehensive Agriculture Support Programme
DAFF	Department of Agriculture, Forestry and Fisheries
DHET	Department of Higher Education and Training
DOA	Department of Agriculture
DHA	Department of Home Affairs
FAO	Food and Agriculture Organisation of the United Nations
HEI	Higher Education Institution
HSRC	Human Sciences Research Council
HTFV	Hard to Fill Vacancy
IFR	Institute for Futures Research, University of Stellenbosch
MAS	Mzabalazo Advisory Services
NAMC	National Agricultural Marketing Council
NDP	National Development Plan
NERPO	National Emergent Red Meat Producers' Organisation
NICD	National Institute for Communicable Diseases
NPC	National Planning Commission

OFO	Organising Framework for Occupations
PAPLRA	Presidential Advisory Panel on Land Reform and Agriculture
POPI	Protection of Personal Information
PPE	Personal Protective Equipment
PPECB	Perishable Produce Export Control Board
QES	Quarterly Employment Statistics
OHS	Occupational Health and Safety
RGDP	Real Gross Domestic Product
PRO	Red Meat Producers' Organisation
SDA	Skills Development Act
SETA	Sector Education and Training Authority
SIC	Standard Industrial Classification
SPOI	Sectoral Priority Occupations and Interventions
WSP	Workplace Skills Plan

1. INTRODUCTION AND PURPOSE

The Department of Agriculture, Land Reform and Rural Development (DALRRD) embarked on a research study to investigate priority skills and occupations in demand in South Africa's agricultural sector, inclusive of agricultural land reform.

1.1 Scope, Focus, and Objectives

The National Development Plan (NDP) places agriculture on the agenda for the development of South Africa (Chapter 6). The NDP calls for the creation of one million additional jobs in agriculture and agro-processing, increased investment in agricultural technologies and improving the quality of skills development via the various post-school education and training systems.

In addition to the guidance received from the NDP, DALRRD recently launched the Agriculture and Agro-processing Masterplan (AAMP), which sets out a sectoral growth strategy for the immediate and medium term.

A third guiding document is the National Education and Training Strategy of DALRRD which aims to address human resource challenges in the sector. Building capacity on scarce knowledge and skills in the sector is central to this strategy.

While the department has been implementing various programmes over the past six years to address skills shortages, there is a need to revisit the list of priority occupations and review it in line with current priorities.

Given the vastness of agriculture, land reform and rural development, it was agreed that the scope of this study would exclude rural development (in general terms). Certainly, rural development and agriculture are intertwined and will be addressed, but in this report, it will be done from an agricultural and land reform perspective.

1.2 Report content

- **Executive Summary**
  A concise executive summary is provided in the introductory part of this report.
- **Section 1: Introduction and purpose**
  This section provides an overview of the project and how it links to other national imperatives.
- **Section 2: Research approach**
  This section provides an overview of the methodology adopted and how the research was conducted to obtain the necessary information to make informed decisions and recommendations with regards to priority skills and occupations in demand in agriculture and land reform.
- **Section 3: Literature review**
  A literature review was conducted on scarce skills in agriculture. This was done by scanning international and national literature. It also contains a short section on how land reform was tackled in three countries. This is submitted separately. Only the key findings from the literature review, as they impact skills needs, are provided in this report.
- **Section 4: Primary research findings**
  This section summarises findings flowing from the literature review, interviews with stakeholders, and feedback from an online survey.
- **Section 5: Conclusions**
  This section draws conclusions from previous sections and specifically from the section containing the research results.
- **Section 6: Recommendations**
  The final section of this report details the priority skills and occupations identified during the study. It includes an indication of education and training providers in South Africa offering learning programmes (courses) to develop people for priority occupations; investigate and identify entry requirements at various levels for those learners who want to pursue careers in the identified occupations in demand and indicate occupations in demand that require professional registration with various professional bodies.

2. RESEARCH APPROACH

The research approach for the study is set out in this section along with the challenges and limitations encountered during the study.

2.1. Approach

The approach and steps followed for the study are outlined in Figure 1 below:

Figure 1: Approach and Methodology

PHASE ONE: PROJECT INCEPTION

1

- Inception meeting with DALRRD conducted
- Identifying existing information and datasets and agreeing access
- Finalise research design and methodology
- Finalise project plan / inception report (this report)

PHASE TWO: DATA COLLECTION

2

Step 2: Literature review

- Stakeholder analysis
- Literature review on the changing context in agriculture and land reform and on emerging skills
- Review and analysis of economic data and trends
- Review of literature including AgriSETA SSPs, AAMP
- Policy review: Land reform, ERRP, AgriSETA strategy, applicable other strategies and policies

Step 3: Secondary data collation

- Review current lists of priority skills and occupations (DAFF and AgriSETA) and align to current sector priorities
- Source and analyse databases – incl. AgriSETA, Quantec and StatsSA
- Finalise sampling for field research

Step 4: Primary data collection (Survey)

- Develop data collection instruments
- Test questionnaire/s and undertake pilot survey
- Administer online survey with employers

Step 4: Primary data collection (Interviews)

- Interview sample of key stakeholders in the agriculture and land reform (approximately 25 interviews)
- Conduct focus group meetings (if necessary)

PHASE THREE: DATA ANALYSIS & REPORTING

3

Step 5: Data analysis

- Clean and quality assure survey results
- Analyse and interpret all interview/ survey results and integrate with literature reviews

Step 6: Synthesis and reporting

- Draw key research findings from primary data collected
- Compile draft integrated report with conclusions and recommendations
- Presentation of draft report
- Report finalisation
- Final presentation & project closure

STEP 1: PROJECT INCEPTION

The purpose of the project inception step was to convene an initial meeting with DALRRD to discuss the goals and objectives of the study alongside the proposed implementation plan. A meeting was held at the offices of DALRRD on 9 May 2022.

This step also entailed a brief scoping of existing information and data to be provided by DALRRD as a basic input to the research process and to assist in creating an overall view of the task at hand.

STEP 2: LITERATURE REVIEW

Literature review was executed, and the key findings are reflected in this report.

STEP 3: SECONDARY DATA COLLECTION

Different quantitative data sources on economic trends and the labour profile of the agricultural sector were identified, compared and validated. These sources included: the AgriSETA, South African Revenue Services (SARS), Statistics South Africa (StatsSA) and data from other research sources relevant to this study. Where data was sourced, it has been properly referenced.

STEP 4: PRIMARY DATA COLLECTION

Two approaches were adopted to collect primary data.

Firstly, an electronic survey instrument was developed with the purpose of distributing it among commercial farmers. The tool used for this purpose was Survey Monkey. (The survey instrument is included in a portfolio of evidence for this project).

The **second** technique adopted to collect primary data was to design two semi-structured interview instruments, focusing on two different stakeholder groups in agriculture, namely:

- Semi-structured interviews with Comprehensive Agricultural Support Programme (CASP) coordinators to form an understanding of smallholder farmers and land reform beneficiary skills needs; and
- Semi-structured interviews with various agricultural bodies such as commodity organisations, PPECB, ARC and NAMC.

This step focused on a range of interviews with identified relevant stakeholders and the application of a survey among farmers.

STEP 5: DATA ANALYSIS

This step entailed the analysis of the responses captured during Step 4. The data was quality controlled throughout the capturing process, and final cleaning and verification of the information was done prior to analysis. The responses obtained through the surveys and interviews were analysed and interpreted in relation to the research questions for this study.

STEP 6: SYNTHESIS AND REPORTING

Research findings were compiled, incorporating knowledge gained from the literature review and primary data collection. These findings, along with associated recommendations, are contained in this report. As a final product of this research, a list of priority skills and occupations was produced.

2.2. Study limitations

Challenges encountered during the research imposed limitations on the study. The main challenge was: **Access to databases.** To implement the online electronic survey, it was necessary to obtain the contact details of commercial farmers.

The best-known up-to-date database of commercial farmers is with the AgriSETA (gained through the submission of WSPs and ATRs). It was not possible to gain access to the AgriSETA database of employers.

It is also known that commodity organisations have comprehensive and accurate information of farming enterprises in their respective commodity groups available. Again, like AgriSETA, it was not possible to gain access to their respective databases. However, many offered to distribute the survey to their stakeholders in support of the research. This assisted substantially to contact farmers. Nevertheless, following up and sending out reminders were out of the hands of the researchers and as a result, limited feedback was received.

As all interviews were conducted virtually via Microsoft Teams or Zoom, it was not possible to contact smallholder farmers and land reform beneficiaries directly. To overcome this limitation, other structures were contacted and interviewed as a proxy for smallholder farmers and agricultural land reform beneficiaries. Interviews were held with eight of the nine provincial CASP coordinators, NERPO and Cedara ATI.

3. LITERATURE REVIEW

The purpose of the literature review was to better understand the current priorities and challenges faced by the sector, and the change drivers, as well as the impact that these have on occupations, jobs and skills needs. (The comprehensive literature review is attached as a separate document. This section only highlights those aspects that are directly related to occupations in high demand).

3.1 Brief summary of aspects considered in the literature review

3.1.1 Policy environment

Research covered the policy and related documents that guide the DALRRD's endeavours to make a positive impact on those who live and work in agriculture. The most important are:

- DALRRD Strategic Plan (2020): the department is committed to maintaining an equitable and sustainable land dispensation, improving the productivity of the agriculture value chains and acting as a coordinator and catalyst in rural development to ensure food security and continued social and economic advancement for all South Africans.
- DALRRD aims to contribute towards the achievement of the National Development Plan (NDP) (Chapter 6 is especially relevant), the NDP Five-Year Implementation Plan, the Medium-Term Strategic Framework (MTSF), priorities of women, children, youth and people with disabilities, provincial priorities, as well as to achieve the mandate of the department.
- The NDP calls for the creation of an additional one million jobs in the agriculture, agroprocessing and other related sectors, increased investment in agricultural technologies, research and the development of adaptation strategies, expanding the college system with a focus on improving quality, improved skills development and training in entrepreneurship, including training of a new cadre of extension officers.
- In addition to the NDP there is the recently developed and adopted Agriculture and Agro-Processing Master Plan (AAMP). The AAMP is a sectoral growth strategy that sets out a series

of immediate- and medium–-term actions needed to enable inclusive growth and job creation in the agricultural and rural economies. One of the key pillars of the Master Plan is provision of comprehensive farmer support, research and development. The plan further advocates for the enhancement of competitive and entrepreneurial opportunities through technological innovations, infrastructure development and digitalisation.

- Policies and strategies pertaining to agricultural and land reform that create opportunities for beneficiaries impact positively on the lives of beneficiaries and their respective communities while maintaining food security. In practice, it means that there is a need to ensure that sufficient post-settlement support is provided.
- Apart from the above four key strategic policy areas for DALRRD to focus on, many other relevant policy documents exist, such as the National Skills Development Plan, the ERRP and its related skills plan, (aimed to address the reconstruction and recovery needs of the economy as a result of the impact of COVID-19) and various sectoral masterplans such as the Sugarcane Value Chain Master Plan for the sugar industry and the Poultry Master Plan for the poultry industry.

3.1.2 Key stakeholders

Key role players in the agricultural sector across the value chain can be divided into the following categories:

- **Government:** DALRRD is responsible for the governance of the entire industry.
- **Research institutions:** These are organisations that undertake research regarding all aspects of the value chain.
- **Producers:** This category includes both large-scale and smallholder farmers who, in most cases, carry out their own harvesting, storage and transportation, and others who produce, process and/or distribute agricultural commodities.
- **Technology suppliers:** These involve the suppliers of equipment and innovative solutions to be used across the value chain.
- **Industry associations and commodity organisations:** These are organisations that support farmers/producers with applicable and reliable information involving regulation, logistics, cultivar developments, etc., and are involved in or support research for various agricultural topics.
- **Labour organisations:** Organisations which support employees across the agricultural sector by aiding in attaining the best possible social and financial positions in employment.
- **Input suppliers:** Producers of agricultural inputs such as seeds, fertiliser, pesticides, packaging and machinery (DALRRD, 2020).
- **Support structures:** Structures such as the National Agricultural Marketing Council (NAMC), Agriculture Research Council (ARC), Perishable Produce Export Control Board (PPECB).
- **Secondary agriculture institutions:** Institutions that initially engage with off take, such as the grain silo industry, abattoirs, fruit packers and liquefiers, exporters, fresh produce markets, and others.

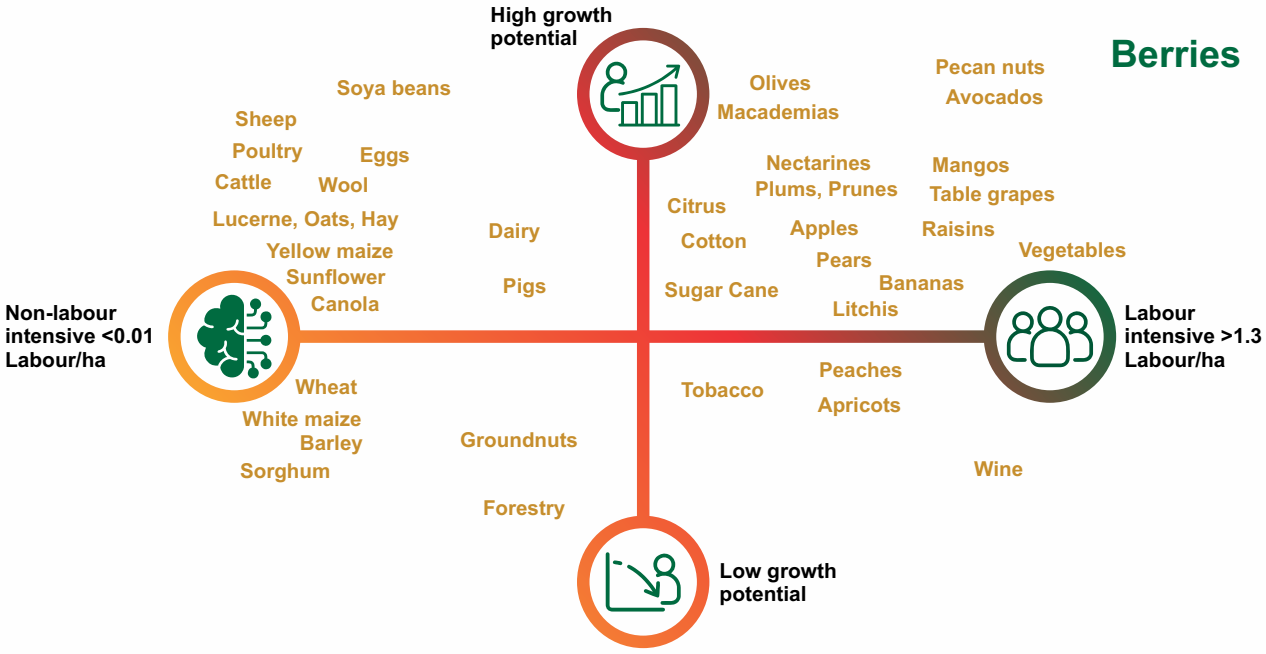
3.1.3 Economy and employment

Agricultural contribution to GVA is relatively stable at 3,2% (for 2021) (AgriSETA, 2021) with red meat being the largest sub-sector (representing about 44%) followed by horticulture (23,1%) and grains and cereals (9,6%) (AgriSETA, 2020).

This picture looks different if employment is the main consideration to determine size. Horticulture leads with an employment of 465 671 (out of a total agricultural employment of 777 879), i.e., approximately 60% of total employment in agriculture, followed by animal husbandry employing about 143 518, i.e., roughly 18% of total employment. These are then followed by the growing of crops, agricultural services and hunting (Stats SA, 2022). Considering both sets of information (size by number of employers and size by number of employees) illustrates the labour intensity of horticulture (DALRRD, 2022).

While the commercial sector is smaller in terms of the number of farming enterprises, it dominates the agricultural landscape. There are approximately 32 000 commercial farming enterprises in total across South Africa (ITA, 2021). The Department of Small Business introduced a new typology on enterprise size, but in the context of skills development the Department of Higher Education and Training's (DHET) definition of enterprise size based on employment is used. Based on this, it becomes clear that agriculture is in essence a small business sector. Using the AgriSETA database of registered entities as a proxy, then 95% of entities are small (1–49 employees), 3% are medium sized (50–149 employees) and 2% can be categorised as large (150+ employees) (AgriSETA, 2021). Figure 2 below clearly illustrates that horticulture not only displays the best growth potential, but also employs most workers per hectare of land used. This, combined with the facts that the horticulture sub-sector employs most workers in agriculture and that it exports produce on a massive scale, means it cannot be ignored when considering skills development needs in agriculture and the occupations in the horticultural industry must be considered carefully and factored into any skills development planning initiatives.

Figure 2: Labour absorption and growth trends by produce type



Source: NDP, 223, Bureau for Agricultural Policy, 2011; (Note: Berries is an insertion as this information became available well after the NDP was formulated.)

While it is the commercial sector that contributes most to food security and exports, the non-commercial (smallholder) sector is extremely important in the South African agriculture as it is the latter that provides at least a basic livelihood to many South Africans. There are about 40 000 commercial farming units, but nearly 2,5 million smallholder farming units. The exact size of the non-commercial farmer sector is not known. The 2016 Agricultural Households Survey by Stats SA indicated that 2,3 million households were engaged in agriculture.

Also of interest, according to APLRA (2019), is that:

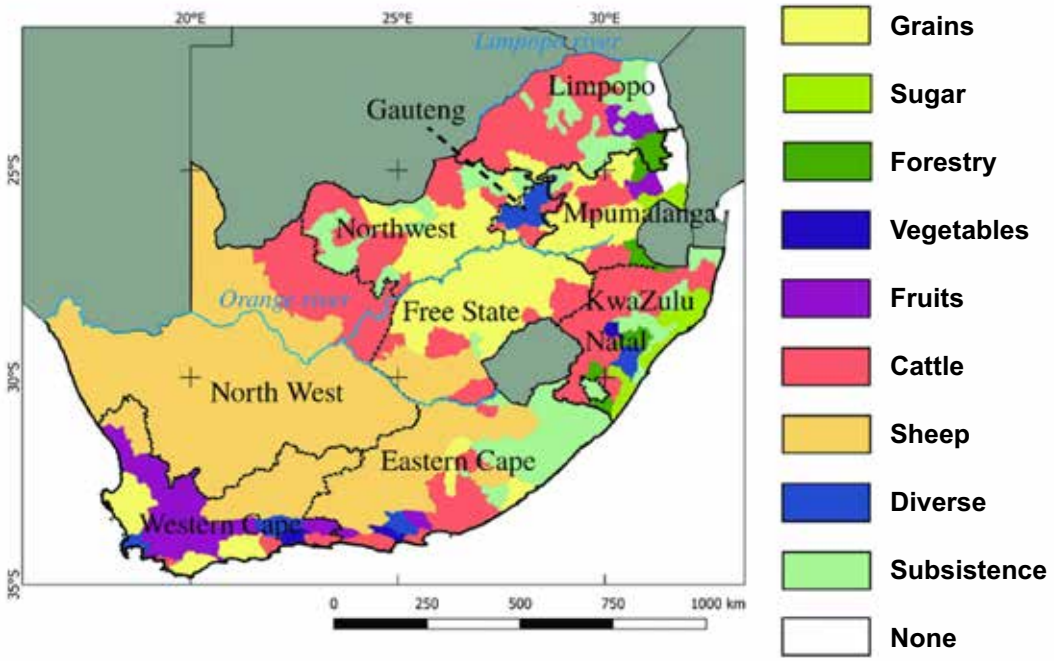
- 34,6% of household heads were in the 20–44 age group;
- 47% of households were led by women (household heads); and
- 84% of households said their "backyard" was the main place of agricultural activity.

3.1.4 Provincial and district breakdown of agriculture

It was possible to obtain a regional perspective, as is provided in Figure 3. From this, it is evident that sheep farming is dominant in Northern Cape, parts of Eastern Cape and Free State. Sugar farming is happening in KwaZulu-Natal (KZN) and forestry in KZN, Limpopo and Mpumalanga.

The figure is be used to map the sub-sectoral skills needs, as identified by the AgriSETA, to provide a provincial indication of skills needs.

Figure 3: Regional distribution of agriculture in South Africa



Source: https://www.researchgate.net/figure/Agricultural-regions-of-South-Africa-and-provincial-breakdown-Commercial-grain-growing_fig1_319168967/download

3.1.5. Land reform

Land reform has been implemented in many countries across the world. Most land reforms have involved transferring rights of ownership from wealthy landlords to poor, smallholder farmers working the land under various kinds of tenancy arrangements. Much less common are redistributive reforms that resettle small farmers on large estates subdivided into smaller plots. Southern Africa, the Africa of "settler states", is something of an outlier in this respect (Cousins, 2019).

3.1.5.1 International perspective

Land reform in three counties were considered. These countries have been selected for the following reasons:

- **Brazil**. Similar to South Africa, it has a dualistic agriculture sector dominated by a small percentage of large commercial enterprises holding rights to the vast majority of good agricultural land and many smallholder farmers farming on small plots in a survivalist mode.

- In **Malawi**, being one of the poorest countries in the world, the vast majority of farmers are traditional smallholder farmers. Malawi followed a specific approach to hand land over and giving farmers property rights that preserve the advantages of customary ownership, ensuring security of tenure.
- **Namibia** was selected because, until its independence in 1990, its policies and approaches to agriculture were closely linked to those of South Africa.

The following table summarises the developments in these counties that will impact on land reform and skills needs in these countries.

Table 1: Land reform and skills needs in selected countries

BRAZIL	MALAWI	NAMIBIA
• Low levels of education and skills among land reform beneficiaries; • Rapid replacement of labour with capital; • Long-standing investment in agricultural research; • Substantial public funds invested in land reform, with some flowing to advancing knowledge and skills to undertake farming; • Growing investment in farmer advisory systems; and • General farmer skills need to be developed.	• Most farmers only attained basic primary education; • Most have never attended any form of vocational and entrepreneurial training; • Access to decentralised extension services, which, is nevertheless weak; • New value value chain orientated curricula; • Training of smallholder farmers focus on full value chain; • Much of the focus is strengthening the capacity of lecturers at Agriculture Training Centres to provide CBET across the various value chains; • Focus on women in agriculture; and • Heavy reliance on donor funding support to develop agriculture.	• The land reform programme is too slow and does not yield the desired outcome of agricultural productivity; • Land reform beneficiaries remain poor and survive from off-farm activities; • Skills needs of land reform beneficiaries are technical skills, financial skills and practical skills (e.g., mechanics, welding, construction, fence making; and) • Training is frequently not demand--driven, but a top-down approach is followed–i.e., training is instituted without checking the state of farming knowledge.

Notes on Brazil mainly obtained from OECD, 2015

Notes on Malawi mainly obtained from Tchale, 2018; Satgé, 2021 and Luwanda, 2015

Notes on Namibia mainly from Likela, 2022; Werner & Kruger, 2007

Similar to South Africa, the land reform process in these countries is faced with many challenges. These include low educational levels and slow land reform processes, which does not yield the desired outcome of agricultural productivity. Brazil shows progress in the sense of good investment in agricultural research; substantial public funds invested in land reform, with some flowing to

advancing knowledge and skills to undertake farming and growing investment in farmer advisory systems. However, in both Malawi and Namibia, extension services are weak and funding remains a challenge. The focus of training is across the agricultural value chain.

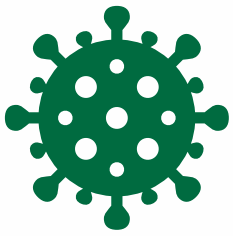
3.1.5.2 South African context

One of the mechanisms to increase expanded agriculture is to increase irrigation, more efficient usage of some underused areas (including through land reform and the use of communal areas). The NDP envisages expanding areas under irrigation from the current 1,5 million ha by at least 500 000 ha through the more efficient usage of existing water resources and by developing new water schemes (IFR, 2022). Irrigation, being a specialist technical intervention, will naturally have an impact on skills needs.
In the AgriSETA SSP (AgriSETA SSP, 15 June 2021), it is stated that "the major factors affecting sustainability of land reform projects are lack of farming skills, **lack of government support, participants resorting to farming on a temporary basis** and **participants' inability to resolve farming challenges on their own.**

One of the recommendations made by the presidential advisory panel is to focus on the capacity of land reform beneficiaries to farm sustainably. **"Critical here is training and skills development with incubation**. In terms of agriculture **revamping extension office** support for local demand, **improving agricultural colleges and strengthening research capacity of Agricultural Research Council (ARC)** is key. For sustainability, the introduction of agriculture at basic education level must get special attention" (PAPLRA, 2019).

However, the effectiveness of extension services should lie in the execution of such services. A study on extension then suggests that **"for public extension and advisory services to be effective, extension agents should render relevant, good quality services and provide information that improves agricultural production and facilitates access to the technologies required by farmers".**

3.1.6 Drivers of change



COVID-19

The first case of COVID-19 in South Africa was confirmed by the National Institute for Communicable Diseases on 5 March 2020 (NICD, 2020). By 31 May 2022, a total of 3 785 398 citizens had beenwere infected and 101 162 had succumbed to the disease (News24, 2022).

Literature on COVID-19 suggests that:

- Although it had a devastating effect on the world and the South African economy, there are signs that the recovery of economies is more rapid than what was expected.
- Even though agriculture was declared a crucial industry at the onset of the pandemic, and therefore exempt from the strictest lockdown regulations, its backward and forward linkages with other sectors of the economy and its strong international interface meant that there were huge knock-on effects on the sector (HSRC, 2020)

Fourth Industrial Revolution

The literature review revealed that:

- Internationally, agriculture is adopting 4IR artificial intelligence systems and machines performing tasks like raising seedlings, replanting and harvesting. Precision farming uses information and technologies (GPS, satellite imagery, control systems, sensors, robots, variable rate technology, telematics, software, etc.,) to improve crops and increase yields, reduce harvest times, and reduce costs and environmental impact by focusing on soil preparation, seeding and harvesting (Ntoyanato-Tyatyantsi, et.al., 2021).
- These technological developments in global agriculture are similarly relevant to South Africa. The focus has shifted towards innovative approaches seeking to exploit South Africa's diverse resources to the full. Some of the technological developments that are already in use relates to electricity (wind and solar), internet connectivity, GPS based applications (digital mapping, soil analysis, navigating tractors, monitoring growing of crops, etc.), drones and satellites (to collect local information from the sky) and artificial insemination and embryo transfer (KLK, n.d.)
- The reality is, however, that most smallholder farmers are inhibited from accessing modern technology by both internal and external factors, yet it is these farmers who need access to technological solutions the most. For new farmers, especially, lack of awareness, training and experience plays a huge role in the take-on of new technological solutions. One of the contributing factors is that the latest technology costs much more than your average smallholder can afford. In addition, many smallholder farmers also likely lack the relevant skills to manage the latest technologies (Le Grange, 2021); (Smidt, 2021).
- This shift towards 4IR technologies in agriculture will have a **marked impact on skills development and brings forth occupations in the ICT space** (IFR, 2022).

The Russian/Ukraine conflict

The contours of the war's consequences are clear: exports from Ukraine have stalled, future harvests are in question, global prices of agriculture commodities have spiked, and most exposed are the countries that rely on agricultural exports from Ukraine and Russia to feed their citizens or fertiliser from Russia and Belarus to produce their own food. The war is disrupting markets for final agricultural products and agricultural inputs at the same time. Agricultural products like wheat and oilseeds are ingredients for staple foods like bread and cooking oil, which are primary sources of calories for millions of people around the world (Welsh, 2022).

The literature review confirmed that South Africa is intertwined with the world market, therefore global developments happening in Russia and Ukraine are likely to affect local prices. Maize and wheat are some of the major staple foods in South Africa, consequently any disruption

in the supplies will be felt by the consumers and all participants in the value chain (Joubert et al, 2022). Ukraine and Russia are top suppliers of the global key staple foods that the majority of South Africans consume daily.

Land reform

There is a need to focus on post-settlement support for farmers and land reform beneficiaries. As stated earlier, this ranges from farm management plans, soil management programmes, conservation and veld management programmes to compulsory capacity building programmes for beneficiaries to address critical skills/capacity gaps (DALRRD, 2022).

Environmental changes

Environmental changes that result in pest and disease outbreaks, drought and floods continue to have an impact on production output and ultimately affects profits. The recent floods that affected the country in April and May 2022 alone have resulted in severe infrastructure and crop damages due to soil getting washed away. This caused significant economic losses. Scientific research with the aim of producing animals and plants that are resistant to environmental changes, pests and diseases should be supported.

South Africa is susceptible to droughts and experiences variable rainfall patterns. Climate change projections seem to indicate that, while South Africa is not projected to become as hot as some of its neighbours to the north, the country is likely to become generally drier and hotter with fewer rainy days and more sporadic (and extreme) rainfall patterns. This is likely to have an influence on the water available for agricultural irrigation in future and could mean that cultivation may no longer be viable in some areas (IFR, 2022).

3.1.5.3 Implications of drivers of change for skills

Together with climate change, both 4IR and the aftermath of COVID-19 will have a lasting impact on agriculture going forward. While it is not possible to accurately predict with whom and what these changes will be, this section of the literature review summarises current research and understanding of the future impact on the agricultural economy, key change drivers and impact on skills needs and skills development.

The three drivers of change that have close links to skills development are 1) changes in technology, which leads to needs for upskilling of people in occupations, 2) the emergence of new occupations, the need to adjust curricula, and 3) the need to increase the pool of trainees being developed for entry into these positions across a range of occupations.

Environmental changes require scientists and researchers and, in the case of land reform, there is a need for a value chain approach in skills development at a level of delivery that the farmer understands and supported by both mentorship and regular extension services.

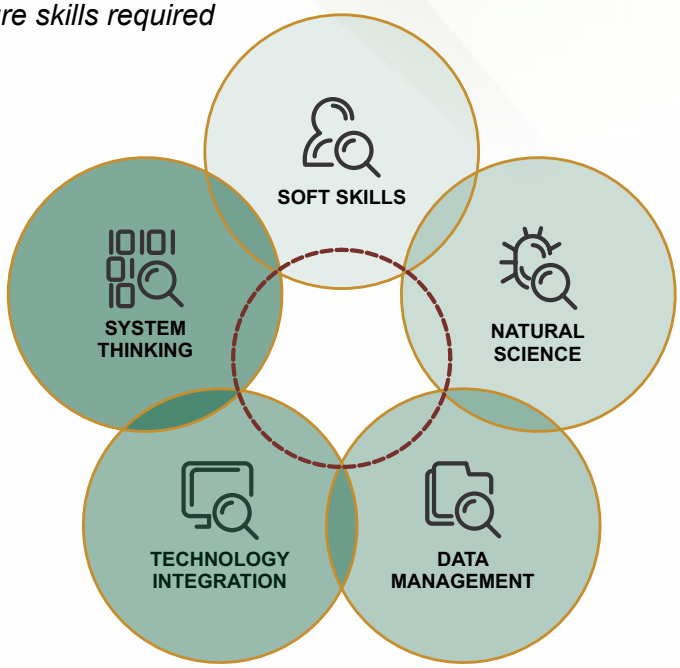
These will impact on skills development and priority occupations:

- Rapid technological advancement is encroaching into on-farm job creation, with more jobs shifting to the off-farm agri-food chains as countries become more developed;;
- While current production technologies and strategies may form the baseline for continued employment in agriculture, new technologies open the opportunity to access new jobs band markers;; and
- Farms that rely on more advanced technological methods will need to employ more highly skilled individuals.

3.2 Priority skills and occupations in agriculture

The Institute for Futures Research (IFR) (2022) identifies five categories of cross-cutting skills that will become more important in future. These are:

Figure 4: Essential future skills required



Source: IFR, 2022

- **Soft Skills:** Encompasses concepts such as collaboration/teamwork, communication, customer service, business principles and sales;
- **Systems thinking:** E.g., design thinking, critical thinking, exponential thinking, process, project management and problem solving;;
- **Technology integration,** i.e: low and high tech, engineering and analysis;;
- **Data management,** e.g., storage, analysis, collection and security; and
- **Basic natural sciences,** viz: soil, biology, plant and animal sciences.

3.2.1 Occupational needs

3.2.1.1 Skills needs at a national level

The literature review considered skills needs at an international level, the expression of occupations in demand by the Department of Home Affairs and what the AgriSETA regards as Sectoral Priority Occupations and Interventions (SPOI). These will be used as a basis, and expanded upon, based on interviews conducted.

The following table summarises priority occupations that came to the fore during the literature review. At this point, no critique could be expressed. The table simply reflects what has been found in the literature. The applicability of this was triangulated during fieldwork.

Table 2: Comparison of priority skills needs

International perspective	DALRRD existing list	DHA	AgriSETA (Commercial)	AgriSETA (Land Reform and Smallholder)
Agric engineer/technician	Bioresource engineering	Agric engineer/ technologist	Agric technician	Agronomy farmer
Food scientist/technologist	Food science and technology	Food and beverage scientist	Finance manager	Farm manager
Agric economist	Agric economist	Biotechnologist	Mixed crop farmer/foreman	Small business manager
Farm manager	Farm manager	Microbiologist	Dairy Farmer	Bookkeeper
Soil and plant scientist	Soil science	Agric scientist	Agric farm manager	Office administrator
	Plant pathology		Agric scientist	Plant pathologist
Veterinarian and vet. Nurse	Veterinary/animal sciences		Agric mobile plant operator	Machine operator
Water resource specialist	Grassland/pasture science		Production operations s/ visor	OHS Advisor
Grape grower and wine maker	Viticulture and oenology		Millwright	
Natural sciences manager	Entomology		Diesel mechanic	
Environmental engineer	Land surveying/geomatics			
Zoologist/wildlife biologist	Urban and regional planning			
Agric consultant	Geo-informatics/geo science			
Botanist	Surveying/cartography			
Agriculture salesperson				
Horticulturalist				

3.2.1.2 Provincial and district level skills needs

At a provincial and district level skills needs, as identified through the AgriSETA sub-sector research processes, were used and mapped according to where different farming activities occur. The work done by the AgriSETA was based on extensive stakeholder consultation and various methods of triangulation. The work is accepted as an accurate reflection of stakeholder views of skills needs.

Table 3: Priority skills per district and province

Northern Cape Districts	Type of farming	Priority occupations
Namakwa	Cattle; sheep	Dairy farmer; red meat de-boner; agricultural scientist; diesel mechanic; agricultural/ horticultural produce inspector; agricultural farm manager; biologist; veterinary technologist; millwright; livestock product analyst; production/ operations supervisor; veterinarian; manufacturing operations manager; slaughterer; engineering manager; fitter and turner; welder; earthmoving plant operator; boilermaker; electrician; and refrigeration mechanic.
Pixley-Ka Seme	Cattle; sheep	
Francis Baard	Cattle; sheep	
ZF Mgcawu	Cattle; sheep	
John Taola Gaetse	Cattle; sheep	
Western Cape Districts	**Type of farming**	**Priority occupations**
West Coast	Grains, fruit; aquaculture	Agricultural farm manager; agricultural mobile plant operator; mixed crop farm production manager/ foreman; production/ operations supervisor (manufacturing); millwright; agricultural scientist; agricultural economist; miller; silo manager; grain grader; workshop manager; commodities trader; parts manager; aquaculture farm manager; engineering manager; aquaculture veterinarian; aquaculture economist; and horticulture produce inspector.
City of Cape Town	Diverse	Occupations similar to those identified in other districts.
Cape Winelands	Fruit	Farm and cellar technician; machine operator; nutritionist; tractor mechanic; horticulture produce inspector
Overberg	Sheep; fruit	Med meat de-boner; agricultural scientist; diesel mechanic; agricultural/ horticultural produce inspector; agricultural farm manager; biologist; veterinary technologist; millwright; livestock product analyst; production/ operations supervisor; veterinarian; slaughterer; engineering manager; fitter and turner; welder; boilermaker; electrician; refrigeration mechanic; farm and cellar technician; nutritionist; tractor mechanic; and horticulture produce inspector.
Garden Route	Sheep; cattle; vegetables	
Central Karoo	Sheep	Med meat de-boner; agricultural scientist; diesel mechanic; agricultural/ horticultural produce inspector; agricultural farm manager; biologist; veterinary technologist; millwright; livestock product analyst; production/ operations supervisor; veterinarian; slaughterer; engineering manager; fitter and turner; welder; boilermaker; electrician; and refrigeration mechanic.

Eastern Cape Districts	Type of farming	Priority occupations
Sarah Baartman	Cattle; sheep	Med meat de-boner; agricultural scientist; diesel mechanic; agricultural/ horticultural produce inspector; agricultural farm manager; biologist; veterinary technologist; millwright; livestock product analyst; production/ operations supervisor; veterinarian; slaughterer; engineering manager; fitter and turner; welder; boilermaker; electrician; and refrigeration mechanic.
Chris Hani	Sheep	
Amathole	Fruit; vegetables; cattle	Med meat de-boner; agricultural scientist; diesel mechanic; agricultural/ horticultural produce inspector; agricultural farm manager; biologist; veterinary technologist; millwright; livestock product analyst; production/ operations supervisor; veterinarian; slaughterer; engineering manager; fitter and turner; welder; boilermaker; electrician; refrigeration mechanic; farm and cellar technician; nutritionist; tractor mechanic; and horticulture produce inspector.
Buffalo City		
OR Tambo	Cattle, sheep, subsistence	Med meat de-boner; agricultural scientist; diesel mechanic; agricultural/ horticultural produce inspector; agricultural farm manager; biologist; veterinary technologist; millwright; livestock product analyst; production/ operations supervisor; veterinarian; slaughterer; engineering manager; fitter and turner; welder; boilermaker; electrician; and refrigeration mechanic.
Alfred Nzo	Subsistence	All the skills needs as articulated for smallholder farmers.
Joe Gqabi	Sheep, cattle	Med meat de-boner; agricultural scientist; diesel mechanic; agricultural/ horticultural produce inspector; agricultural farm manager; biologist; veterinary technologist; millwright; livestock product analyst; production/ operations supervisor; veterinarian; slaughterer; engineering manager; fitter and turner; welder; boilermaker; electrician; and refrigeration mechanic.
Free State Districts	**Type of farming**	**Priority occupations**
Lejweleutswa	Grain	Agricultural farm manager; agricultural mobile plant operator; production/ operations supervisor (manufacturing); millwright; agricultural scientist; agricultural economist; miller; silo manager; grain grader; workshop manager; and commodities trader.
Xhariep	Cattle, sheep	Med meat de-boner; agricultural scientist; diesel mechanic; agricultural/ horticultural produce inspector; agricultural farm manager; biologist; veterinary technologist; millwright; livestock product analyst; production/ operations supervisor; veterinarian; slaughterer; engineering manager; fitter and turner; welder; boilermaker; electrician; and refrigeration mechanic.
Mangaung		
Thabo Mofutsanyana	Grain, cattle	Agricultural farm manager; agricultural mobile plant operator; production/operations supervisor (manufacturing); millwright; agricultural scientist; agricultural economist; miller; silo manager; grain grader; workshop manager; commodities trader;
		med meat de-boner; agricultural scientist; diesel mechanic; agricultural/ horticultural produce inspector; agricultural farm manager; biologist; veterinary technologist; millwright; livestock product analyst; production/operations supervisor; veterinarian; slaughterer; engineering manager; fitter and turner; welder; boilermaker; electrician; and refrigeration mechanic.

Fezile Dabi	Grain	Agricultural farm manager; agricultural mobile plant operator; production/ operations supervisor (manufacturing); millwright; agricultural scientist; agricultural economist; miller; silo manager; grain grader; workshop manager; and commodities trader.
North West Districts	**Type of farming**	**Priority occupations**
Dr Ruth Segomotsi Mompati	Cattle; subsistence	Med meat de-boner; agricultural scientist; diesel mechanic; agricultural/ horticultural produce inspector; agricultural farm manager; biologist; veterinary technologist; millwright; livestock product analyst; production/ operations supervisor; veterinarian; slaughterer; engineering manager; fitter and turner; welder; boilermaker; electrician; refrigeration mechanic; agricultural farm manager; agricultural mobile plant operator; production/ operations supervisor (manufacturing); millwright; agricultural scientist; agricultural economist; miller; silo manager; grain grader; workshop manager; commodities trader; all the skills needs as articulated for smallholder farmers.
Dr Kenneth Kaunda	Grains	
Ngaka Modiri Molema	Cattle; grains; subsistence	
Bonjanala Platinum		
Limpopo Districts	**Type of farming**	**Priority occupations**
Waterberg	Cattle, grains	med meat de-boner; agricultural scientist; diesel mechanic; agricultural/ horticultural produce inspector; agricultural farm manager; biologist; veterinary technologist; millwright; livestock product analyst; production/ operations supervisor; veterinarian; slaughterer; engineering manager; fitter and turner; welder; boilermaker; electrician; and refrigeration mechanic. Agricultural farm manager; agricultural mobile plant operator; production/operations supervisor (manufacturing); millwright; agricultural scientist; agricultural economist; miller; silo manager; grain grader; workshop manager; and commodities trader.
Capricorn	Cattle; subsistence	Med meat de-boner; agricultural scientist; diesel mechanic; agricultural/ horticultural produce inspector; agricultural farm manager; biologist; veterinary technologist; millwright; livestock product analyst; production/ operations supervisor; veterinarian; slaughterer; engineering manager; fitter and turner; welder; boilermaker; electrician; and refrigeration mechanic. all the skills needs as articulated for smallholder farmers.
Vhembe	Cattle; subsistence	
Sekhukune	Cattle; subsistence	
Mopani	Fruit; subsistence	Machine operator; nutritionist; tractor mechanic; horticulture produce inspector. all the skills needs as articulated for smallholder farmers.
Mpumalanga Districts	**Type of farming**	**Priority occupations**
Gert Sibande	Cattle, grain	Med meat de-boner; agricultural scientist; diesel mechanic; agricultural/ horticultural produce inspector; agricultural farm manager; biologist; veterinary technologist; millwright; livestock product analyst; production/ operations supervisor; veterinarian; slaughterer; engineering manager; fitter and turner; welder; boilermaker; electrician; refrigeration mechanic.

Nkangala		agricultural farm manager; agricultural mobile plant operator; production/ operations supervisor (manufacturing); millwright; agricultural scientist; agricultural economist; miller; silo manager; grain grader; workshop manager; and commodities trader.
Ehlanzeni	Forestry; vegetables; fruit; sugar	Machine operator; nutritionist; tractor mechanic; horticulture produce inspector. agricultural farm manager; agricultural mobile plant operator; mixed crop production manager; millwright; agricultural economist; sugar manufacturing pan boiler; boiler, engine and panel operators; mechanical engineer; electrical engineer; electrical engineering technician; manufacturing operations manager; chemical engineer; engineering manager; factory manager; and industrial engineer
KwaZulu-Natal Districts	**Type of farming**	**Priority occupations**
Ugu Harry Gwala	Cattle; forestry; sugar	Med meat de-boner; agricultural scientist; diesel mechanic; agricultural/ horticultural produce inspector; agricultural farm manager; biologist; veterinary technologist; millwright; livestock product analyst; production/ operations supervisor; veterinarian; slaughterer; engineering manager; fitter and turner; welder; boilermaker; electrician; and refrigeration mechanic. Agricultural farm manager; agricultural mobile plant operator; mixed crop production manager; millwright; agricultural economist; sugar manufacturing pan boiler; boiler, engine and panel operators; mechanical engineer; electrical engineer; electrical engineering technician; manufacturing operations manager; chemical engineer; engineering manager; factory manager; and industrial engineer.
eThekwini	Sugar, vegetables	Agricultural farm manager; agricultural mobile plant operator; mixed crop production manager; millwright; agricultural economist; sugar manufacturing pan boiler; boiler, engine and panel operators; mechanical engineer; electrical engineer; electrical engineering technician; manufacturing operations manager; chemical engineer; engineering manager; factory manager; and industrial engineer. Machine operator; nutritionist; tractor mechanic; horticulture produce inspector.
Umgungundlovu	Cattle, sugar, vegetables	Med meat de-boner; agricultural scientist; diesel mechanic; agricultural/ horticultural produce inspector; agricultural farm manager; biologist; veterinary technologist; millwright; livestock product analyst; production/ operations supervisor; veterinarian; slaughterer; engineering manager; fitter and turner; welder; boilermaker; electrician; and refrigeration mechanic.

		Agricultural farm manager; agricultural mobile plant operator; mixed crop production manager; millwright; agricultural economist; sugar manufacturing pan boiler; boiler, engine and panel operators; mechanical engineer; electrical engineer; electrical engineering technician; manufacturing operations manager; chemical engineer; engineering manager; factory manager; and industrial engineer. Machine operator; nutritionist; tractor mechanic; horticulture produce inspector.
Uthekhela Amajuba Umzinyathi Zululand	Cattle, subsistence farming	Med meat de-boner; agricultural scientist; diesel mechanic; agricultural/ horticultural produce inspector; agricultural farm manager; biologist; veterinary technologist; millwright; livestock product analyst; production/ operations supervisor; veterinarian; slaughterer; engineering manager; fitter and turner; welder; boilermaker; electrician; and refrigeration mechanic. All the skills needs as articulated for smallholder farmers.
Ilembe	Vegetables; sugar	Machine operator; nutritionist; tractor mechanic; horticulture produce inspector. agricultural farm manager; agricultural mobile plant operator; mixed crop production manager; millwright; agricultural economist; sugar manufacturing pan boiler; boiler, engine and panel operators; mechanical engineer; electrical engineer; electrical engineering technician; manufacturing operations manager; chemical engineer; engineering manager; factory manager; industrial engineer.
King Cetshwayo Umkhanya-Kude	Sugar, subsistence farming	Agricultural farm manager; agricultural mobile plant operator; mixed crop production manager; millwright; agricultural economist; sugar manufacturing pan boiler; boiler, engine and panel operators; mechanical engineer; electrical engineer; electrical engineering technician; manufacturing operations manager; chemical engineer; engineering manager; factory manager; and industrial engineer. All the skills needs as articulated for smallholder farmers.
Gauteng Districts	**Type of farming**	**Priority occupations**
West Rand Sedibeng City of Johannesburg Ekurhuleni City of Tshwane	Vegetables, limited cattle farming	Machine operator; nutritionist; tractor mechanic; and horticulture produce inspector. Med meat de-boner; agricultural scientist; diesel mechanic; agricultural/ horticultural produce inspector; agricultural farm manager; biologist; veterinary technologist; millwright; livestock product analyst; production/ operations supervisor; veterinarian; slaughterer; engineering manager; fitter and turner; welder; boilermaker; electrician; and refrigeration mechanic.

Source: 11 Sub-sector Skills Plans, AgriSETA, 2022 - 2023

The tables above illustrates that there is a high level of agreement on key occupations, and this supports the notion that occupations in high demand are:

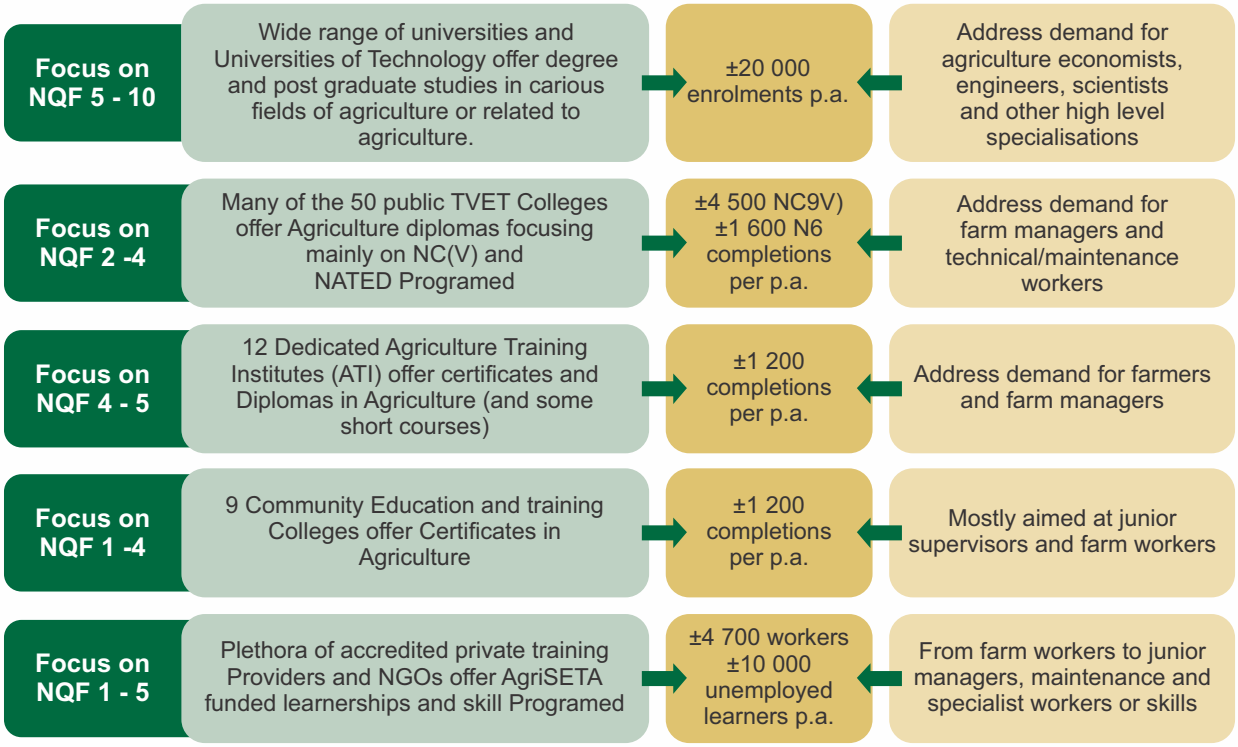
- High-level science and engineering skills;
- Managerial skills;
- Production skills; and
- Technical and artisanal skills.

3.3 Broad Overview of Skills Supply to Agriculture in South Africa

Skills are supplied to the sector by various institutions, operating at different levels of the National Qualifications Framework (NQF). At the highest level are universities and universities of technology. There are 12 Agricultural Training Institutes (formerly known as Agricultural Colleges) offering agricultural diplomas and a range of certificate programmes. Some of the public TVET colleges offer agriculture, each following its own approach to the delivery of programmes—either the National Certificate (Vocation.al) [NC(V)] in agriculture (at NQF levels 2, 3 and 4) or an agriculture diploma following the National Accredited Technical Education Diploma (NATED) route (N4–N6).

Finally, there is a myriad of accredited private training providers. AgriSETA, as the quality assurance body for providers in agriculture has, over the years, accredited more than 1 700 agricultural training providers (AgriSETA Website). Figure 5 summarises education and skills supply to the agricultural sector.

Figure 5: Education and training providers at various NQF levels



Source: Constructed from websites of provision institutions in South Africa

The challenge, therefore, does not lie in the availability of training providers, but rather in what is delivered. Programmes are general in nature such as National Certificate in Plant Production, Animal Production or Mixed Farming Systems at various levels of the NQF. Many of these qualifications are old (were developed in the early 2000s and have not been updated to take cognisance of the latest developments and technologies.)

The second challenge in South Africa is that there is a tendency to provide training that is directed to a specific job (farm worker, field supervisor, junior farm manager, tractor operator, etc.,). This is suitable for the commercial sector which tends to train narrowly to address specific skills needs at a specific time (e.g., pruner, picker, packer, etc.,).

A study was initiated by the ASSAf Science, Technology, Engineering and Mathematics (STEM) Education Standing Committee (Academy of Science of South Africa (ASSAf); 2019), deriving from a deep concern about the status of Agricultural Education and Training (AET) in the country. The study sought to identify and address the challenges facing the AET sector in South Africa. Some of the key findings of the study include inadequate funding for practical-level training; weak linkages to industry for understanding training needs; poor quality and inadequate numbers of educators who are appropriately trained to teach agriculture at school level; and poor linkages in the research–teaching–extension nexus.

Smallholder farmers are not likely to benefit from the narrow approach. Smallholder farmers tend to be individually responsible for all functions along the value chain of their selected commodity.

Finally, the agricultural sector lags in the development of modern occupational qualifications, curricula and learning material. The result is that learning is frequently not aligned to workplace needs, which, in turn, has a negative effect on employability (FCDO, 2022).

3.4 Conclusions on the literature review

Contrary to the economy in general in South Africa, agriculture is performing relatively well.

While this is the case, it does not necessarily convert into jobs and job creation. In fact, over the years, employment in agriculture has been declining consistently (though in the last two years there are signs of employment growth again). Added to this is the fact that many commodities (mainly animal production and field crops) occupy large tracts of land but create very few jobs. Most agricultural jobs are focused in the horticulture sector.

4IR is as relevant to agriculture as it is to any other sector of the economy. Commercial farmers are adopting new technologies at a rapid rate (some examples are the use of drones, self-driven, GPS guides tractors, advanced scanning technologies for tracking and tracing produce, etc.,). Due to the high initial capital outlay, this is generally not available to the smallholder farmer whose efforts remain manual and labour intensive.

The vast differences between commercial and smallholder farming calls for different approaches to skills development and provision. Smallholder farmers need to be well versed in the value chain (as they are normally responsible for every step in the value chain) and must have the ability to participate in the full value chain. Commercial farmers are shifting to higher levels of skills, of which many is driven by 4IR. Also, as commercial entities are becoming fewer but larger, the need for managerial skills increases.

The AAMP also focuses on job creation in the agriculture and rural economies. One of the key pillars of the master plan is provision of comprehensive farmer support, as well as research and development.

Occupations in demand can broadly be categorised as follows:

- High-level occupations at NQF5 and beyond including agricultural economists, agricultural scientists, veterinarian sciences and agricultural engineering;

- Managerial occupations which can range from farmers (managing their own farms) to specialised managers in large commercial entities;
- Technical occupations, generally at NQF4, which includes artisanal and maintenance skills. This category also includes occupations related to the operation of agricultural machinery and mobile plant operators; and
- At the level of the smallholder farmer, the occupational focus is on the farmer him/herself and also on support activities such as bookkeepers and administrators.

There are priority skills within many of these occupations, which is important to consider when skills development interventions are being planned. These priority skills are reflected in the last section of the report.

3.4.1 Summary of key findings from the literature review that have skills implications

The table below highlights the key findings from the literature review and indicates what the implications of skills are.

Table 4: Key findings with implications for skills

Key findings	Implications/signals for skills
NDP: Research and the development of adaptation strategies needed	Training of agricultural research scientists, engineers and technicians.
AAMP: Research and development	
PAPLRA: Strengthening research capacity of Agricultural Research Council (ARC)	
NDP: Expanding the college system with a focus on improving quality PAPLRA: Improving agricultural colleges	Poor quality and inadequate numbers of educators who are appropriately trained; Management development needed; and Improved linkages with industry needed: • Bursaries for educators; • Incentivising work exposure for educators; • Management development programmes for college managers; and • Incentivising industry to “guest lecture” at colleges.
NDP: Improved skills development and training in entrepreneurship	Production skills, management skills, finance marketing, technology; combined with incubation or mentorship.
PAPLRA: Training and skills development with incubation.	
AAMP: Comprehensive farmer support	Extension and advisory services.

Key findings	Implications/signals for skills
NDP: Training of a new cadre of extension officers.	Targeted training programmes enhancing the skills of the providers of extension: • Review of what is curricula is available and adjustments were needed; • Develop CPD programmes; • Provide bursaries for extension officer in employment; and • Develop new potential employees for extension services.
PAPLRA: Revamping extension office support	
4IR and technology	Scientific and engineering skills at professional and technician level. Precision farming: • GPS; • satellite imagery; • control systems; • sensors; • robots; • variable rate technology; • telematics, software, etc.

4. RESEARCH FINDINGS

This section contains an analysis of information obtained through the interviews and telephonic/online surveys conducted for the purpose of this study. The responses obtained through these research methods are analysed and interpreted in relation to the research questions that the study seeks to address.

4.1 Results from online survey of commercial farmers and interviews with key stakeholders

Every attempt was made to distribute this online survey as widely as possible among commercial farmers. Access to relevant databases was a major constraint. Most who are in possession of some or other database on commercial farmers were not prepared to share it with the research team, quoting the Protection of Personal Information (POPI) Act as the constraining factor. Every attempt was made to engage with the AgriSETA (who is the custodian of a very large database of approximately 2000 farmers, based on WSP/ATRs received annually), but the research team, at the time of distributing the survey, was not successful in engaging with the institution. It was subsequently decided to approach commodity organisations to distribute the survey on the researchers' behalf. Because no commodity organisation indicated that they will not do so, it was difficult to determine if all that were requested actually did distribute the survey. Some commodity organisations provided excellent support in this regard and did not only distribute the survey, but also engaged with their members to motivate them to complete the survey.

The following structures were interviewed:

- South African Subtropical Growers Association;
- Citrus Growers Association (via the Citrus Academy).
- Hortgro (deciduous fruit industry);
- Berries SA;

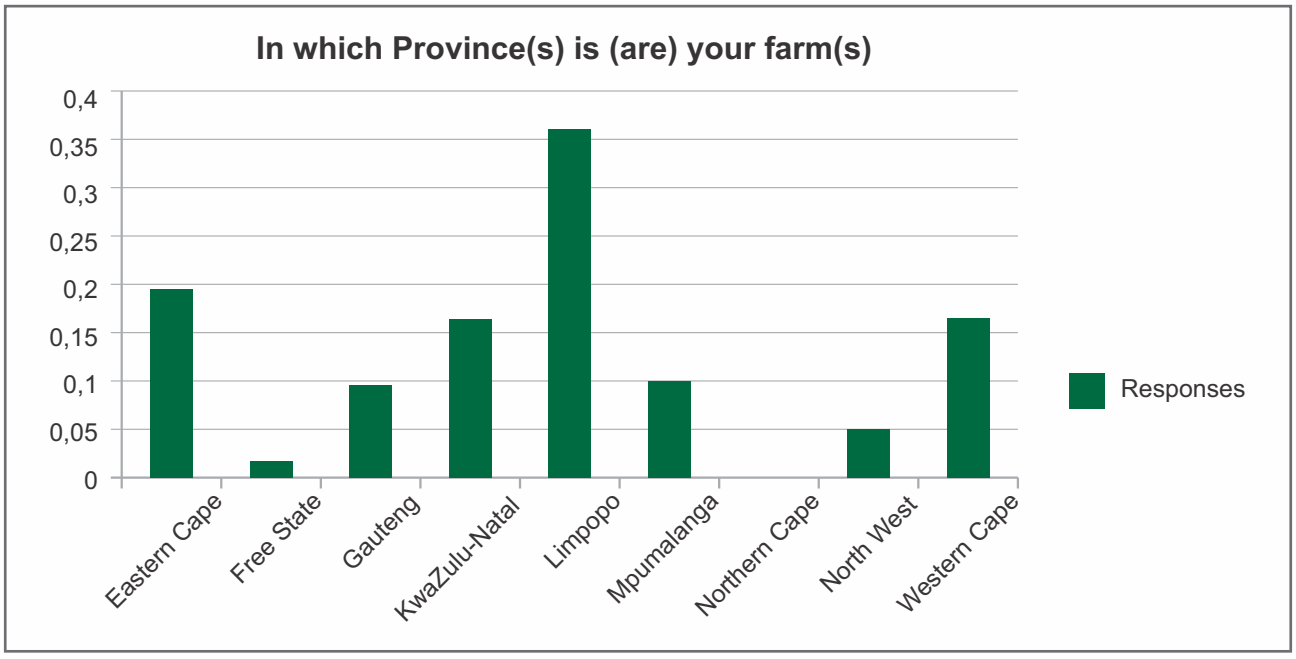
- South African Poultry Association;
- South African Cane Growers Association;
- SA Tobacco Transformative Alliance;
- Limpopo Tobacco Processors;
- Milk SA,
- National Red meat Producers' Organisation (NERPO);
- Red Meat Producers' Organisation (RPO).
- Grain SA;
- Perishable Produce Export Control Board (PPECB);
- National Agricultural Marketing Board (NAMC);
- Agricultural Research Council (ARC);
- AgriSETA; and
- Eight ProvincialEightx Pprovincial CASP coordinators (focus group discussions).

Overview

Of the 79 respondents to the survey, a total of 71 fully completed the survey. Their responses were analysed.

The analysis that follows is therefore based on the feedback received from 71 respondents. It should be noted that not all answers were at all times completed. This discrepancy will be recognised throughout the analysis.

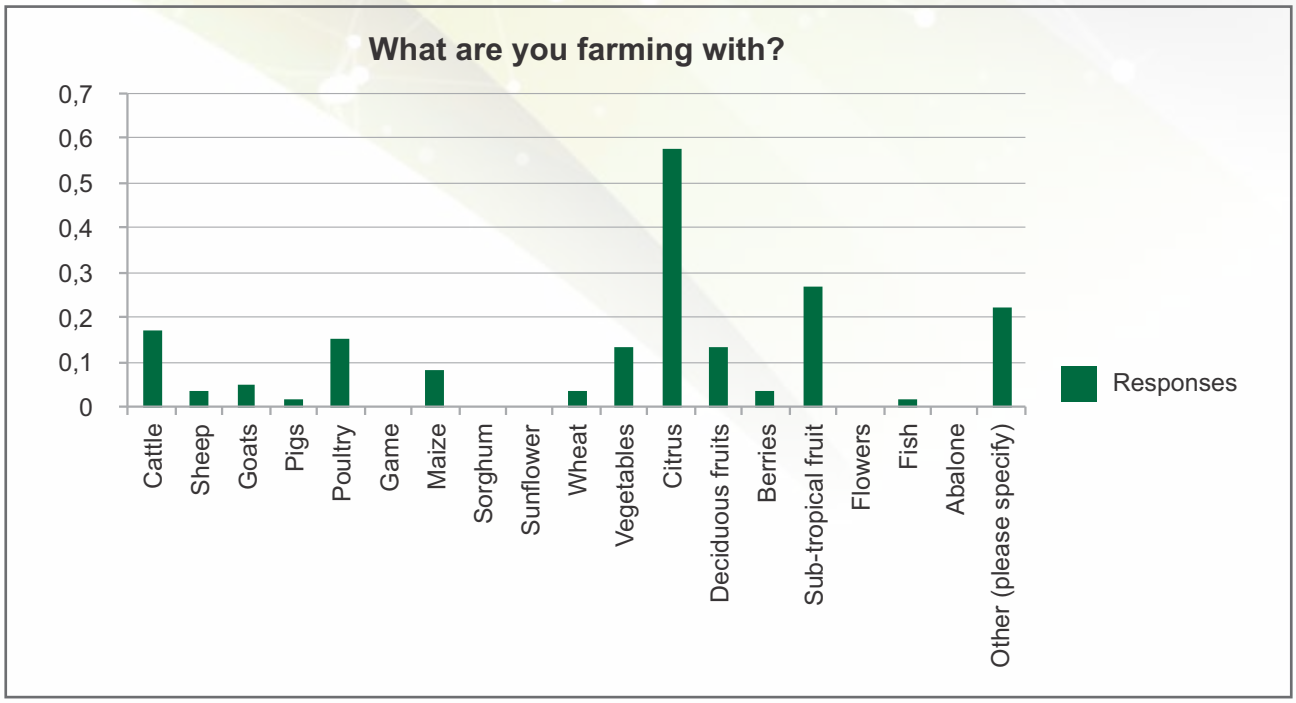
Figure 6: Provincial breakdown of respondents



Most responses were received from Limpopo (35%), followed by Eastern Cape and Western Cape (with 19% each) and KZN (17%).

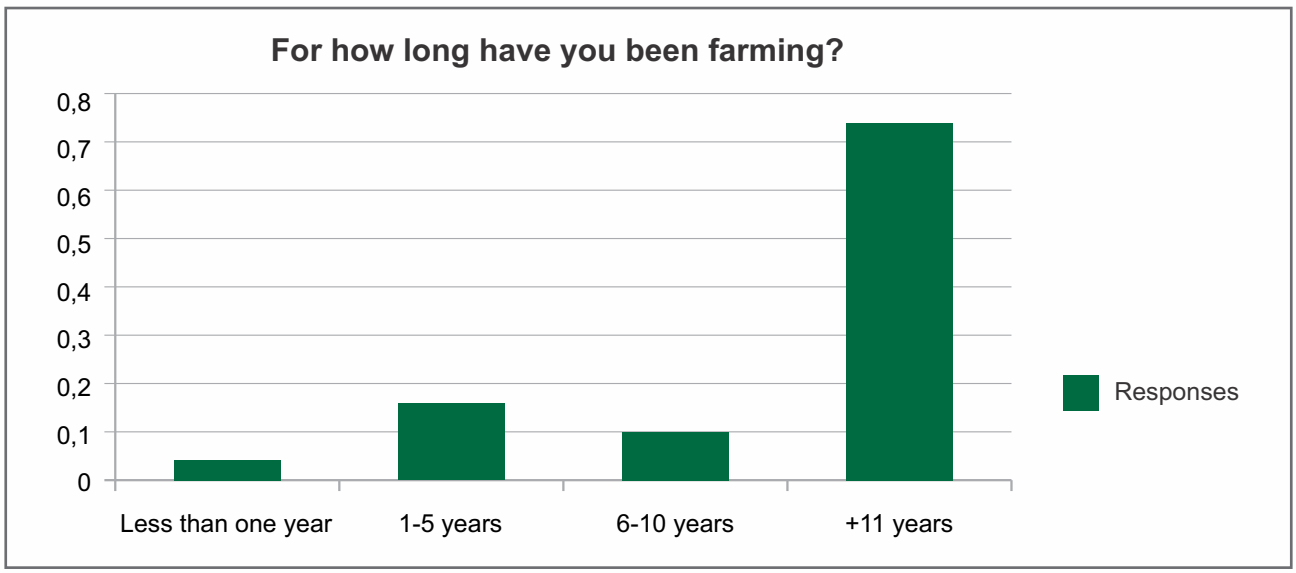
The vast majority of responses were received from the citrus producers (56%) followed by subtropical fruit (29%), cattle (19%) and poultry (15%). The third biggest grouping is actually “Other”. While the reasons for “Other” is not known, the assumption can be made that most of this category will be mixed farming practices. (Figure 7)

Figure 7: Respondents by commodity farmed with



The higher responses from citrus, subtropical fruit, red meat and poultry were to be expected. These were the commodity organisations that understood the value of the survey and showed a keen interest to distribute it amongst their members and engaged in the necessary follow-ups to motivate members to participate.

Figure 8: Respondents’ experience in farming



Respondents to this survey were experienced farmers (Figure 8). 72% of respondents have been farming for 11 years or more and a total of 26% have been farming for a periods ranging from one to 10 years.

Figure 9: Annual business turnover of respondents

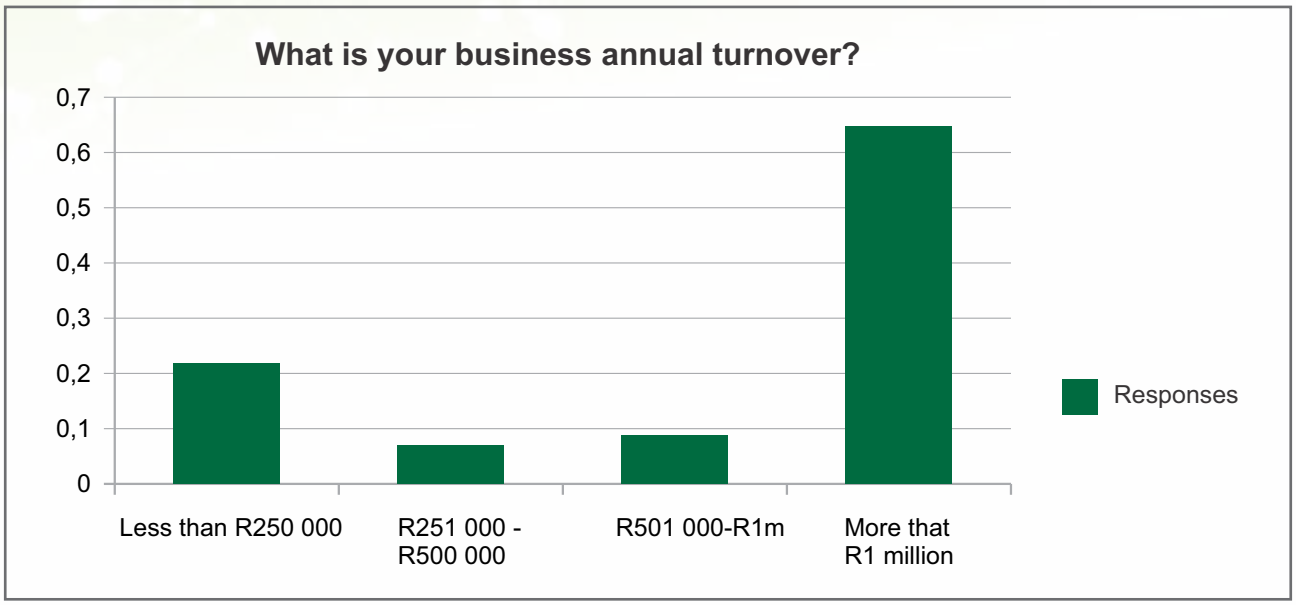
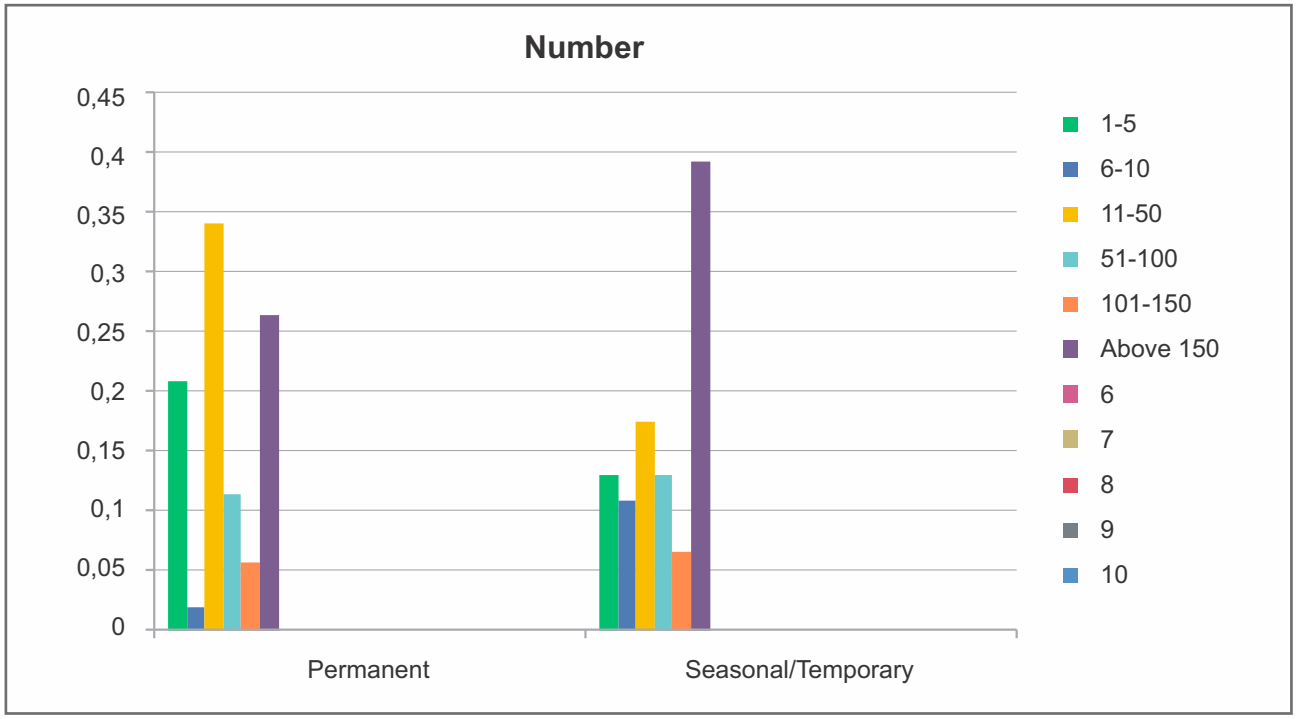


Figure 9 illustrates that the vast majority of respondents have an annual turnover of more than a million rand. This corresponds well with the size of respondents by employment with many large companies (150 or more employees) responded (see Figure 10 below.

Figure 10: Number of employees (permanent and seasonal)



However, the vast majority of respondents fall in the small and medium employment categories (based on DHET definition of size of enterprise). Those that responded reflect that 55% are employing between one and 50 permanent workers and a further 19% are medium-sized employers (between 50 and 150 employees).

A similar trend applies to seasonal workers where 37% are large employers (150+ employees) while the balance is either small-or medium-sized employers. This provides a good spread between small and large respondents.

Demand

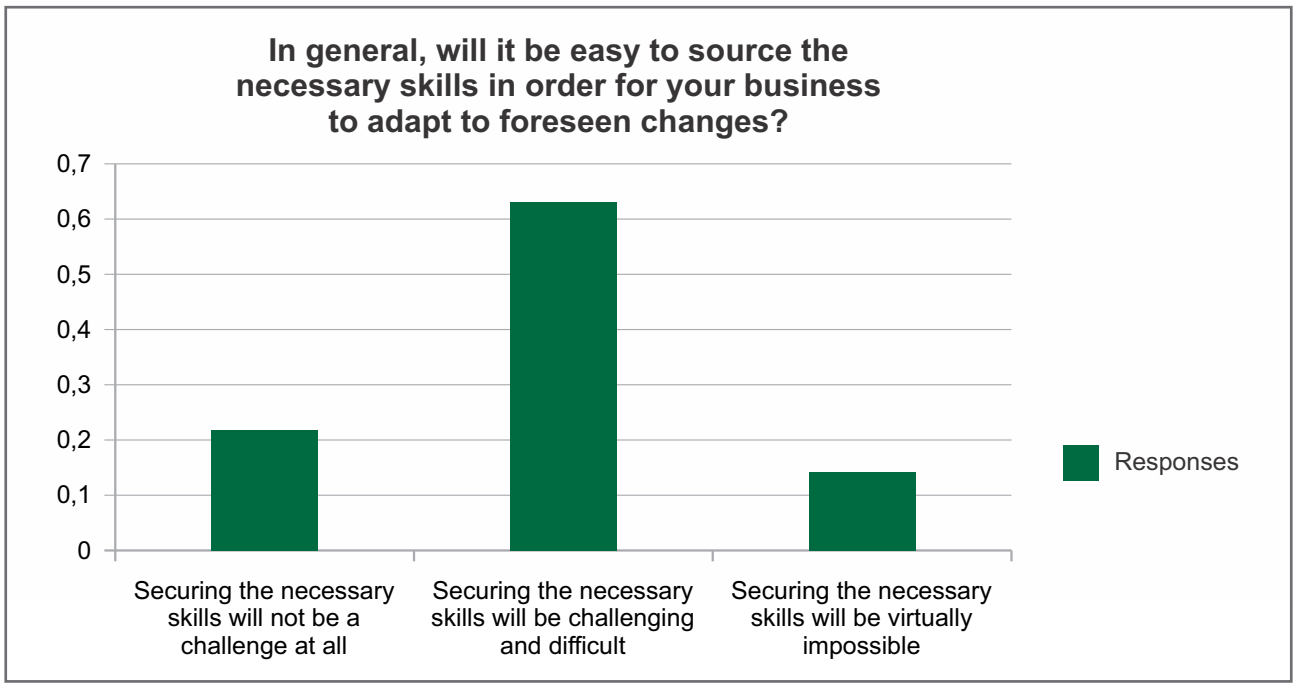
This section of the report focuses on skills needs of commercial farming enterprises. It also attempts to give an indication of future skills needs as a result of technological advancements in the agricultural sector.

While the responses to the survey resulted in wide ranging suggestions, the following five are the most common structural changes expected by farmers:

- **Market related changes:** Comments focus on issues such as market access, improved local market access for small businesses, government intervention in imports, export regulations, private ports, foreign quotas and a focus on specific markets;
- **Larger entities and mechanisation:** Farmers will become larger due to economic pressure and economy of scale (a view strongly supported by Grain SA), takeovers to establish mega farmers, less independent farms but farm sizes will get bigger. Coupled with this is the general feeling that more automation and mechanisation will happen over the next five years, adoption of technologies which will make farms more self-sufficient, and which will address the electricity crises on farms. Specific commodities which were listed to adopt more automation are poultry and piggeries; and
- **Labour and employment:** As a result of economies of scale and technology advancement, many indicated that all this will result in a reduction in employment, smallholder farmers will find it more difficult to survive, seasonal workers will be reduced, and older unskilled workers will be replaced with younger skilled workers.

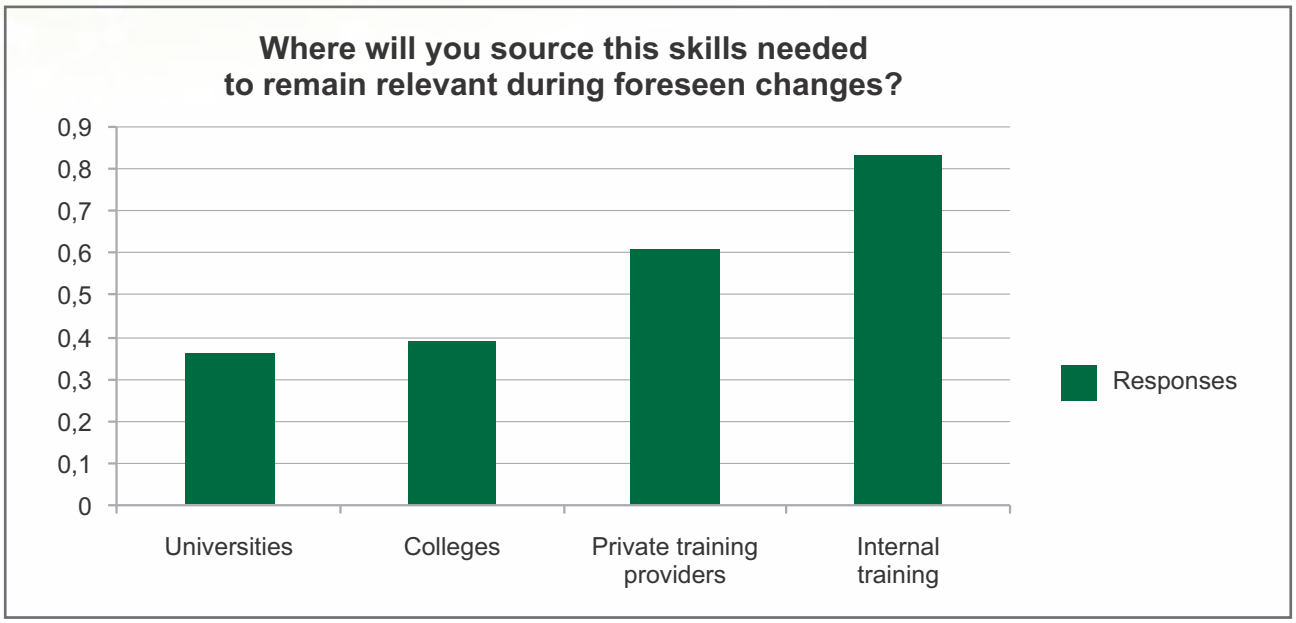
The direct impact of this at farm level will be a shortage of skilled workers to engage with advancing technologies as less manual and unskilled labour will be needed and smallholder farming will come under increased pressure.

Figure 11: General overview of availability of skills



According to Figure 11, most respondents were of the opinion that as changes occurred in agriculture (especially those of a technological nature) it would become more difficult to attract the necessary skills. A total of 85% indicated it would be challenging and difficult (62%) and a further 15% felt it would be virtually impossible to secure the necessary skills.

Figure 12: Sources of skills



Farmers will firstly rely on internal training to ensure that the correct skills are available to manage change (81%) and secondly, they opted for private training providers (63%) and then for universities rely on universities and TVET colleges (38% each). As respondents were allowed to indicate more than one source, it is clear that, apart from internal training, farmers use various types of skills suppliers to ensure that the right skills are available. Figures 13 and 14 focus on the impact of new technologies on skills needs and the need for employees to be exposed to such technologies. In both cases, there were 33 respondents and in both cases the responses were overwhelmingly positive that new technologies will have an impact (70% in both cases).

Figure 13: Impact of technology on skills needs

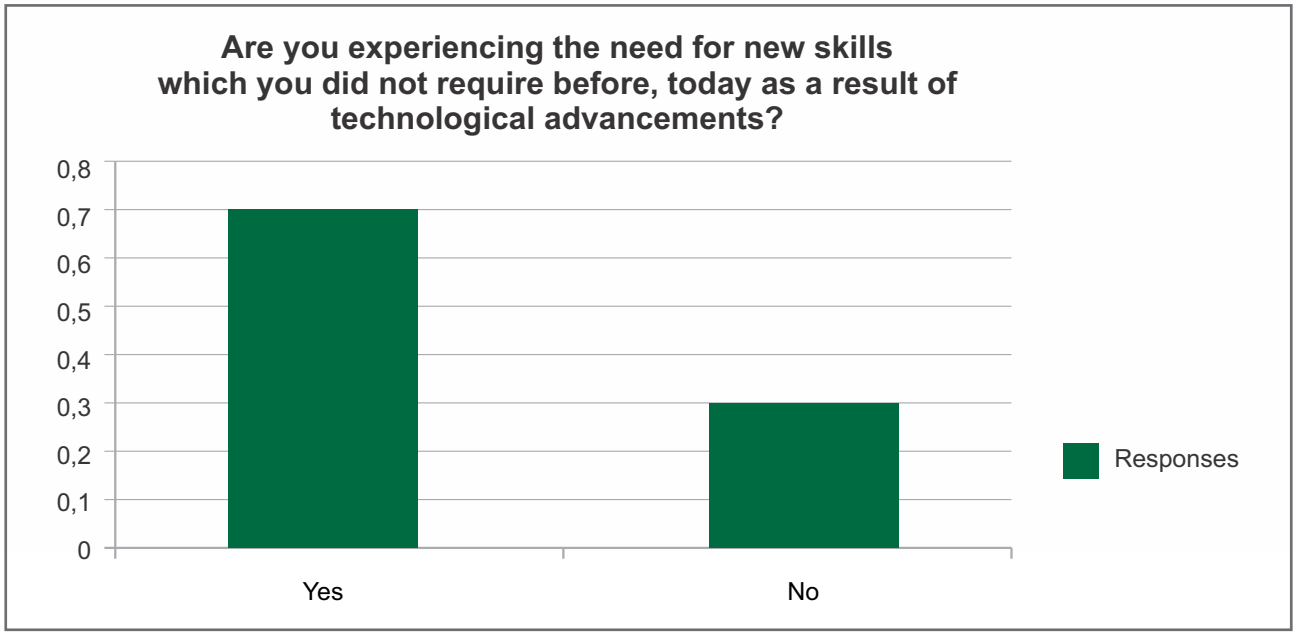
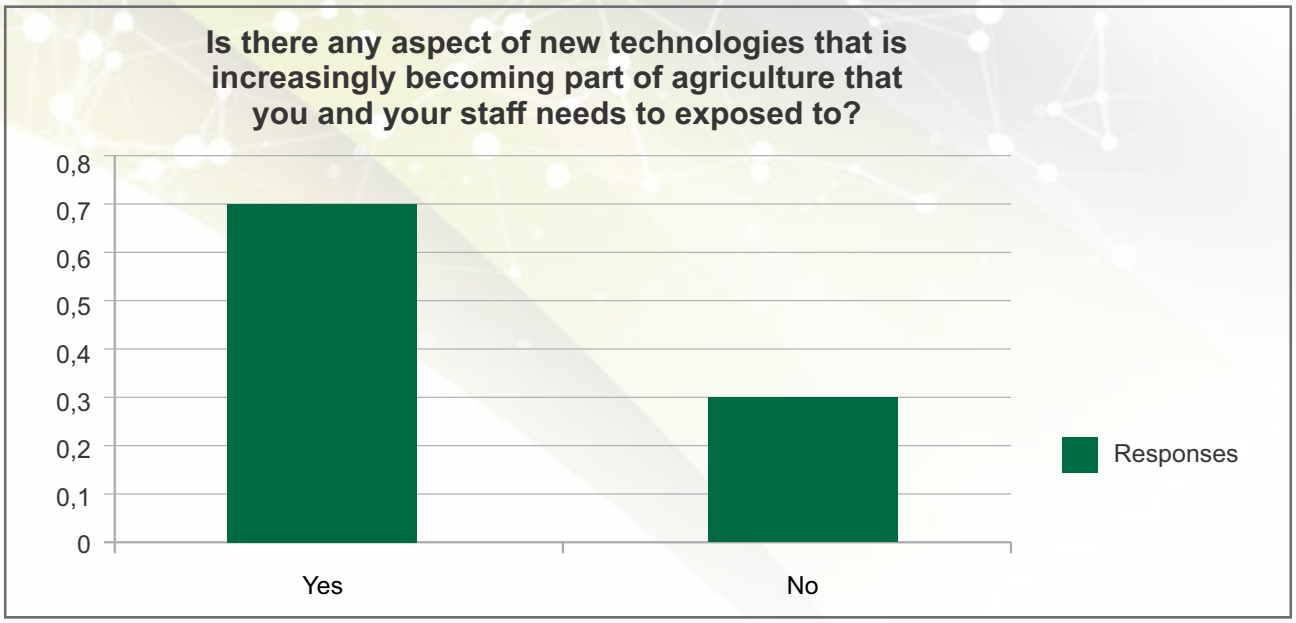


Figure 14: Need for new technology aligned skills



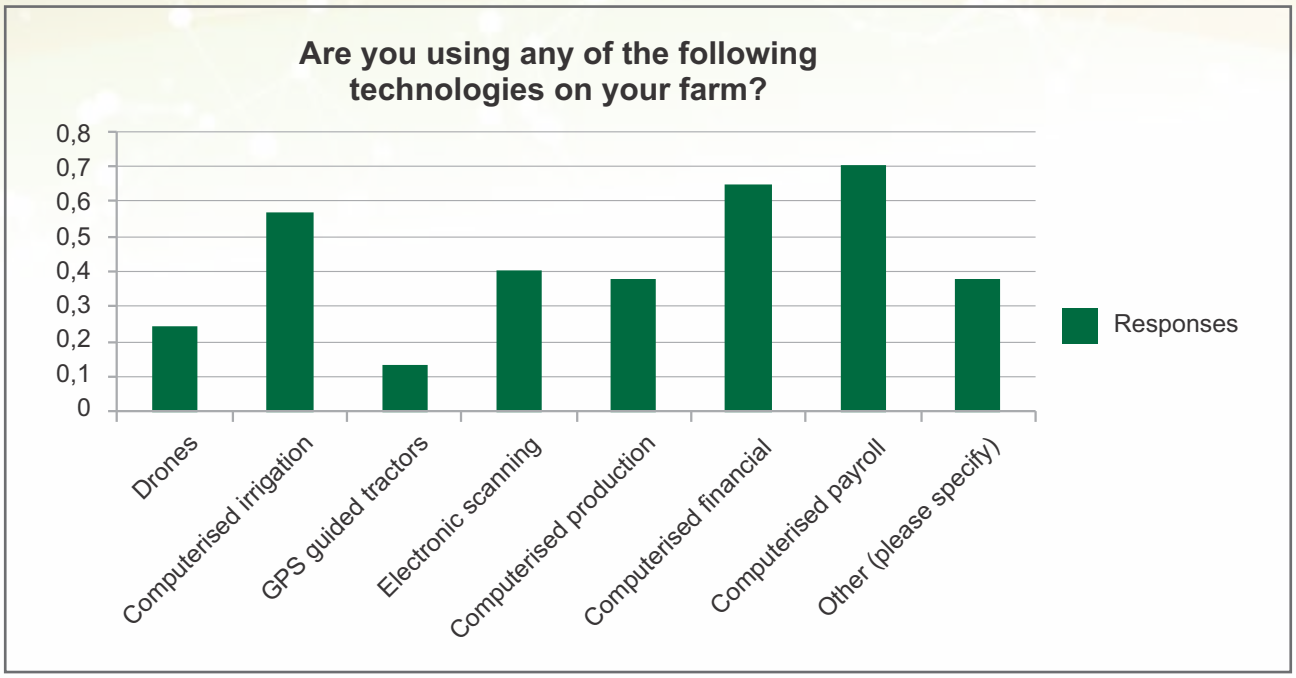
Most prominent technologies mentioned are related to:

- **Field management:** E.g., drones, GPS mapping, automatic fertigation systems, and automated irrigation systems;
- **ICT applications:** E.g., software packages (e.g., Pastel), apps to enable management from mobile phones, less paperwork and effective time use. The PPECB also suggests that ICT applications will assist in data management, which is central to the cold chain management process;
- **Automated packhouse systems:** E.g., advanced laboratory equipment, automated fruit grading systems and robotics in packhouses. It has been foreseen by the fruit industry that the packhouse manager of the future will need to have an engineering degree, in particular industrial engineering; and
- **Cold chain management:** The fruit industry indicated that, especially in the export environment, automation is becoming more and more important such as scanners, automation of the full cold chain and going paperless. This view is strongly supported by PPECB that states there will be a need for knowledgeable persons in cold chain management, assessors of the status of the cold chain, and understanding the cold chain regulatory environment.

The outcomes of these technologies will be improved quality and cost effectiveness, increase in software developers and data scientists, and, especially in the case of poultry, there will be more automated chicken houses. It has been noted repeatedly that all these technological advancements will have an impact on skills needs and training focused on technology which will require more mathematical skills. In general, employees will have to be better educated and technologically orientated.

This is an important observation, as it will impact directly on priority skills that will require focus on the development and funding of learning programmes. However, it is necessary to specify such priority skills in more detail. Figure 15 summarises responses to the types of technologies that are perceived to be priority applications in the workplace.

Figure 15: Use of technologies



"I would say that precision farming means using all available technologies to collect data to make informed choices on the optimal use of inputs, weather it is on fertiliser or seeding rate or irrigation—it is a combination of using those to make better choices."

Figure 15 more specifically reflects some of those skill sets required by farmers to cope with technological advancements, and which should be noted when considering priority skills. Most popular are computerised systems such as payroll, finance and production, but technologies such as the use of drones, computerised irrigation, GPS and advanced scanning systems are also popular. All these technologies received more than 10% support from respondents.

Central to technology advancement is precision farming (Fruit SA, Grain SA). It represents a switch from "maximising everything to optimising inputs". Whatever tools that can help to guide farmers more precisely to where the optimum is, with "optimum" being preferred over "maximum".

Respondents also indicated that, looking into the future—five years ahead—certain jobs will become less important. The most common listed are unskilled labour and general workers and menial tasks such as hand weeding, manual irrigation and harvesting. In general mechanisation will force these jobs into the background.

During fieldwork, a range of occupations in high demand were identified, for example, in the plant production sector are **agronomists, plant breeders, plant pathologists and bio engineers**—these skills will have an impact on crop improvement, plant health and climate resilience. These occupations, with their priority skills areas, are reflected in the AgriSETA SPOI list.

4.2 Smallholder farmers and land reform beneficiaries

Similar to the engagement with commercial farmers, it was not possible to secure databases with contact details of smallholder farmers and agricultural land reform beneficiaries and, as a result, no direct contact was made with these categories of farmers.

To overcome this challenge, DALRRD CASP coordinators in the nine provinces were used as a proxy for smallholder farmers and agricultural land reform beneficiaries. An interview was held with representatives from eight of the nine provinces, as well as with Cedara Agricultural Training Institute and NERPO.

In some provinces, the CASP coordinators conducted skills needs research on a provincial basis. Where this information was provided to the MAS research team, it is indicated in the analysis provided here.

The type of farming activities that smallholder farmers and land reform beneficiaries are involved in resemble the distribution of agricultural activities, as illustrated in Figure 2 of this report. In North West, there is an increased interest in farming with cannabis.

Without exception, interviewees indicated that smallholder farmers as well as land reform beneficiaries are older people, many of them close to retirement. Across the provinces that participated in the interviews, it was indicated that various efforts are being made to attract young people into the sector, but with relatively limited success. Young people do not want to work in the agricultural sector, and they do not want to live in rural areas. This view is explicitly supported by NERPO, which stated that the emerging red meat sector is patriarchal, mainly males over the age of 60. NERPO is also of the opinion that the youth in the sector is not there by choice. Many are well-schooled with post-school academic qualifications and are on the farm because there are no jobs available in the economy. They then return to the farm to -assist their fathers with administration, finance and computer-related work. They will leave the farm as soon as a job offer aligned to their interests comes forth.

"Agriculture is under threat—it is a political priority, but the system does not cope."

The key changes expected over the next –three to five years resemble the drivers of change as identified in the literature review. These include:

- technology;
- climate change coupled with natural disasters, and the resulting social, economic and environmental challenges;
- challenging economic conditions with rising input costs and shrinking profit margins; and
- changing norms and standards in relation to export requirements, which makes it difficult to understand the goalposts.

In addition, inadequate funding to help smallholder farmers and land reform beneficiaries has been identified as a key challenge—the number of farmers is decreasing due to the fact the funding is not sufficient or comes in late owing to the tendering system of the department. There is a lack of coordinated support. Land reform beneficiaries do not get enough working capital.

This view is supported by commodity organisations. The fruit industry indicated that smallholder and emerging farmers are more vulnerable, have less resources and financing and less purchasing power to negotiate on input costs. One further example is that of tobacco production that is a very specific commodity requiring sizable capital, which is a challenge for new entrants. There is ostensibly not much support available from government or elsewhere because of the anti-tobacco stance in South Africa.

There will be costs to implement new technology, which will be challenging for smallholder farmers. Farmers will need to be trained/skilled through relevant programmes to make use of new technology, and to enable them to venture into the farming activities that they have been previously not been

able to. Some of the skills challenges faced by smallholder farmers are, according to the fruit industry stakeholders interviewed, that there is a move towards employing **engineers** and **artisans** (and moving towards paperless data management). Which, because of the cost implications, it is out of reach of smallholder farmers and, as a result, their activities are more manual and labour intensive. However, as smallholder farmers are forced to adopt more advanced technologies, one of the consequences is that fewer workers will be needed, but they will have to have higher skills levels. They will need a broader range of skills (Upskilling of current workers must become a priority). Higher literacy levels will be needed to enable them to understand technology changes and to work independently. It is, however, difficult, as many are aged. *"They battle to adapt, even though we are trying to teach them."* NERPO quoted the example that drone technology is becoming common in the red meat industry, but due to cost and the fact that most emergent red meat farmers are illiterate, they cannot adopt to using the technology. However, emerging red meat producers are important and need to be "taken along". The RPO indicates that it aims to increase the export of red meat from 5% to 20% of local production, and this increase will have to come mainly from the smallholder and emerging sectors. Short courses, delivered at a level which the farmers can understand, are needed.

"We are expected to move an emerging farmer to a commercial stage. Those farmers do not necessarily have the skills to do the business. They rely a lot on indigenous knowledge, they rely a lot on the capacity of extension and advisory services that the department will offer, they also rely a lot on financial support from government, which sometimes does not really work well for them."

Land reform beneficiaries get land, but they do not understand what it entails to run a farming business, and how to set goals. They need training associated with markets and with the **management of a farming business**. They also need training on how to maintain farm and water infrastructure. In addition, they want training in terms of climate smart agriculture and how best to adopt and mitigate the risks that they are confronted with.

Responses to the question on how easy it is to find production workers for day-to-day work on the farm also varied. Most felt that it was easy but indicated that there were no technical skills to support farming businesses.

Finding employees for administrative posts is also not viewed as challenging—in some instances workers' children go to college, study administration, come back and work on the farm. However, skills gaps that were identified include **office management, procurement and planning**.

Obtaining **supervisory**, and especially **managerial skills**, is problematic.

Reflecting on funding of training, respondents stated that CASP funds were ringfenced and only the ones that are financed get training, the rest were left out. AgriSETA provides support, but it is not enough.

Regarding the adequacy of the extension services provided by the department, most respondents indicated that the function is vastly under-resourced in terms of human resources. Many of the extension officers are nearing retirement age, and they are not replaced timeously.

Extension officers are also mostly generalists. They try to deal with the range of services required, but the services offered are not up to standard. It is rare to get an extension officer to specialise, but if that happens, they are still expected to provide services across the production spectrum. Subsequently, they end up being a generalist again. There are also new types of farming, such as aquaculture, for which extension officers cannot provide guidance.

A further challenge identified in some provinces is that extension officers only deal with applications for funding, all the paperwork, and project managing implementation. They do not have time to give advice to their farmers.

NERPO described extension services as limited and referred to an EU-DALRRD programme to advance the skills of extension officers. The available services from veterinarians and animal health technicians are limited as well.

Proposed solutions include that extension officers should work closely with commodity organisations to learn and develop themselves, obtain training and collaborate around providing support to smallholder farmers. Continuous professional development is crucial, as is the provision of bursaries to them to further their studies. Training programmes provided should be reviewed and updated.

The value of **mentorship** provided by commercial farmers is viewed in a positive light. Most provinces work with commodity organisations to identify potential mentors and to incentivise them to provide support. The duration varies between eight months and three years.

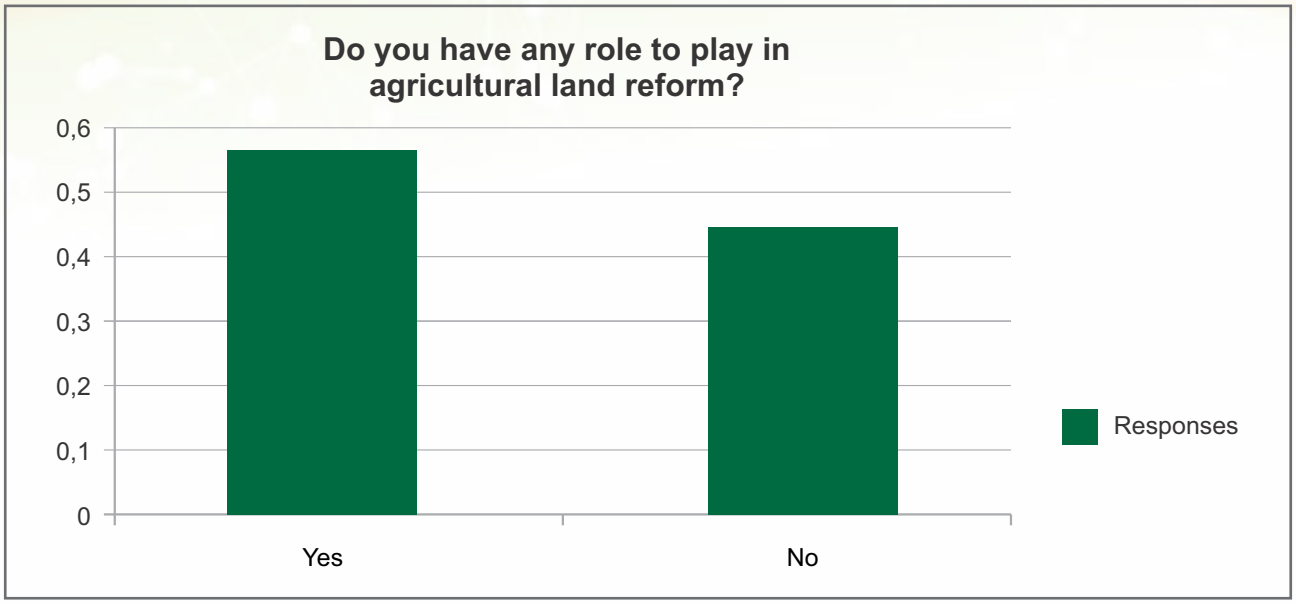
With regards to land reform beneficiaries, **farm management** has been mentioned as the biggest single need. People need market intelligence, understand finance, etc. This can best be achieved through extended mentorship programmes. The current mentorship support is viewed as not enough and too short.

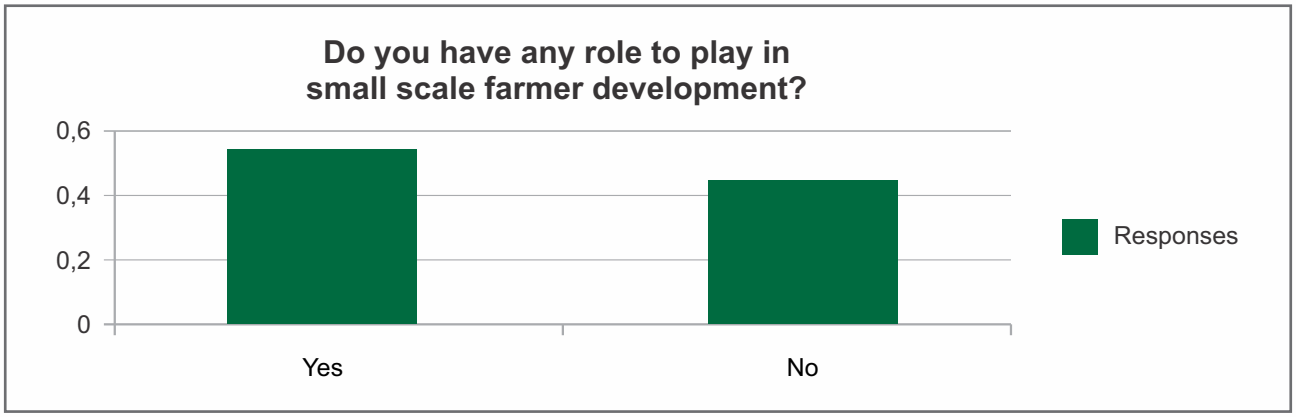
Commercial farmers are generally in agreement with CASP coordinators with regards to supporting smallholder farmers and agricultural land reform beneficiaries—as reflected in Figure 16. It is clear that commercial farmers are of the view that they have a responsibility towards both smallholder farmer development and beneficiaries of agricultural land reform. Even organisations not directly involved in farming, such as PPECB, provide training and mentoring services to smallholder farmers who are entering the export market.

"I think the mentors worked extremely well. But unfortunately, mentorship comes with a price and sometimes we find it difficult to get proper support from our department for mentorship. There is a lot of commercial farmers that are more than willing to be a mentor but at the price."

"If we are talking about what is needed to take a land reform beneficiary to a commercially viable level, we are talking about a very intensive long-term mentorship."

Figure 16: Commercial farmers' perceived responsibility towards land reform beneficiaries and smallholder farmers





Commercial farmers also indicated that, in their view, the following were most important for land reform beneficiaries and smallholder farmers to succeed:

Land Reform beneficiaries	Smallholder farmers
Business management skills, to include: • Financial skills; • Long-term planning; • Production, marketing and HR management; • Supervision and leadership. Production management skills, to include: • Pest and disease control; • Fertility; • Mechanical matters; and • Irrigation. **Technical commodity specific knowledge and skills.** Soft skills and ethics to include: • Desire to want to farm; • Commercial vs subsistence farming attitude; • Will and dedication; and • Mathematics.	Business management skills, to include: • Finances; • General business acumen; • Labour and HR management; and • Marketing. Production and technical skills, to include: • Water management; • Automation and technology; Environmental and climate knowledge; and Technical commodity specific knowledge and skills.

From the above, it is clear that commercial farmers see similar skills needs for agricultural land reform beneficiaries and smallholder farmers. The main focus should be on **managerial skills, commodity specific technical skills** and **soft skills**, ideally offered through skills programmes pitched at a level that the farmer can accommodate.

When interviewees were asked about priority occupations for owners of and workers on the farm, as well as to identify occupations needed to improve the performance of the agricultural sector as a whole, the following occupations were mentioned:

Broader skills needs in support of smallholder farmers and agriculture land reform beneficiaries	Skills needs of smallholder farmers and extension officers
Research skills—production, engineering	Production related skills
Agricultural engineers	Management skills
Veterinarian Specialists (rural areas)	Training across all commodities to enable farmers to stay abreast of changes
Extension officers with an economy background	Aquaculture
Agriculture researchers on smallholder farmers	Bee farming
GIS developer	Qualified tractor drivers
Agronomy	More practical training across the board
Pasture science	Agricultural apprenticeships
Weed science	
Entomology	
Horticulture	
Rangeland science	
Animal geneticist/Genomic scientist	

Source: Research conducted by CASP coordinators

With regards to the sourcing of skills, farmers obtained skills via universities, colleges, private providers and internal training. Some commodity organisations are key providers, and use is also made of the Agricultural Research Council (ARC). Farmers are willing to take on graduates and not having to pay for them (under the departmental graduate programme).

"The material is a bit beyond the league of our farmers because we've got smallholder farmers and emerging farmers. They want to learn the basics, now a person comes here talks about artificial insemination - – high tech things that farmers don't understand."

With regards to the quality of training, respondents felt that there is no engagement or collaboration between the department and the training institutions. The department should be able to tell the institution what type of training they are looking for so that the institutions can reconfigure or design the curriculum that will respond to what the market needs. Things are changing fast, and courses offered by colleges and HE institutions are not always keeping track of these changes. *"The curriculum of the university and the market demand need to be aligned. The university needs to do a market analysis of skills demand and restructure their programmes accordingly."*

Another problem relates to the level at which training is being delivered. One level of training is needed for emerging farmers, while the same topic needs to be delivered at another level for the farmer that is already a commercial farmer.

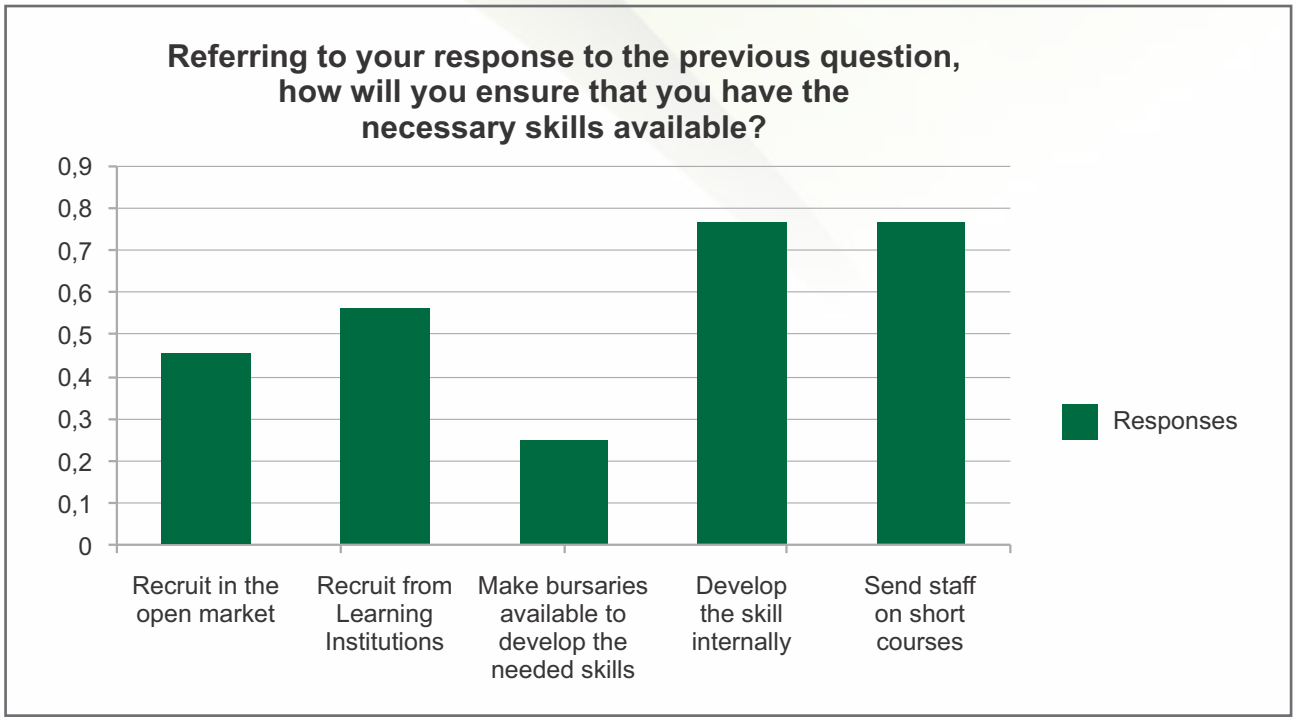
There is also a view that practical training is inadequate, and one proposal is to introduce apprenticeships for the agricultural sector (which will be longer and more practical). Some farmers are complaining about the skills levels provided by learnerships.

4.3 Supply of skills

Given the fact that farmers indicated that they would require new skills, especially with regards to ICT and related technologies, this section explores the sources of such skills.

Commercial farmers were asked where they would source the necessary skills from. (See Figure 17). Internal staff development and utilisation of short courses are perceived to be the most popular routes. Traditionally, the use of short courses is highly popular within the agricultural industry. The AgriSETA annual report for 2020–2021 records that, while 4,109 learners entered learnerships, 9,077 learners entered skills programmes (AgriSETA, 2021).

Figure 17: Sourcing the required skills

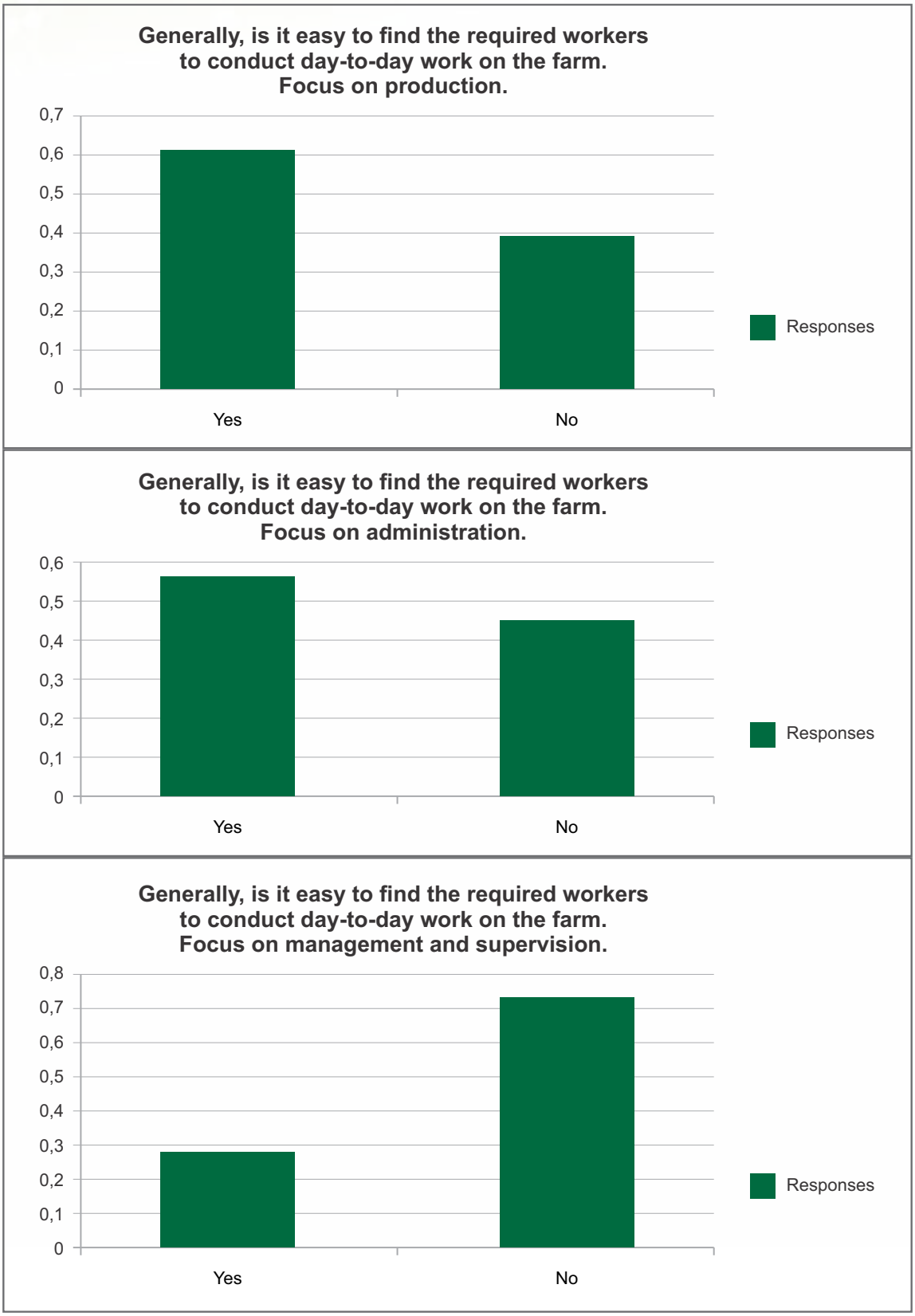


It is also true that for each new ICT or related technology adopted, a new employee is not necessarily required—in most cases it is a matter of "topping-up" an existing skill set to be able to apply the new technology in the workplace. This underscores the responses that most skills development for new technologies will be done via short courses and/or internal training processes.

It is also the case that farmers will turn to supply institutions (such as universities and others) (55%) as well as the open labour market (42%).

It is only among more senior personnel where farmers have difficulty in securing the necessary skills. Figure 18 reflects that 61% of respondents stated it was easy to find production workers, 55% stated it was easy to find administrative workers but for management and supervision, 71% of respondents indicated that it was difficult to find suitable employees.

Figure 18: Availability of workers in broad occupational categories



Among the scarce skills listed are scientists such as **biotechnology, phytosanitary technologists, entomologists** and **packhouse specialists**—it is believed that supply institutions do not produce sufficient scientists. **Managerial and supervisory skills** are also listed as being scarce.

Respondents frequently listed a wide range of life skills such as being punctual and honest, positive orientation to work, work ethics, people management and work readiness, i.e., **soft skills**.

It was also stated that in rural areas, well qualified and **experienced administrative workers** are hard to come by.

From a supervisory and management perspective, good managers with technological and automation skill/knowledge are not readily available.

Finally, **technicians and artisans** are difficult to recruit. A wide range of artisanal skills were listed as being difficult to secure, such as diesel mechanics, plumbers, welders and bricklayers.

In commenting on how post school institutions should address scarce skills, respondents commented as follows:

- Need to channel more youths into vocational education and training;
- Improved government basic education in rural areas to create a better pipeline to higher education institutions;
- Entrepreneurship: Focus should be to create a mindset for graduates to think of creating jobs rather than looking for a job after completion;
- The output from ATIs is of inferior quality;
- There is a need for more BSc-qualified youth; and
- Increase the availability of bursaries for post school education.

"What I see is a fragmented structure. We have institutions that do not speak to a common goal. They don't have a platform where institutions are coming together, especially those that are in agriculture, and we say these are the skills that are needed and are we still relevant."

"A lot of our biggest and grandest farmers at the moment were brought up through agricultural colleges—while the university provided the necessary academic background, it was the agricultural colleges that provided balance and practice"

Some commodity organisations also made reference to agricultural colleges (now known as Agricultural Training Institutes). GrainSA specifically stated that although universities provide academic training, it is the colleges that are supposed to provide the technical, practical know-how. These colleges are not up for the task and government will have to join hands with the private sector to rebuild the agricultural colleges as institutions of choice.

4.4 Key findings with implications for skills

Key findings	Impact in relation to skills	Impact on	
		Commercial farmers	Land reform beneficiaries
Changes in technology (4IR)	A shortage of skilled workers to engage with advanced technologies: • upskilling of existing employees; • training of more engineers and technicians; • increase in software developers and data scientists. Skills needed within those occupations: • Field management, e.g., drones, GPS mapping, automatic fertigation systems, automated irrigation systems; • ICT applications such as apps to enable farm management from mobile phones; • Automated packhouse systems, such as advanced laboratory equipment, automated fruit grading systems and robotics; and • Cold chain management: especially in the export environment automation is becoming more and more important such as scanners, automation of the full cold chain and going paperless.	Yes	Yes
Climate change coupled with natural disasters, and the resulting social, economic and environmental challenges.	• Development of scientists to research alternative farming methods on how to cope with climate change (e.g., extensive droughts and heat stress lowering crop productivity; changes in rainfall variability and increased temperatures);	Yes	Yes
Climate change coupled with natural disasters, and the resulting social, economic and environmental challenges.	• Inclusion of these knowledge sets in the training of extension officers; and • Support training provision that can deliver training at the level of the smallholder farmer to understand the impact of climate changes.	Yes	Yes
Export requirements becoming more stringent.	• People in technical, administrative and management positions need to stay abreast of changing requirements.	Yes	Yes

Key findings	Impact in relation to skills	Impact on	
		Commercial farmers	Land reform beneficiaries
Inadequate supply of skills—institutions do not develop a sufficient number of people.	• Increase the training of scientists such as biotechnology, phytosanitary technologists, entomologists and packhouse specialists—it is believed that supply institutions do not produce a sufficient number of scientists; and • There is also an inadequate production of engineers, technicians and artisans.	Yes	Yes
Older people, often close to retirement; Recruitment difficulties: Sector is not viewed as attractive; people do not want to work in rural settings.	Skills development on its own will not solve this challenge, but consideration can be given to increasing the pool of skilled people that potentially can work in the sector. • Increase career guidance interventions to make young people aware of opportunities in the agriculture sector; • Replacement of older employees with younger skilled workers—training large numbers of young people in production, and farm management; and • Training across all occupations in agriculture		Yes
Extension services.	The function is vastly under-resourced; Extension officers are also mostly generalists. Increase the number of people being training as extension officers. There are new types of farming, such as aquaculture, for which extension officers cannot provide guidance. Build knowledge of these into the curricula of training programmes in order to: • Train more extension officers; and • Upskill current cadres of extension officers (CPD, bursaries, collaboration with commodity organisation).	Yes	
Mentorship.	Farm management has been mentioned as the biggest single need. People need: • market intelligence; and • understand finance, etc. This can best be achieved through extended mentorship programmes. The current mentorship support is viewed as not enough and too short.		Yes

Key findings	Impact in relation to skills	Impact on	
		Commercial farmers	Land reform beneficiaries
Low literacy levels of smallholder farmers and land reform beneficiaries.	• Develop training programmes at a level that farmers can understand and use the knowledge; and	Yes	
Lack of farming skills.	Support adult education and training programmes. Business management skills, to include: • Financial skills; • Long-term planning; • Production, marketing and HR management; and • Supervision and leadership. Production management skills to include: • Pest and disease control; • Fertility; • Mechanical matters; and • Irrigation.	Yes	
Lack of farming skills.	**Technical commodity specific knowledge and skills.** Soft skills and ethics to include: • Desire to want to farm; • Commercial vs subsistence farming attitude; and • Will and dedication. Mathematics.	Yes	
No engagement or collaboration between the DALRRD and training institutions.	The curriculum offered by universities and market demand need to be aligned. The university needs to do a market analysis of skills demand and restructure their programmes accordingly.	Yes	Yes
Quality of training from ATIs is viewed as inadequate.	• Weak linkages to industry for understanding training needs; • Poor quality and inadequate numbers of educators who are appropriately trained to teach agriculture at school level; and • Lack of managerial skills. • Provision of practical training is inadequate.	Yes	Yes
Agricultural sector lags in the development of modern occupational qualifications, curricula and learning material.	The result is that learning is frequently not aligned to workplace needs which, in turn, has a negative effect on employability.	Yes	Yes

5. CONCLUSIONS

This section details the conclusions that can be drawn from the research conducted (covering the literature review, secondary data analysis, interviews and the survey). There is a range of factors that impact the agriculture sector.

The commercial farming sector in South Africa is strong, and **while not growing at a rapid rate, it is expanding**, but this expansion is not necessarily linked to an expansion in employment. There are some sub-sectors such as the berry industry that is expanding at a rapid rate, both in terms of hectares planted and labour. In general, however, commercial farming units are reducing but those that remain are becoming larger and larger, giving them economies of scale, which is not possible among smaller independent farmers.

The literature review laid bare that **export requirements are becoming more stringent** and are placing additional pressure on producers, from a technical, administrative and management perspective. At the same time, respondents indicated that **agriculture is in the midst of adopting 4IR technologies** and is doing so at a rapid rate. This is in line with international developments as revealed by the literature review. It has been stated that the South African commercial farmer is open to and quick to adopt new technologies.

All of these have implications on skills and the need for differently skilled personnel. ICT (data management, payroll, tracking and tracing), advanced technologies such as GPS, electronic scanning, cold chain management and control, drones, computerised irrigation and precision farming are all trends that training providers and academic institutions will have to take note of and ensure that their curricula are aligned to these new developments.

Smallholder farmers and land reform beneficiaries are exposed to a number of challenges. They tend to be **individually responsible for all functions along the value chain of their selected commodity.** They do **not have the capital to engage in new technologies** nor is the financial assistance available to them sufficient to secure such technologies.

The development needs of **smallholder farmers and land reform beneficiaries are more basic than those of commercial farmers:** they need to be exposed to short programmes which build

their capacity in aspects such as business acumen, management of people, leadership, and financial planning. Consistency of the quality of training is problematic, and the level at which training is delivered needs to be adjustable to respond to the needs of the smallholder farmer and land reform beneficiary.

Many of the smallholder farmers do **not necessarily have the skills to run a business**, and they rely on indigenous knowledge. They rely extensively on the support and **capacity of extension and advisory services** that the department offers; they also rely heavily on financial support from government, which is viewed as being inadequate.

Regarding the adequacy of the extension services provided by the department, the majority view is that **the function is vastly under-resourced in terms of human resources**. Many of the extension officers are nearing retirement age, and there are no succession measures in place to replace them timeously. There is also a **gap between what they know, and what the latest technology developments require**. There is a lot that can be done in that regard such as continuous professional development. Most of them are generalists and lack in-depth knowledge to provide support.

Mentorship to support smallholder farmers is viewed as making a very positive contribution to the sustainability of these farming enterprises. The opinion expressed is that the current system of support should be expanded and extended. There are, in general, willingness from commercial farmers and commodity organisations to provide such services.

With regards to the supply of skills, the view is that the **agricultural sector lags in the development of modern occupational qualifications, curricula and learning material**. The result is that learning is frequently not aligned to workplace needs which, in turn, has a negative effect on employability. Supply from Agricultural Training Institutes is viewed as poor, the main reasons being quoted is that lecturers do not have the requisite qualifications and experience; and managerial skills are lacking.

Critical skills (top-up skills) needs are resulting from **changes in technology, and qualifications are not staying abreast.**

Despite the above, it was found that farmers will turn to supply institutions (such as universities and others) as well as the open labour market to source skills. This means that the supply side is not ignored to address skills shortages or skills needs.

In the table below, a summary is provided of key factors that impact the agricultural sector, and what the skills implication of those factors are.

Key findings	Implications/signals for skills	Occupations affected (where applicable)	Skills priorities (where applicable)
National imperatives			
NDP: Research and the development of adaptation strategies needed; AAMP: Research and development; PAPLRA: strengthening research capacity of Agricultural Research Council (ARC).	Development of higher lever skills—sciences and engineering.	Scientists; Science technicians.	Companion animal nutritionist; plant pathology manager; pomologist; farming scientist; seed production horticulturist; agronomist; animal nutritionist; agricultural immunologist; plant/seed breeder; seed product developer; animal husbandry scientist; plant production scientist; seed production agronomist; agrostologist; quarantine scientist; seed analyst; plant biologist; ecologist; toxicologist; plant physiologist; plant pathologist; soil and plant scientists; and entomology.
NDP: Expanding the college system with a focus on improving quality; PAPLRA: improving agricultural colleges.	Improved lecturer qualifications and experience; Improved management competencies; Improved linkages with industry; and Improved curricula.	ATI lecturers ATI management	CPD of lecturing staff prioritised.
NDP: Improved skills development and training in entrepreneurship.	Focus should be to create a mindset for graduates to think of creating jobs rather than looking for a job after completion.	Smallholder farmers Mentors	Entrepreneurial training; and Agricultural extension officers.
NDP: Training of a new cadre of extension officers; PAPLRA: Revamping extension office support	Train an additional pool of extension officers; Upskills existing pool of extension officers; Extension agents should render relevant, good quality services and provide information that improves agricultural production and facilitates access to the technologies required by farmers.	Agriculture consultant	Agricultural extension officer

Key findings	Implications/signals for skills	Occupations affected (where applicable)	Skills priorities (where applicable)
AAMP: Comprehensive farmer support; PAPLRA: Training and skills development with incubation.	Short courses across the agriculture value chain Mentorship Extension services	Smallholder farmers and land reform beneficiaries; Mentors	Focused needs driven skills programmes; Agricultural extension officers.
Land reform beneficiaries and smallholder farmers			
Lack of farming skills	**Short courses:** Business management skills, to include: • Financial skills; • Long term planning; • Production, marketing and HR management; and • Supervision and leadership. Production management skills to include: • Pest and disease control; • Fertility; • Mechanical matters; • Irrigation. Technical commodity specific knowledge and skills. Soft skills and ethics to include: • Desire to want to farm; • Commercial vs subsistence farming attitude; • Will and dedication; and Basic Mathematics	Smallholder farmers and land reform beneficiaries.	Farm management training; and Skills programmes focusing on specific technical issues.

Key findings	Implications/signals for skills	Occupations affected (where applicable)	Skills priorities (where applicable)
Older people, often close to retirement; Recruitment difficulties: Sector is not viewed as attractive; people do not want to work in rural settings	Skills development on its own will not solve this challenge, but consideration can be given to increasing the pool of skilled people that potentially can work in the sector. • Increase career guidance interventions to make young people aware of opportunities in the agriculture sector; and • replacement of older employees with younger skilled workers–training large numbers of young people in production, and farm management. Training across all occupations in agriculture.	Smallholder farmers; Farm workers across all commodities	
Extension services	The function is vastly under-resourced; Extension officers are also mostly generalists. Increase the number of people being training as extension officers.	Agriculture consultant	Agricultural extension officers
	There are new types of farming, such as aquaculture, for which extension officers cannot provide guidance. Build knowledge of these into the curricula of training programmes.		
	• Train more extension officers; • Upskill current cadres of extension officers (CPD, bursaries, collaboration with commodity organisation).		

Key findings	Implications/signals for skills	Occupations affected (where applicable)	Skills priorities (where applicable)
Mentorship	Farm management has been mentioned as the biggest single need. People need: • market intelligence; and • understand finance, etc. This can best be achieved through extended mentorship programmes. The current mentorship support is viewed as not enough and too short.		
Low literacy levels of smallholder farmers and land reform beneficiaries	• Develop training programmes at a level that farmers can understand and use the knowledge. • Support adult education and training programmes	Smallholder farmers and land reform beneficiaries	
Technology	Short courses (at a level that farmers can internalise the content), on various technology applications across all commodities: • Field management, e.g., Drones, automated irrigation systems; and • ICT applications such as Apps to enable farm management from mobile phones.	Smallholder farmers and land reform beneficiaries	
Climate change	"Topping-up" an existing skill set for smallholder farmers—they want training in terms of climate smart agriculture and how best to adopt and mitigate the risks that they are confronted with.	Smallholder farmers and land reform beneficiaries	

Key findings	Implications/signals for skills	Occupations affected (where applicable)	Skills priorities (where applicable)
Commercial farmers			
Farm management skills	Farm managers are needed in all commodities	Farm manager	• Livestock farm manager; • Horticultural farm manager; • Vegetable farm manager; • Dairy farm manager; • Agronomy farm manager; • Mixed crop • Livestock farm manager; • Arboriculture farm manager • Field vegetable ornamental horticultural farm manager; • Sugar farm manager
Changes in technology, 4 IR	A shortage of skilled workers to engage with advanced technologies: • upskilling of existing employees; • training of more engineers and technicians; and • increase in software developers and data scientists. Skills needed within those occupations: • Field management, e.g., drones, GPS mapping, automatic fertigation systems, automated irrigation systems • ICT applications such as Apps to enable farm management from mobile phones	• Agricultural engineers • Scientists • ICT Systems Analyst	• Natural resources engineer; irrigation engineer; crop production mechanisation engineer; aqua culture engineer; agricultural product processing engineer; agricultural structures and facilities engineer • Refer scientist specialisation earlier in table • ICT business systems analyst; ICT systems strategist; internet consultant/ specialist; ict systems coordinator; ict systems

Key findings	Implications/signals for skills	Occupations affected (where applicable)	Skills priorities (where applicable)
Changes in technology, 4 IR	• Automated packhouse systems, such as advanced laboratory equipment, automated fruit grading systems and robotics Cold chain management: Especially in the export environment automation is becoming more and more important such as scanners, automation of the full cold chain and going paperless.		
Climate change coupled with natural disasters, and the resulting social, economic and environmental challenges	• Development of scientists to research alternative farming methods on how to cope with climate change (example, extensive droughts and heat stress lowering crop productivity; changes in rainfall variability and increased temperatures) • Inclusion of these knowledge sets in the training of extension officers Support training provision that can deliver training at the level of the smallholder farmer to understand the impact of climate changes	Scientists	Refer above
Export requirements are becoming more stringent	People in technical, administrative and management positions need to stay abreast of changing requirements		

Key findings	Implications/signals for skills	Occupations affected (where applicable)	Skills priorities (where applicable)
Inadequate supply of skills–institutions do not develop a sufficient number of people	• Increase the training of scientists such as biotechnology, phytosanitary technologists, entomologists and packhouse specialists–it is believed that supply institutions do not produce a sufficient number of scientists There is also an inadequate production of engineers, technicians and artisans	Scientists, engineers, technologists; artisans	
Recruitment difficulties: Sector is not viewed as attractive; people do not want to work in rural settings	Although skills developments on its own will not resolve this challenge, developing a larger pool of skilled people available for employment in the sector may assist. Obtaining supervisory and especially managerial skills is problematic Technicians and artisans are difficult to recruit	Farm managers Technicians Artisans	
Findings in relation to provision			
No engagement or collaboration between the department and the training institutions	The curriculum of universities and market demand need to be aligned. The university needs to do a market analysis of skills demand and restructure their programmes accordingly		
Agricultural sector lags in the development of modern occupational qualifications, curricula and learning material	The result is that learning is frequently not aligned to workplace needs which, in turn, has a negative effect on employability.		

Key findings	Implications/signals for skills	Occupations affected (where applicable)	Skills priorities (where applicable)
Quality of training from ATI's is viewed as inadequate	• weak linkages to industry for understanding training needs; • poor quality and inadequate numbers of educators who are appropriately trained to teach agriculture at school level • Lack of managerial skills		
The level at which training is being delivered	Adjustment of training programmes to a level that smallholder farmers and land reform beneficiaries and comprehend the content		
Practical training is inadequate	More work placements for ARI students can be supported		

A range of occupations in demand lists, or "priority skills sets" have been identified by various role-players. Occupations in demand have also been identified during this research. In the section that follows, an effort is made to distil those and those falling within the DALRRD mandate, and which the department can optimally address with the highest impact, whilst considering national priorities.

6. RECOMMEN-DATIONS

This section aims to reflect the priority skills and occupations in high demand in the agricultural sector. It takes cognisance of the literature review (which included various sets of identified priority occupations), as well as the findings from the survey and interviews conducted with various key structures and stakeholders in the sector.

It should be noted that all commodity structures, without exception, indicated that they participate annually in the development of skills needs lists by AgriSETA. This is done through the development of a sub-sector skills plan for each of the 11 defined sub-sectors. **All respondents indicated that they are in agreement with what is contained in the sub-sector skills plans and that these respond to their expressed needs.**

For these reasons, the researchers made extensive use of AgriSETA's findings, but at the same time enriched the information with knowledge gained from the survey and interviews, and considering the DALRRD mandate and skills needs resulting from national imperatives.

The reasons for difficulty to fill vacancies may lead to occupations being listed as priority occupations. The reasons vary between related-and-unrelated skills.

It is understandable why the employers are having difficulty to fill some occupations because there is little that the employer can do regarding the location and working hours as the nature of the sector requires them to be in the rural area or secluded areas. The sector also requires one to work long hours. Skills development will not directly address this, but increasing the pool of skills may lead to more people accepting positions in remote areas.

Where the lack of relevant qualification is a factor leading to an occupation being placed on a list of occupations in demand, or where the employer gets a candidate that holds an agricultural qualification but lack the capacity to use that knowledge in the specific sub-sector, skills development, through various learning programmes, internships and work-integrated learning, can contribute to alleviating the shortage of skills

The above factors were taken into account when the proposed DALRRD occupations and priority skills in high demand were drafted.

Skills needs, as expressed through the DHA scarce skills list, the AgriSETA SPOI list, the AgriSETA sub-sector lists, and through this research were considered. Occupations which can be developed through a range of learning interventions as well as interventions that will facilitate improved delivery of skills to the sector have been selected. The following criteria has been applied in distilling the information:

- Occupations selected are core occupations within the sector—support or transversal functions such as finance, marketing and HR, for example, have been excluded from the list;
- Occupations selected were identified across the three sources of identified occupations in demand;
- It should be noted that much of the detail is better captured in the "specialisations/alternative titles" or priority occupations list;
- Skills needs of smallholder farmers and land reform beneficiaries that can by supported by skills programmes channelled through the CASP programmes; and
- Skills needs resulting from national imperatives.

This section will incorporate projections for the next five years. The legend describes the various ratings that will be applicable.

6.1 Recommended DALRRD Priority Skills and Occupations in Demand

Table 5: Skills needs and proposed DALRRD focus

OFO Code (where applicable)	Occupation	Specific skills priorities to be supported	Motivation	Priorities
131101 (extend to 6311** to include farmers)	Agricultural farm manager	Livestock farm manager; horticultural farm manager; vegetable farm manager; dairy farm manager; agronomy farm manager; mixed crop and livestock farm manager; arboriculture farm manager; field vegetable ornamental horticultural farm manager; and sugar farm manager.	Supported by AgriSETA SPOI list; Supported by DALRRD; Supported by literature review; and Supported by interviews focusing on land reform and smallholder farmers (who are generally mixed farmers).	613101 Mixed crop and livestock farmer, (but all specialisations can be supported, depending on the nature of the farming activity).

Legend: *The project growth trends illustrated, is based on an intrpretation of what was learnt from the literature review, the feedback received from teh surveys and interviews:*

↑↑ *Very strong*	↑ *Positive growth*	→ *Stable, no growth in numbers*	↓ *Declining numbers*

OFO Code (where applicable)	Occupation	Specific skills priorities to be supported	Motivation	Priorities	
	Nature of support	Agriculture management (NQF 5–7) supported by bursaries and learnerships at Universities TVET Colleges, ATIs; and Agriculture farmer (NQF 2–4) supported by learnerships and skills programmes at ATIs/accr. private providers.		Growth rating	↑↑
213202	Agricultural scientist	Companion animal nutritionist; plant pathology manager; pomologist; farming scientist; seed production horticulturist; agronomist, animal nutritionist, agricultural immunologist; plant/ seed breeder; seed product developer; animal husbandry scientist; plant production scientist; seed production agronomist; agrostologist; quarantine scientist; seed analyst; plant biologist; ecologist; toxicologist; plant physiologist; plant pathologist; and soil and plant scientists/ entomology.	Supported by AgriSETA SPOI list; Supported by DALRRD; Supported by literature review; Supported by survey results and interviews; and Supported by DHA. Entomology added–supported by DALRRD, interviews.	213 202 Plant pathologists 314 201 Seed production horticulturalist 312109 Entomology. (but due to the general shortage of agriculture scientists, all of the specialisations can be supported).	
	Nature of support	Agricultural scientist in any of the specialisations (NQF 5–10) supported with bursaries at universities.		Growth rating	↑↑

Legend: *The project growth trends illustrated, is based on an intrpretation of what was learnt from the literature review, the feedback received from teh surveys and interviews:*

↑↑ *Very strong*	↑ *Positive growth*	→ *Stable, no growth in numbers*	↓ *Declining numbers*

OFO Code (where applicable)	Occupation	Specific skills priorities to be supported	Motivation	Priorities	
214905	Agricultural engineer	Biosystems engineer; biochemical engineer; gis and land use management engineer; natural resources engineer; crop production mechanisation engineer; agricultural product processing engineer; agricultural structures and facilities engineer; irrigation engineer; aquaculture engineer; and produce process engineer.	Supported by literature review; Supported by survey results; and interviews; Supported by DHA; and Supported by AgriSETA subsectors.	All specialities	
		Agriculture Engineering any of the specialisations (NQF 5–10) supported with bursaries at universities		Growth rating	↑↑
312201	Production/ operations supervisor	Production plant supervisor; shift manager (production); beneficiation plant foreman; assembly supervisor; and manufacturing foreman.	Supported by AgriSETA SPOI list Supported by literature review Supported by survey results and interviews	312201 Production plant supervisor	
	Nature of support	Learnerships and skills programmes presented by accredited providers		Growth rating	↑

Legend: *The project growth trends illustrated, is based on an intrpretation of what was learnt from the literature review, the feedback received from teh surveys and interviews:*

↑↑ *Very strong*	↑ *Positive growth*	→ *Stable, no growth in numbers*	↓ *Declining numbers*

OFO Code (where applicable)	Occupation	Specific skills priorities to be supported	Motivation	Priorities	
314201	Agricultural technician	Field production officer; animal breeding technician; agricultural research technician; poultry technical officer; irrigation technician agricultural technical officer; agronomy technician; agricultural laboratory technician; wool testing technician; artificial insemination technical officer; field crop technical officer; seed research technician horticultural technical officer; agricultural technical advisor; and agricultural sampling officer.	Supported by AgriSETA SPOI list Supported by literature review Supported by interviews Supported by DHA	312201 Agricultural Technician and all its specialisations	
	Nature of support	Technology Diploma at universities of technology, certificate programmes at ATIs, learnerships and skills programmes by accredited private providers.		Growth rating	↑↑
653306	Diesel mechanic	Diesel injector/ diesel fuel injection mechanic; diesel fitter-mechanic; diesel fuel injection technician; diesel electrical fitter; field service technician (diesel); and truck mechanic.	Supported by AgriSETA SPOI list Supported by interviews	653306 Diesel mechanic	
	Nature of Support	Apprenticeship at TVET colleges, which implement occupational programmes (NQF4).		Growth rating	↑↑

OFO Code (where applicable)	Occupation	Specific skills priorities to be supported	Motivation	Priorities	
671202	Millwright	Machine tool millwright; electro mechanician/ millwright (electro mechanician); winder technician; and ground electro mechanician.	Supported by AgriSETA SPOI list Supported by Interviews	671202 Millwright	
	Nature of support	Apprenticeship at TVET colleges, which implement occupational programmes (NQF4)		Growth rating	↑↑
734101	Agricultural mobile plant operator	Cotton picking machine operator; chemical applicator; farm equipment; machinery operator; agricultural mobile equipment operator; tractor driver; harvester operator; agricultural machine and equipment operator; rotary hoe operator; agrichemical spraying; and dusting operator.	AgriSETA SPOI list for commercial and smallholder/land reform interviews.	734101 Agricultural mobile equipment operator	
	Nature of support	Skills programmes offered by ATIS and accredited private providers.		Growth rating	→

Legend: *The project growth trends illustrated, is based on an intrpretation of what was learnt from the literature review, the feedback received from teh surveys and interviews:*

↑↑	*Very strong*	↑	*Positive growth*	→	*Stable, no growth in numbers*	↓	*Declining numbers*

OFO Code (where applicable)	Occupation	Specific skills priorities to be supported	Motivation	Priorities	
Proposed additions to AgriSETA SPOI list					
213201	Agriculture consultant	Agricultural extension officer; farm economic techniques advisor; agriculture field officer; landcare officer; horticulture consultant; advisor; vegetable consultant; field husbandry consultant; advisor; animal husbandry consultant; advisor agriculture economic advisor; agriculture advisor; farm consultant/ advisor; floriculture consultant/advisor; orchard consultant; pasture consultant; and agriculture mentor.	Supported by literature review Supported by survey Supported by interviews	213201 Agricultural extension officer	
	Nature of support	Bursaries for appropriate degree at university or diploma at ATI.		Growth rating	↑↑
213301	Conservation scientist	Ecologist; water conservation scientist; marine ecologist; soil conservationist; conservation officer; animal ecologist conservancy advisory scientist; forestry conservationist fish and games officer; ecological researcher species protection officer; fisheries advisor	Supported by literature review; and supported by interviews.	213301 Water conservation scientist	
	Nature of support	Bursaries for degrees and post graduate degrees at Universities (NQF5–10).		Growth rating	↑↑

Legend: *The project growth trends illustrated, is based on an intrpretation of what was learnt from the literature review, the feedback received from teh surveys and interviews:*

↑↑ *Very strong*	↑ *Positive growth*	→ *Stable, no growth in numbers*	↓ *Declining numbers*

OFO Code (where applicable)	Occupation	Specific skills priorities to be supported	Motivation	Priorities	
225101	Veterinarian	Veterinarian parasitologist; animal doctor; veterinary pathologist; and veterinary epidemiologist.	Supported by literature review; supported by DALRRD; and supported by interviews.	225101 Veterinarian	
	Nature of support	Bursaries for veterinarian studies (NQF 5–8) at university.		Growth rating	↑↑
263101	Economist	Economic forecaster; macro-economist; mineral economist; small business economist; environmental economist; research economist; industrial economist; econometrician; and agricultural economist.	Supported by literature review; supported by DALRRD; and supported by interviews.	263101 Agricultural economist	
	Nature of support	Bursaries for degree and post graduate degrees at Universities (NQF 5–10).		Growth rating	→
324101	Veterinary nurse	Artificial inseminator; veterinary assistant; animal nurse; and veterinary vaccinator.	Supported by literature review; Supported by DALRRD; and Supported by interviews.	324 101 Veterinary Nurse and all specialisations	
	Nature of support	Bursaries for studies at appropriate TVET colleges and ATIs.		Growth rating	↑↑
324102	Veterinary technician		Supported by literature review; and Supported by interviews.		
	Nature of support	Bursaries for veterinarian technology studies at University (NQF5–6).		Growth rating	↑↑

Legend: *The project growth trends illustrated, is based on an intrpretation of what was learnt from the literature review, the feedback received from teh surveys and interviews:*

↑↑ *Very strong*	↑ *Positive growth*	→ *Stable, no growth in numbers*	↓ *Declining numbers*

6.2 Skills needs of smallholder farmers and land reform beneficiaries

In addition to developing priority skills as per the proposed list above, there are various challenges in relation to smallholder and emerging farmers that have been identified. It is important to identify those issues that can be addressed by the department from a skills development perspective.

Key issue	DALRRD intervention
Farmers will need to be trained/skilled through programmes to make use of new technology.	• Skills programmes at a level that is accessible to farm managers; • Improved and expanded mentorship programmes; and • mproved extension services.
Reliance on the capacity of extension and advisory services.	• Bursaries for extension studies; • Support for continuous professional development programmes; • Forge partnerships with commodity organisations for skills transfer; and • Review and update training programmes in collaboration with providers of such training and farmers in the sector.
Lack of managerial and strategic skills.	• Skills programmes at a level that is accessible to farm managers; • Improved and expanded mentorship programmes; and • Improved extension services.

6.3 Skills needs as identified through national imperatives

The table below lists national priorities and the potential skills development support that can be provided by the DALRRD:

Table 6: Skills needs resulting from national imperatives

National priority	Source	DALRRD intervention
Research and the development of adaptation strategies.	NDP	Bursaries for research scientists and engineering studies
Expanding the college system with a focus on improving quality.		Assistance to ATIs through: • Upskilling of lecturers (bursaries and support of short courses—CPD); • Incentives to farmers to give lecturers exposure to the workplace; • Management development programmes for ATI management; and • Collaborate with ATI's and AgriSETA to update curricula. • Provide incentives to farmers to provide work experience to ATI learners.

National priority	Source	DALRRD intervention
Improved skills development and training in entrepreneurship.	NDP	Support increased and expanded mentorship programmes for smallholder farmers and land reform beneficiaries.
Training of a new cadre of extension officers.		• Bursaries for extension studies; • Support for continuous professional development programmes; • Forge partnerships with commodity organisations for skills transfer; and • Review and update training programmes in collaboration with providers of such training and farmers in the sector.
Provision of comprehensive farmer support.	AAMP	• Support increased and expanded mentorship programmes for smallholder farmers and land reform beneficiaries; • Bursaries for extension studies; and • Support for continuous professional development programmes Forge partnerships with commodity organisations for skills transfer.
Research and development.		Bursaries: Agricultural scientist, engineers
Focus on the optimisation of the Skills Development Act's (SDA) enablers such as the Sector Education and Training Authorities (SETA), the Workplace Skills Plans (WSP) and the Skills Levy fund.		Improved collaboration between DALRRD and the AgriSETA

6.4 Entry requirements; professional registration requirements and training providers for occupations in demand

Career information on the identified occupations in demand is provided in Annexure A. It includes:

- What the occupations broadly entail;
- What the priority skills or areas of specialisation are within the occupations;
- Information on entry requirements and professional registration requirements for occupations in demand; and
- Information on training providers offering courses relevant to developing people for these occupations.

7. FINAL RECOMMENDATIONS

It is therefore recommended that DALRRD support various skills development interventions to develop people for priority occupations through:

- Bursaries;
- Work experience or work integrated learning;
- Skills programmes;
- Short courses; and
- Apprenticeships.

It is also recommended that joint research and joint planning between DALRRD and AgriSETA be considered to optimise resource utilisation and resource allocation.

Collaboration with training institutions should be considered to facilitate improved alignment between qualifications offered and industry needs.

Developing a cadre of new extension officers and the re-skilling and upskilling of existing extension officers are needed through provision of bursaries and CPD opportunities and expanded partnerships with commodity organisations.

Mentorship offerings should be expanded in terms of duration and number of mentors doing mentorship.

Assistance with development of learning material that can address the skills needs of small-scale farmers.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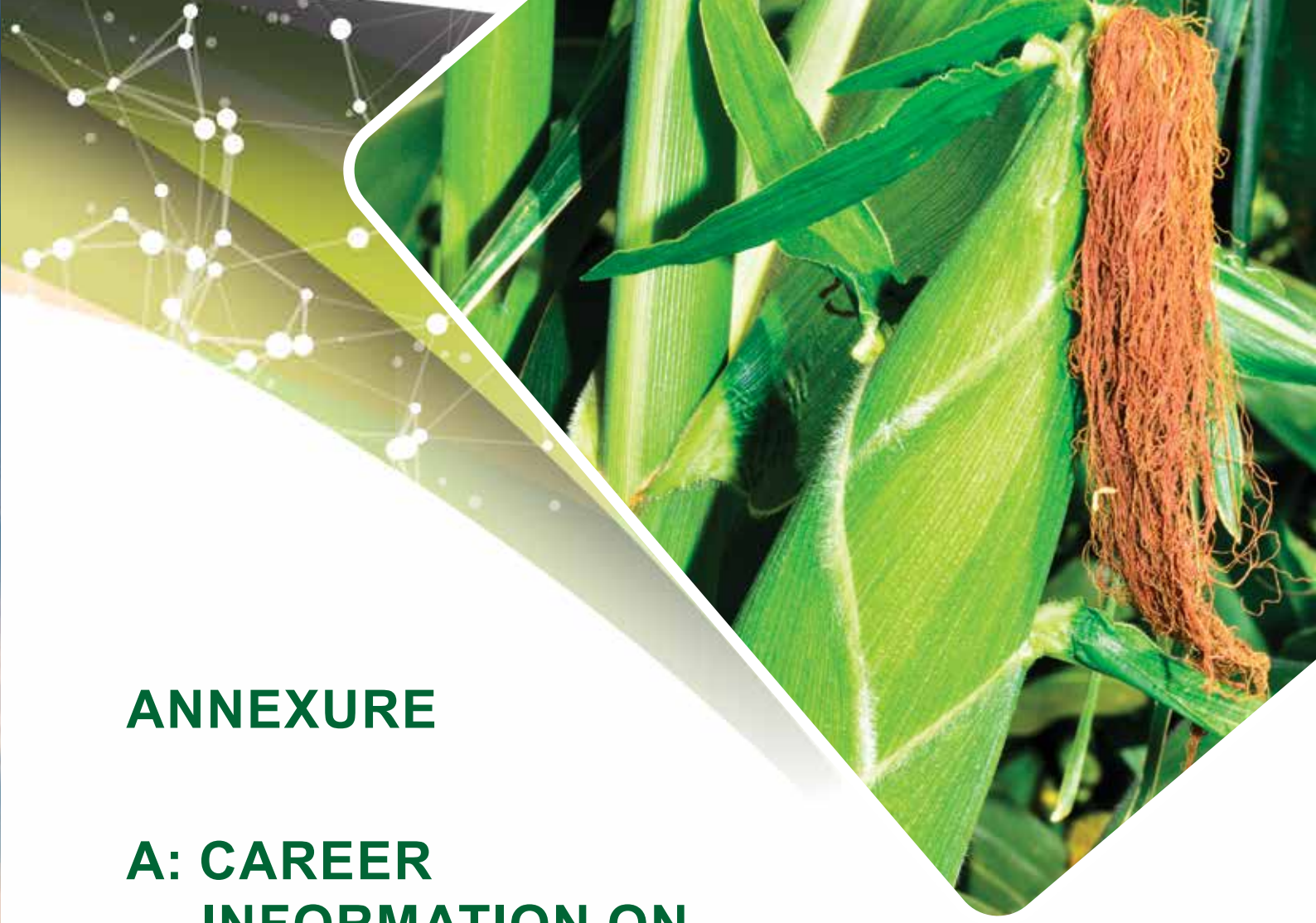

ANNEXURE

A: CAREER INFORMATION ON PRIORITY OCCUPATIONS AND OCCUPATIONS IN DEMAND

AGRICULTURAL SCIENTIST

(OFO code 2021-213202)

Listed areas of specialisation

Seed production horticulturist;	companion animal nutritionist;
plant pathology manager;	soil and plant scientists;
quarantine scientist;	agronomist
animal nutritionist;	agricultural immunologist
agrostologist;	plant/seed breeder
plant production scientist;	farming scientist
plant physiologist;	seed analyst
seed product developer;	seed production agronomist
pomologist;	plant pathologist and
animal husbandry scientist;	plant biologist/ecologist/toxicologist

This sheet discusses the occupation: Agricultural scientist. All areas of specialisation are equally important and relevant.

Overview

The demand for scientists in the field of agricultural research and agricultural application will continue to increase as the world's population grows and changing climatic conditions present a host of new challenges to farmers. To ensure food security as the world population grows, researchers must continue to develop improved crops, healthier animals and more productive farming methods.

What does an agricultural scientist do?

These scientists do research that help to protect our country's biodiversity by developing environmentally friendly farming methods, for example, by replacing harmful pesticides with safer bio-control methods.

Agricultural science and research are diverse fields–ranging from cutting-edge work at the molecular level to engineering high-precision equipment for commercial farming. In a country like South Africa, there is also a huge need to help emerging farmers who play a key role in rural food security. Agricultural scientists also do cutting-edge work on the processing, preservation and packaging of a wide variety of foods and developing novel convenience foods.

Agricultural scientists develop cost effective ways of producing agricultural products by using the scientific methods to experiment with, and research animal reproduction and nutrition, plant yields and the general management of the farm.

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 specialise 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 specialise in certain types of animals, their breeding, physiology, or nutrition or the products of animals such as meat, butter or eggs.

What to expect

Agricultural scientists can work in a wide variety of environments, depending on the area in which they have specialised. They can work in office environments, in laboratories, test kitchens or dairies and outdoors, particularly when doing research. They use scientific equipment.

Agricultural scientists primarily work in basic research and applied research, but they can also work in the private sector.

In basic and applied research, they:

- Work to understand the processes behind the growth of crops and animals;
- Convert that knowledge into practical methods for improving food quality; and
- Communicate the advantages of their findings through reports and presentations.

In private industry they commonly work for:

1. Food production companies;
2. Farms;
3. Processing plants; and
4. Pharmaceutical companies (developing medical products).

There can be a lot of travelling to inspect farms and factories to make sure that good standards are being followed.

Agricultural scientists derive job satisfaction from knowing that they are contributing meaningfully to improving agriculture; that they are discovering new things; that they are able to solve problems and to utiliseutilise resources fully. They work with other people and are frequently working outdoors.

Some of the demanding aspects of the job is that it is hard work, sometimes in difficult or unpleasant environments. It is a results-driven career, with time and other pressures; and the success of projects often depends on making the correct recommendations.

Required aptitude and personality traits

Agricultural scientists need to be accurate and methodical so that they can be trusted to be responsible when making big decisions—— as well as when doing research. Since they often work in a team, it is important that they are able to establish good relationships and work well with others.

The basic aptitude and personality requirements include the ability to work independently; above average intelligence; being a creative and innovative thinker; and having an interest in agriculture —— in soil, plants and animals. The person must also be a good communicator with good interpersonal skills; be practically orientated and have patience and perseverance.

Required school subjects

You will need to have taken the following subjects in high school:

- Mathematics; and
- Science (Physics and Biology.)

Recommended subjects:

- Life sciences;
- Consumer studies;
- Accounting;
- Economics; and
- Agricultural Sciences.sciences

Candidates must have achieved a National Senior Certificate meeting the requirements for a degree course or meeting diploma requirements for a diploma course. Each institution will have its own minimum entry requirements.

Training

Occupation in general

Degree: Most universities in South Africa offer a degree and diploma in Agriculture:–UFS, UFH, UL, US, UKZN, UP, NMMU, NWU, UNISA.

Diploma: N.Dip. is offered at TUT, CUT, DUT, NWU, and UFH.

A bachelor's degree in Agricultural Science is mostly the requirement. With a degree in agricultural science, you may focus on areas like animal and nutritional sciences. Here are some of the programmes you could complete:

University of the Free State:

- Bachelor in Agriculture (BAgric).

Stellenbosch University:

- BSc (Food Science);
- BScAgric Agricultural Economic Analysis and Management with Food Science;
- BScAgric Agricultural Economics with Food Science; and
- BScAgric (Animal Science).

UNISA:

- Bachelor of Science in Agricultural Science (Agricultural Business and Management);
- Bachelor of Science in Agricultural Science (Animal Science); and
- Bachelor of Science in Agricultural Science (Plant Science).

Areas of specialisation

Note: *Most of the areas of specialisation are achieved through postgraduate studies —– Masters and doctoral studies. The list below indicates the preferred undergraduate studies in preparation for the selected area of specialisation.*

Area of specialisation	Relevant fields of study
Seed production horticulturist/; plant pathology manager; plant production scientist; agrostologist; plant physiologist; seed product developer; soil and plant scientists; plant; seed breeder; seed analyst; plant pathologist; plant biologist; ecologist; and toxicologist.	BSc Plant Sciences.
Pomologist.	BSc Horticulture, BSc Botany.
Agriculture Immunologist.	Plant related: BSc Plant Sciences. Animal related: BSc Veterinary Sciences; and BSc Animal Production.
Quarantine Scientist; Animal Nutritionist; Animal Husbandry Scientist; and Animal Nutritionist.	BSc Animal Sciences; and BSc Veterinary Sciences.
Agronomist; and Farming Scientist.	BSc Agric; and B Agric Agronomy.

Professional and representative bodies

- South African Council for Natural Scientific Professions (SACNASP);
- Agricultural Research Council (ARC); and
- South African Society for Animal Science (SASAS).

Resources

1. https://www.saasta.ac.za/images/SAASTA_CareersinAgri5b.pdf
2. https://www.bachelorsportal.com/search/bachelor/agriculture/south-africa/page-2
3. https://www.bachelorsportal.com/universities/18541/natural-and-agricultural-sciences.html

AGRICULTURAL ENGINEER

(OFO code 2021-214905)

Listed areas of specialisation

Biosystems engineer;	Biochemical engineer;
GIS and land use management engineer;	Natural resources engineer;
Crop production mechanisation engineer;	Agricultural product processing engineer
Agricultural structures and facilities engineer;	Irrigation engineer; and
Aquaculture engineer;	Produce process engineer.

This sheet discusses the occupation: Agriculture Engineering. All areas of specialisation are equally important and relevant.

Overview

The agricultural landscape is changing at a rapid rate. Contrary to common belief that agriculture is very traditional and set in its ways of doing things, it is adopting 4IR technologies at a rapid rate. Processes are becoming more mechanised, electronic controllers, scanners and equipment finds its way into the workplace and the use of big data and computerised programmes to assist in planning and monitoring is everywhere to be found.

All of this emphasise the growing importance of the agricultural engineer. 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.

What does an agricultural engineer do?

An agricultural engineer uses latest scientific technology to design new machines which will help farmers in doing their job more easily, in future. An agricultural engineers contributes to improving the economic output in the agriculture field by inventing and discovering the efficient tools. Agricultural

engineering is a very broad field, and it includes sub-branches such as soil science, environment science, plant bio-engineering, animal science, etc.

Typical duties are:

- Use computer software to design equipment, systems, or structures;
- Modify environmental factors that affect animal or crop production, such as airflow in a shed or runoff patterns on a field;
- Test equipment to ensure its safety and reliability;
- Oversee construction and production operations; and
- Plan and work together with clients, contractors, consultants and other engineers to ensure effective and desirable outcomes;.

Agricultural engineers work in farming, including aquaculture (farming of aquatic-based food), forestry and food processing. They work on a wide variety of projects. For example, some agricultural engineers work to develop climate control systems that increase the comfort and productivity of livestock, whereas others work to increase the storage capacity and efficiency of refrigeration. Many agricultural engineers develop better solutions for animal waste disposal. Those with computer programming skills work to integrate artificial intelligence and geospatial systems into agriculture. For example, they work to improve efficiency in fertilisers application or to automate harvesting systems.

What to expect

Agricultural engineers typically work in offices, but may spend time at a variety of worksites, both indoors and outdoors. They may travel to agricultural sites to see that equipment and machinery are functioning according to both the manufacturers' specifications and federal and state regulations. Agricultural engineers occasionally work in laboratories to test the quality of processing equipment. They may work onsite- when they supervise livestock facility upgrades or water resource management projects, etc.

Agricultural engineers work with others in designing solutions to problems or applying technological advances. They work with people from a variety of backgrounds, such as business, agronomy, animal sciences and public policy.

Their work can depend on the weather or growing seasons, so they sometimes work long hours to take advantage of the right conditions.

Required aptitude and personality traits

Agricultural engineers have distinct personalities. They tend to be investigative individuals, which means they are intellectual, introspective and inquisitive.

They are:

- Curious;
- methodical; Methodical;
- rational;Rational;
- analytical;Analytical; and
- Logical.

Required school subjects

You will need to have taken the following subjects at high school:

- Mathematics; and
- Science (Physics and Biology).

Recommended subjects:

- Life Sciences;
- Consumer Studies; and
- Agricultural Sciences.

Candidates must have achieved a National Senior Certificate meeting the requirements for a degree course or meeting diploma requirements for a diploma course. Each institution will have its own minimum entry requirements.

Training

Occupation in general

Degree: Most universities in South Africa offer a degree in agricultural engineering:–UFS, UFH, UL, US, UKZN, UP, NMU, NWU, and UNISA. A bachelor's degree in Agricultural Engineering is mostly the requirement. With a degree in agricultural engineering, you may focus on any of the areas listed above as specialisations. Here are some of the programmes you could complete:

UKZN:	• Agricultural (Bioresources) Engineering.
UNISA:	• Agricultural Engineering.
University:UFS	• Agricultural Engineering.
NMU:	• Agricultural Engineering.
NWU:	• Agricultural Engineering.
UL:	• Agricultural Engineering Department.

Areas of specialisation

Note: *Most of these areas of specialisation are achieved through postgraduate studies–masters and doctoral studies. The list below indicates the preferred undergraduate studies in preparation for the selected area of specialisation.*

Area of specialisation	Relevant fields of study
Biosystems Engineer; Biochemical Engineer; and Aquaculture engineer.	BEng Biomedical Engineering; and BSc Biology.
GIS and Land use Management Engineer; Agricultural Structures and Facilities Engineer; Agricultural Product Processing Engineer; and Natural Resources Engineer.	BSc Civil Engineering; BSc Surveying; BSc Building and Construction Management; and BSc Agricultural Engineers.
Crop Production Mechanisation Engineer.	BSc Agricultural Engineering
Irrigation Engineer.	BSc Hydrology BSc Environmental Studies; and BSc Water Studies.
Produce Process Engineer.	BSC Industrial Engineering.
Quarantine Scientist; Animal Nutritionist; Animal Husbandry Scientist; and Animal Nutritionist.	BSc Animal Sciences; and BSc Veterinary Sciences.
Agronomist; and Farming Scientist.	BSc Agric; B Agric Agronomy

Professional and representative bodies

- Engineering Council of South Africa (ECSA);
- South African Institute of Agricultural Engineers (SAIAE);
- ARC Institute for Agricultural Engineering; and
- Pan African Society for Agricultural Engineering (PASAE).

Resources

1. https://www.careerexplorer.com/careers/agricultural-engineers

AGRICULTURAL FARM MANAGER

(OFO code 2021-131101)

Listed areas of specialisation

Agronomy farm manager;	horticultural farm manager;
sugar farm manager;	ornamental horticultural farm manager;
dairy farm manager;	mixed crop farm manager;
vegetable farm manager;	livestock farm manager;
field vegetable farm manager;	mixed crop and livestock farm manager;
arboriculture farm manager;	aquaculture farm manager; and
crocodile farm manager;	abalone farm manager.
mariculture farm manager;	

This sheet discusses the occupation: Agricultural Farm Manager. All areas of specialisation are equally important and relevant.

Special note

Smaller commercial farmer, smallholder farmers and land reform beneficiaries cannot employ farm managers —– they are directly responsible for all functions and activities on the farm. However, their field of study is the same as that of a farm manager, albeit on a lower level in most cases.

The description in this section is, therefore, also relevant to a farmer.

Overview

Agricultural managers supervise and implement various activities on farms, nurseries, greenhouses, and other agricultural production sites. This position is incredibly important for the maintenance of the nation's food supply. Many are self-employed and take part in different aspects of agricultural management. Others working on larger farms may lead a team of other workers or have more specialised tasks. Bachelor's degrees in agricultural sciences or other botany-related fields are

becoming an industry standard for those who are not self-employed. However, work experience on farms is still the most popular form of preparation for agricultural management positions.

What does an agricultural manager do?

Agricultural managers plan and coordinate the operation of farms, nurseries, greenhouses and other agricultural production sites. In larger work settings, they will work with supervisors and foremen to care for the crops and animals under their supervision.

Agricultural managers oversee all aspects of running farms and other facilities that produce crops and animals. Some of their duties include planning, supervising, and sometimes participating in the planting, fertilisations and harvesting process. They are also involved in selecting the proper equipment and supplies needed to properly support the farm. Depending on the size of the facility, an agricultural manager will also be required to keep the books and market the yield for that year. While jobs do vary, most agricultural managers should be comfortable with performing the following duties within the scope of their profession:

- Develop and lead strategic planning activities, including internal and external analysis of operations;
- Keep track of projections based on changing market environment;
- Develop and promote robust supplier diversity;
- Knowledge of procurement and supply chain as they relate to agricultural industry;
- General knowledge of production, markets and supply chain processes of agricultural commodities in South Africa;
- Direct performance on KPIs, and productivity initiatives and innovation;
- Manage and coordinate all phases of agricultural production from planting to harvest;
- Optimise yield in the most cost-effective manner;
- Have a broad scope of knowledge that includes crop and soil science, meteorology, crop physiology and related fields;
- Communicate with colleagues, farmers and the public;
- Lead a team of workers, supervisors and foremen; and
- Prepare, submit and present regular reports.

What to expect

The agriculture farm manager will spend most of his/her time in the fields, orchards and lands, overseeing production activities. It will be expected of a farm manager to be “hands on” and continuously engage with foremen and supervisors. The farm manager should also not expect that work will be the same every day, during harvesting work differs completely from the planting season. There are times between seasons where the work pressure can be lower, which is the ideal time for planning, maintenance and preparation. However, during the harvesting season, the farm manager and his/her team will work under extreme pressure to collect the harvest as quickly as possible.

The farm manager should also expect changes and pressures brought about by external factors such as adverse climate conditions, droughts, fire and pests. The ability to adapt rapidly is required. Required aptitude and personality traits. The work of agriculture farm managers is as diverse as the commodities that are being produced.

Single commodity farmers (such as fruit farmers or cattle ranchers) are highly specialised and generally linked to precision farming. Farm managers for single commodity farming will most likely be or become specialists in that field themselves.

Alternatively, the work of the mixed crop or mixed crop and livestock farm manager is much more diverse and it will be expected of farm managers to be versatile and adaptable, they should have the ability to constantly refocus on a different crop or animal and they should have a very broad understanding of many crops and animals.

Adaptability is likely the most important trait a farm manager should have different seasons have different requirements, climate impacts directly on farming operations and (especially in the case of export farms) continuous legislative and regulatory changes and requirements place pressure on the farm manager.

Required School Subjects

You will need to have taken the following subjects at high school:

- Life Sciences;
- Consumer Studies;
- Accounting;
- Economics; and
- Agricultural Sciences.

Candidates must have achieved a National Senior Certificate meeting the requirements for a degree course or meeting diploma requirements for a diploma course.

Each institution will have its own minimum entry requirements.

Training

Occupation in general

Degree: Most universities in South Africa offer a degree and diploma in Agriculture: UFS, UFH, UL, US, UKZN, UP, NMMU, NWU, and UNISA.
Diploma: N.Dip. is offered at TUT, CUT, DUT, NWU, and UFH.

A bachelor's degree in Agricultural Management is mostly the requirement. However, it is also possible to follow an alternative route by completing a certificate or diploma programme at a TVET College or Agricultural Training Institute. Some specific programmes offered by universities are:

University of Fort Hare:

- Bachelor of Agriculture – (B Agric); and
- Bachelor of Science in Agriculture (BSc Agric);

University of the Free State:

- Bachelor of Agriculture majoring in Crop Production Management:
- Bachelor of Science in Agriculture majoring in Agronomy: and
- Bachelor of Agriculture majoring in Irrigation Management.

Tshwane University of Technology:

- National Diploma: Agriculture: Mixed Farming.

UNISA:

- Bachelor of Science in Agricultural Science (Agricultural Business and Management);
- Bachelor of Science in Agricultural Science (Animal Science); and
- Bachelor of Science in Agricultural Science (Plant Science).

Other universities and universities of technology can also be considered by prospective students in Agriculture Farm Management. Selected TVET colleges offer certificate and diploma programmes in general agriculture and can be considered. This is relevant to the farmer as well.
The following are three examples only:

Boland TVET College:

- National N-Diploma: Farming Management (N4–N6).

Lovedale TVET College:

- National Diploma: Farming Management (N4–N6).

Gert Sibande TVET College:

- National Certificate: Primary Agriculture.

All Agriculture Training Institutes (ATIs) offer programmes in farm management (Diplomas and Certificate Programmes. This is relevant to the farmer as well.

These ATIs are:

- Cedara College of Agriculture (KZN);
- Elsenburg Agriculture Training College (Western Cape);
- Fort Cox College of Agriculture and Forestry Training Institute (Eastern Cape);
- Tsholo Agriculture and Rural Development Institute (Eastern Cape);
- Glen College of Agriculture (Free State);
- Grootfontein Agricultural Development Institute (Eastern Cape);
- Lowveld College of Agriculture (Mpumalanga);
- Madzivandela College of Agriculture (Limpopo);
- Owen Sithole College of Agriculture (KZN);
- Potchefstroom College of Agriculture (North West);
- Taung Agricultural College (North West);
- Tompi Seleka Agricultural College (Limpopo); and
- Marapyane College of Agriculture (Mpumalanga).

Private providers are active in presenting learnerships and skills programmes aimed directly at the farmer. The current registered learnerships (with AgriSETA) are:

- National Certificate in Plant Production;
- National Certificate in Animal production; and
- National Certificate in Mixed Farming Systems.

These certificate programmes are available from NQF levels 2–4.

Areas of specialisation

Area of specialisation	Relevant fields of study
All animal related	B Agric Animal Production or plant related diploma or learnership programme.
All plant related	B Agric Plant production or plant related Diploma or Learnership

Professional and representative bodies

- Institute of Agricultural Management (IAGRM).

For farmers:

- AgriSA;
- TLUSA;
- African Farmers Association of South Africa (AFASA);
- NAFUP;
- ARC Institute for Agricultural Engineering; and
- Pan African Society for Agricultural Engineering (PASAE).

Resources

1. https://www.environmentalscience.org/career/agricultural-manager
2. https://tvetcollegesportal.co.za/tvet-colleges-in-south-africa-online-application/?gclid=Cj0KCQiAvqGcBhCJARIsAFQ5ke4IYjnxBJ5aeU8ow_VKuydEZihijDkSKzeGZ0GRVRqgbYmve-lf5TcaAuLiEALw_wcB
3. https://uni24.co.za/list-agricultural-schools-south-africa/

AGRICULTURE CONSULTANT — AGRICULTURAL EXTENSION OFFICER

(OFO code 2021-213201)

Listed areas of specialisation

Field husbandry consultant/advisor;	Pasture consultant;
Farm consultant/advisor;	Horticulture consultant/advisor;
Animal husbandry consultant/advisor;	Agricultural extension officer;
Floriculture consultant/advisor;	Agriculture mentor;
Orchard consultant;	Landcare officer; and
Vegetable consultant;	Agricultural field officer.

This sheet discusses the occupation: Agricultural extension officer, therefore areas of specialisation will not be discussed.

Overview

Agricultural extension officers are the link between research and farmers. They operate as advisors, facilitators and communicators, helping farmers in their decision making and ensuring that appropriate knowledge is implemented to obtain the best results with regards to sustainable production and general rural development.

What does an extension officer do?

Agricultural extension officers communicate to farmers agricultural information on natural resources, animals, crops, on how best to utilise the farmland, how to construct proper irrigation schemes, the economic use and storage of water, how to combat animal disease, and how to 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.

What to expect

Agricultural extension officers usually work within a community and are expected to have a wide knowledge of agriculture, or they may choose to operate from a more central locality and provide, as subject matter specialists, more specialised services within specific farming enterprises. They do this in collaboration with farming communities, helping them to help themselves to become more self-reliant and independent.

Agricultural extension officers are employed by government departments of agriculture, industries which manufacture agricultural chemicals and fertilisers, or which buy agricultural products, agricultural cooperatives and NGOs (non-governmental organisations) involved in agricultural or rural development.

Agricultural extension officers work mainly outdoors visiting farmers. They also spend time in the office researching and developing plans for sustainable farming.

When working with land reform beneficiaries and smallholder farmers in traditional areas, the Agricultural extension officer will have to acknowledge and engage with traditional leaders, land reform structures and other community-based structures.

Required aptitude and personality traits

Communication and interpersonal skills are vital for the Agricultural extension officer. They spend the better part of the day interacting with farmers or scientists and benefit from:

- Strong communication skills;
- Knowledge of farming and the environment;
- Planning and project management;
- Persuasive abilities; and
- Understand how collective or communal traditional farming structures work and how to interact with them.

Required School Subjects

You will need to have taken the following subjects at high school:

- Life Sciences;
- Consumer Studies;
- Economics; and
- Agricultural Sciences.

Candidates must have achieved a National Senior Certificate meeting the requirements for a degree course or meeting diploma requirements for a diploma course. Each institution will have its own minimum admission requirements.

Training

Occupation in general

BSc (Agric) at universities such as UFS, UL, US, UP, UKZN, UNISA, UFH, NWU and UZ. National Diploma in Agricultural Management at CPUT, CUT, NMMU, TUT, UNISA, and DUT. Other universities and universities of technology can also be considered by prospective students in Agriculture Extension Selected TVET colleges offer certificate and diploma programmes in general agriculture and can be considered. The following are three examples only:

Boland TVET College:
- National N-Diploma: Farming Management (N4–N6).

Lovedale TVET College:
- National Diploma: Farming Management (N4–N6).

Gert Sibande TVET College:
- National Certificate: Primary Agriculture.

All Agriculture Training Institutes (ATIs) offer programmes in farm management (Diplomas and certificate programmes. These ATIs are:

- Cedara College of Agriculture (KZN);
- Elsenburg Agriculture Training College (Western Cape);
- Fort Cox College of Agriculture and Forestry Training Institute (Eastern Cape);
- Tsholo Agriculture and Rural Development Institute (Eastern Cape);
- Glen College of Agriculture (Free State);
- Grootfontein Agricultural Development Institute (Eastern Cape);
- Lowveld College of Agriculture (Mpumalanga);
- Madzivandela College of Agriculture (Limpopo);
- Owen Sithole College of Agriculture (KZN);
- Potchefstroom College of Agriculture (North West);
- Taung Agricultural College (North West);
- Tompi Seleka Agricultural College (Limpopo); and
- Marapyane College of Agriculture (Mpumalanga).

Professional and representative bodies

- South African Society for Agricultural Extension (SASAE).

Resources

1. https://www.gostudy.net/occupation/agricultural-extension-officer#:~:text=In%20addition%2C%20check%20the%20university,programme%20you%20want%20to%20do.andtext=The%20minimum%20requirement%20for%20appointment,(Agric)%20or%20BAgric%20degree.andtext=Diploma%3A%20CPUT%2C%20CUT%2C%20NMMU,NWU%2C%20Fort%20Hare%2C%20DUT.
2. https://www.jobvine.co.za/job-description/agricultural-extension-officer/
3. https://www.foodformzansi.co.za/agriseta-learner-connect-meet-an-agricultural-extension-officer/

VETERINARIAN

(OFO code 2021-225101)

Listed areas of specialisation

Veterinarian parasitologist;	animal doctor; and
veterinary pathologist;	veterinary epidemiologist.

This sheet discusses the occupation: Veterinarian. All areas of specialisation are equally important and relevant.

Overview

Animal health is of paramount importance. South Africa regularly experiences the outbreak of diseases such as foot-and-mouth disease, avian flu, swine flu and the like. These immediately have a negative economic impact. Large numbers of animals have to be culled (e.g. ostriches as a result of avian flu), quarantine of pigs and cattle which impacts on the ability of the farmer to trade or export the animals.

At a more micro level there is a need to attend to injured animals, assist in difficult births, operate on deformities and so forth. The veterinarian is indispensable in any farming operation that involves any form of livestock.

What does a veterinarian do?

Veterinarians treat the injuries and illnesses of pets and other animals with a variety of medical equipment, including surgical tools and x-ray and ultrasound machines. They provide treatment for animals that is similar to the services a physician provides to humans.

Veterinarians work passionately to diagnose, treat diseases and dysfunctions in animals as well as prevent diseases in animals. These individuals are expected to always act in such a manner as to maintain and promote the prestige, honour, dignity and interests of the profession. Veterinarians serve the public and the interests of the animals with regard to the latest scientific knowledge.

What to expect

The job of a veterinarian can be quite stressful. There is generally a shortage of veterinarians in South Africa, and many choose to work in urban areas focusing on pets. The demand for veterinarians in the livestock sector of agriculture is high and from time to time requires working extensive hours in less than ideal work environments (e.g., on-farm without the necessary treatment facilities).

There are many opportunities for veterinarians which are not limited to the daily treatment of animals. Below is a summary of some of the work opportunities:

Private practice–most veterinarians in South Africa work in private practices, either working in their own clinics, working in partnership with another veterinarian, as an assistant to another veterinarian, or as a locum.

Veterinary research institutes–veterinarians who decide to pursue a career in research typically work in the fields of veterinary, agriculture and biomedical sciences).

Zoos–Veterinarians also work in zoos where they provide clinical services, disease prevention strategies, and a whole range of consultative services on nutrition, management, production, reproduction and biotechnology (embryo transfer).

Wildlife centers–while some veterinarians work in zoos, others work in animal conservation centers. Here, they help to keep animal populations balanced by protecting animals whose populations are under threat and keeping those animals whose populations can be a threat to others under control. They are also responsible for overseeing the daily operations of the centers they work at as well as ensuring that all relevant regulations are followed in the process.

Colleges and universities–qualified veterinarians can teach at veterinary, medical, agricultural and natural science faculties where they can also conduct research and participate in community engagement projects as well as the provision of clinical services.

Government agencies–a large number of veterinarians work in state or provincial agencies where they typically help with regulatory services related to the diagnosis, surveillance, monitoring, control, prevention and eradication of notifiable diseases. Veterinarians working for the government are also responsible for overseeing the import and export of animals and animal products as well as food safety and security.

Diagnostic laboratories–veterinarians can also work in private and government-run diagnostic laboratories performing routine or forensic diagnostic services in various disciplines such as pathology, clinical pathology, microbiology and toxicology.

Pharmaceutical companies–veterinarians can work in research and product development in the pharmaceutical and feed industries where they provide technical advice in sales and management.
Consultancy firms–some veterinarians work as veterinary consultants and provide specialised farm management and clinical veterinary services to the farm animal and pet industries.

Required aptitude and personality traits

Veterinarians need to have a unique set of traits. Some of the most important are:

- Compassion;
- Analytical skills;

- Interpersonal skills;
- Problem solving;
- Scientific aptitude;
- Critical thinking;
- Management skills; and
- Manual dexterity.

Required School Subjects

You will need to have taken the following subjects at high school:

- English;
- Mathematics;
- Physical Sciences; and
- Life Sciences.

Candidates must have achieved a National Senior Certificate meeting the requirements for the degree course.

Training

Occupation in general

Veterinarians in South Africa study for a minimum of six years. This include pursuing a Bachelor of Veterinary Science programme that involves four and a half years of studying the core veterinary curriculum followed by one and a half years of work integrated training and a research project.

Students of veterinary science are required to register with the SA Veterinary Council.

University of Pretoria (Onderstepoort campus):

- Bachelor of Veterinary Science BVSc).

Areas of Specialisation

Area of specialisation	Relevant fields of study
Veterinarian parasitologist; veterinary pathologist; and veterinary epidemiologist.	All post graduate studies building on BVSc.

Professional and representative bodies

- South African Veterinary Council (SAVC)
- South African Veterinary Association (SAVA)

Resources

1. https://savc.org.za/veterinary-profession/
2. https://hw-careers.co.za/career/veterinarian/

VETERINARY TECHNICIAN

(OFO code 2021-324102)

Listed areas of specialisation

None

Overview

The veterinary technician is also referred to as an animal health technician.

The veterinary technician's duties and responsibilities typically include ensuring the health, productivity and reproductive health of the livestock and animal population in our country. Investigating and preventing disease in animals by implementing health strategies is another important part of the job.

What does a veterinarian technician do?

A veterinary technician prepares vaccines, serums or tissue samples, takes blood samples and performs medical tests in a laboratory environment for use in the treatment and diagnosis of diseases in animals. Veterinary technicians serve veterinarians in ways that are similar to what laboratory technicians and nurses do for doctors.

Veterinary technicians assist with the treatment of animals by taking medical backgrounds from their owners and helping to administer treatments or medications. They also test blood and other samples as necessary.

Specific responsibilities may vary depending on where a veterinary technician work. For example, those working in small private practices serving family pets will likely spend more time assisting veterinarians with treatments and working with pet owners. Those working in research laboratories, however, might spend more of their time in a laboratory setting, performing tests.

What to expect

Much of a veterinary technician's work is done in a laboratory setting, but technicians might also assist veterinarians with exams and procedures when necessary and relevant. Those in this career get to play a role in helping sick and injured animals, but it also can be difficult work. The job sometimes includes dealing with aggressive, frightened, abused, or injured pets, and may require assisting veterinarians with euthanisings animals.

Practices that have weekend or evening hours typically will expect technicians to take some evening and weekend shifts. When working on farms, working outside normal working hours is common and can happen frequently.

Required aptitude and personality traitsVeterinarian technicians need to have a unique set of traits. Some of the most important are:

- Compassion;
- Teamwork;
- Active listening;
- Verbal communication;
- Organisational skills; and
- Stamina.

Required School Subjects

You will need to have taken the following subjects at high school:

- English;
- Mathematics;
- Physical Sciences; and
- Life Sciences.

Candidates must have achieved a National Senior Certificate meeting the requirements for the degree course.

Training

Occupation in General

Veterinary technicians in South Africa typically study for four years or more,including:

- 3 to 3 1/2 years for National Diploma; and
- One year for Bachelor of Technology.

Tshwane University of Technology:

- Bachelor of Science in Animal Health.

University of North West:

- Bachelor of Science in Veterinary Science.

University of Pretoria:

- Bachelor of Technology in Veterinary Technology.

University of the North West.

- Diploma in Animal Health.

Tshwane University of Technology:

- National Diploma in Veterinary Technology.

Professional and representative bodies

- South African Veterinary Council (SAVC).
- South African Veterinary Association (SAVA); and
- International Veterinary Nurses and Technicians Association (IVNTA).

Resources

1. https://savc.org.za/veterinary-profession/
2. https://hw-careers.co.za/career/veterinarian/

VETERINARY NURSE

(OFO code 2021-324101)

Listed areas of specialisation

Artificial inseminator;	animal nurse; and
veterinary vaccinator;	veterinary assistant.

Overview

Veterinary nurses work as caring professionals and make important contributions to the physical and emotional wellbeing of animals and people. Veterinary nursing requires a dedicated and motivated person with a particular interest in working with animals and their owners. The veterinary nurse is a member of a professional team that includes veterinarians and is expected to show a high degree of responsibility, organisational skills and patience. Self-discipline, compassion, honesty, dedication and a sense of humour are recommended attributes.

The curriculum taught to veterinary nurses does not only qualify them to act as assistants in a vet's practice where pets are treated, it also gives them broad-based skills in primary health care that are valuable to the agriculture sector in general.

Veterinary nursing is a challenging, exciting and stable career: only 50 students qualify per year, and there is good job security. All nurses are registered as para-veterinary professionals by the South African Veterinary Council.

What does a veterinarian nurse do?

Veterinary nurses assist veterinarians with surgery and the medical care of animals of all species. They can be employed by private veterinary clinics and hospitals as well as state veterinary services. Qualified veterinary nurses are in demand in the veterinary pharmaceutical industry and in animal welfare. Veterinary nurses can also follow careers in agriculture, game farming and in wildlife rehabilitation centres, research institutes and laboratories, pet boarding facilities and horse breeding or riding establishments.

As a veterinary nurse, you will be involved in the hands-on nursing care of a range of animals, providing both emergency and routine healthcare. You will work alongside veterinary surgeons to promote animal health and welfare through responsible ownership and play a key role in the education of pet owners.

As a veterinary nurse, you will need to:

- confidently handle and restrain animals;
- provide nursing care to hospitalised patients, including patient monitoring and health checking, feeding, grooming and walking animals;
- administer treatments, including injections, tablets, fluids and blood transfusions;
- perform diagnostic tests, e.g., blood sampling, urine analysis and x-rays;
- prepare animals for surgery and perform some minor procedures, e.g., suturing wounds and dental hygiene;
- monitor anaesthesia;
- assist veterinary surgeons with operations;
- maintain the cleanliness and hygiene of the practice;
- communicate with pet owners, gaining their trust and reassuring them about their animal's treatment; and
- educate pet owners on animal health, including vaccinations, worming, flea prevention and appropriate nutrition.

What to expect

Depending on the practice and your own interests, you may specialise in one of these areas:

- **General practice (first opinion)**——first-line care of animals including vaccinating, neutering, worming and health checking;
- **Emergency practce**——practices that typically operate overnight and at weekends seeing urgent and critical cases; and
- **Referral practice** ——specialist practices that tend to see the more complex cases. Examples include orthopedics, oncology and ophthalmology. In some cases, these may be species-specific, e.g., canine, equine or exotics.

Every day will bring different challenges, but variety is one of the most enjoyable aspects of the role. The job is physically demanding. You will be on your feet for most of the day and will be involved in lifting and restraining animals. Practicing hygiene tasks, including disinfecting kennels and sterilising surgical equipment, are important and integral parts of the role. As you areone is required to be hands-on with a range of animals, bites and scratches are a potential risk.

You will play a key role in supporting pet owners in making (sometimes difficult) decisions regarding their animal's care and wellbeing.

Required aptitude and personality traits

Veterinary nurses need to have a unique set of traits. Some of the most important are:

- The ability to communicate with pet owners, veterinary surgeons and people from a range of backgrounds;

- Effective teamworking skills, as you will be working closely with veterinary surgeons and other professionals when caring for patients;
- The ability to work independently and use your own initiative on occasions when you have sole responsibility for patient care, for example, out-of-hours work; and
- Strong attention to detail, particularly when administering medications and monitoring multiple patients; and
- That you can stay calm and composed in stressful situations and work well under pressure when dealing with emergencies.

Required school subjects

You will need to have taken the following subjects at high school:

- English;
- Mathematics;
- Physical Sciences; and
- Life Sciences.

Candidates must have achieved a National Senior Certificate meeting the requirements for the degree course.

Training

Occupation in general

University of Pretoria:

- BVetNurs; and
- Diploma in Veterinarian Nurse.

UNISA:

- Diploma in Animal Health.

Areas of specialisation

Area of specialisation	Relevant fields of study
Artificial inseminator; veterinary vaccinator; and veterinary assistant.	All short courses to specialise on top of the veterinarian nurse qualification

Resources

1. https://savc.org.za/veterinary-nurse/

CONSERVATION SCIENTIST— WATER CONSERVATION SCIENTIST

(OFO code 2021-213301)

Listed areas of specialisation

Ecologist;	water conservation scientist
marine ecologist;	soil conservationist;
conservation officer;	animal ecologist;
conservancy advisory scientist;	forestry conservationist;
fish and games officer;	ecological researcher; and
species protection officer;	fisheries advisor.

This sheet discusses the occupation: Water conservation scientist and the areas of specialisation will not be discussed.

Overview

Successful agriculture depends on healthy soil and water. Life needs a continual source of water for sustenance, and soil is essential for plant growth, providing nutrients, water, physical support and biological interactions with roots. Fertile soil and clean water are both renewable resources in natural systems and can also be renewable resources in the context of agricultural production.

Water and soil are integrated and highly interrelated and are normally treated together, which is why water conservationists are frequently referred to water and soil conservation.

A soil and water conservationist is a type of conservation scientist that performs land surveys, designs soil or water conservation plans, creates guidelines to prevent erosion, develops practices for sustainable land use, and monitors water and soil conditions.

What does a water conservation scientist do?

A soil and water conservationist's work looks at the conservation of soil, water and related natural resources on land used to produce food, fibre and other services that improve people's quality of life. They work to discover, develop, implement and improve ways to use land that sustains its productive capacity and enhances the environment at the same time.

Soil conservationists can supervise other conservation workers who construct erosion barriers or plant new crops. They may also perform long-term monitoring to ensure conservation plans are properly followed. If they work for governments, they can perform environmental compliance checks, review annual reports and manage local field offices.

Soil and water conservationist's duties may include:

- Advising farmers on how to rotate different crops to avoid depleting the soil of nutrients and to conserve water;
- Advising landowners on ways in which they can safely use their land without degrading its quality;
- Travelling to areas that are experiencing erosion and develop plans to control it;
- Helping livestock farmers determine the number and kinds of animals to graze, and during what seasons to graze them;
- Participating on work teams to plan, develop, or implement programmes or policies for improving environmental habitats, wetlands, or groundwater or soil resources;
- Implementing soil or water management techniques, such as nutrient management, erosion control, buffers, or filter strips in accordance with conservation plans; and
- Identifying or recommending integrated weed and pest management strategies such as resistant plants, cultural or behavioural controls, soil amendments, insects, natural enemies, barriers, or pesticides.

What to expect

Soil and water conservationists can work in a variety of locations. In the office, they may analyse data, research new technology, communicate with clients, and participate in committees for policy, regulation, and educational programme development. In the field, conservationists can inspect and test crops and soils, monitor water control structures, make presentations to farmers and businesses and participate in field tours and training sessions.

The government is a major employer of soil conservationists; agriculture corporations and mining companies are other employers in this field.

Required aptitude and personality traits

Soil and water conservationists have distinct personalities. They tend to be investigative individuals, which means they are intellectual, introspective and inquisitive. They are curious, methodical, rational, analytical and logical. Some of them are also enterprising, meaning they are adventurous, ambitious, assertive, extroverted, energetic, enthusiastic, confident and optimistic.

Required School Subjects will need to have taken the following subjects at high school:

- English;
- Mathematics;
- Physical Sciences; and
- Biology/Physiology.

Candidates must have achieved a National Senior Certificate meeting the requirements for a degree course.

Training

Occupation in General

Most universities of technology will provide for studies related to water and soil conservation. The following are some universities that offer dedicated programmes.

North West University (Centre for Water Sciences and Management):

- BSC (Hons) Hydrology and Geohydrology.

Rhodes University (Institute for Water Research):

- MSc Hydrology and Water Resource Science.

Wits University:

- BSc Environmental Studies.

Central University of Technology:

- BSc Hydrology and Water Resources Management.

University of the Western Cape (Institute for Water Studies):

- BSc Water studies.

Resources

1. https://www.careerexplorer.com/careers/soil-and-water-conservationist/#what-does-a-soil-and-water-conservationist-do
2. https://www.environmentalscience.org/career/water-conservationist
3. https://www.wrc.org.za/

ECONOMIST—
AGRICULTURAL ECONOMIST

(OFO code 2021-263101)

Listed areas of specialisation

Environmental economist;	econometrician;
Economic advisor;	financial economist;
Health economist;	economic consultant;
Economic analyst;	resource economist;
Micro-economist;	mineral economist;
Research economist;	taxation economist;
Merger analyst;	industrial economist;
Small business economist;	macro-economist;
Agricultural economist;	development finance project analyst;
Labour market economist;	and price economist
Economic forecaster.	

The focus of this sheet is on: Agricultural economist. Most areas of specialisation are not directly relevant to or a priority for agriculture and will not be discussed.

Overview

The food and fibre industry is one of the most important sectors of the South African economy. Not only does it provide the essential products and resources to feed and clothe the population, but it also contributes about 15% to the South African gross national product and provides employment for about 1,2 million workers and a livelihood for about 6 million people. Food and clothes are and will remain one of mankind's primary needs.

Within this industry, the agricultural economist plays a vital role. The agricultural economist has multiple functions and can work at the micro or the macro level. At the micro-level, i.e., on the farm, the agricultural economist is involved in all matters that are related to resource use, management, optimal production, processing, distribution and the use of agricultural products. At the macro-level, the agricultural economist will focus on national and international matters, economic growth projections and analysis in an attempt to provide a bird's eye view of the future of a product or commodity.

A major challenge facing South Africa is the development of rural areas, many of which are severely disadvantaged. Agricultural economists are well-placed to meet these challenges and to work with governments to develop agricultural policies to promote income growth in poor areas. The national and provincial departments of agriculture are both major employers of agricultural economists who are involved with varied tasks.

What does an agricultural economist do?

The agricultural economist analyses aspects of financing, the allocation of inputs and resources, all in an attempt to maximise profits. Certain agricultural economists are involved in the marketing of food and fibre and trading that is involved through different channels until it reaches the end-user. Both local and export markets are concerned. Agricultural economists participate in the development of strategies designed to assist farmers who may previously have received little assistance from agricultural extension workers. Work on developing such strategies has many elements, from promotion and market development through to pricing policies and agricultural finance.

Agricultural economists also have an important strategic role to play in the private sector. At macro level, agricultural economists are employed by multinational food companies and export organisations to analyse the factors that influence the trade of agricultural products. Agricultural economists' knowledge of the macroeconomic variables, such as inflation, exchange rates, and interest rates puts them in a position to identify the effects of various macroeconomic policies on the food and fibre industry, and eventually on the whole population.

The multidisciplinary nature of agricultural economists' training ensures that they can converse with specialists in these fields, a skill that makes agricultural economists indispensable in certain organisations and state departments.

What to expect

Agricultural economists find themselves working in banks, credit unions, insurance companies, legal firms and private companies. Some get jobs with the government.

Required aptitude and personality traits

The following are some of the traits of an agricultural economist:

- A deep interest in agriculture and the natural environment;
- Interestan interest in economics;
- Higha high mathematical, analytical and scientific aptitude;
- Creative, thorough and analytical;
- Problem-solving abilities; and
- Good communication, research and organisational skills.

Required school subjects

You will need to have taken the following subjects at high school:

- English;
- Mathematics;
- Physical Sciences; and
- Life orientation.

Candidates must have achieved a National Senior Certificate meeting the requirements for the degree course.

Training

Occupation in general

Most universities and universities of technology will provide agricultural economics studies. The following are some universities that offer dedicated programmes:

University of Pretoria:

- BComm Agribusiness Management.

University of Stellenbosch:

- BAgric Agri-business management.

University of Limpopo:

- BSc Agric economics.

University of Fort Hare:

- B Agric. economics

Resources

1 https://www.up.ac.za/agricultural-economics-extension-and-rural-development/article/46493/opportunities-for-agricultural-economists

2 https://www.onlinecollegereport.com/what-can-you-do-with-an-agricultural-economics-degree/

3 https://www.aeasa.org.za/

DIESEL MECHANIC

(OFO code 2021-653306)

Listed areas of specialisation

Diesel electrical fitter;	diesel fuel injection mechanic;
diesel fitter-mechanic;	truck mechanic; and
diesel fuel injection technician;	field service technician (diesel);
diesel injector technician.	

This sheet discusses the occupation: Diesel mechanic. All areas of specialisation are equally important and relevant.

Overview

Most agricultural machinery and mobile plants are powered by diesel engines. This includes tractors, harvesters and logistical vehicles. Many static motors such as generators, water pumps, crushers and hammer mills are also driven by diesel engines. These equipment needs to be maintained and repaired by a diesel mechanic.

What does a diesel mechanic do?

Diesel mechanics diagnose and repair the mechanical and electrical faults of diesel vehicles and machinery. Diesel mechanics diagnose engine trouble, dismantle the engine when necessary, and replace or repair defective parts. They reassemble the engine and repair mechanical and electrical faults in machinery.

What to expect

Diesel Mechanic Skills – With so many companies turning to diesel-powered vehicles to transport goods across the country, diesel mechanics deal mainly in diesel engine repair and vehicular component maintenance, requiring them to possess a core understanding of part functions.

Diesel mechanics are skilled technicians that inspect and service vehicles that run on diesel engines, such as cars, trucks and other types of machinery. Their responsibilities include diagnosing damaged diesel motors, repairing them and ensuring their long-term maintenance. Professional experts in diesel mechanics must have a broad knowledge of numerous kinds of repairs. They have to inspect and repair electrical systems, retrofit exhaust systems and replace motor components. They earn the necessary skills for this job from mandatory diesel mechanic courses and apprenticeship training. Diesel mechanic jobs in South Africa provide a decent salary. This trade has promising prospects and allows qualified service technicians to choose from a broad variety of sectors and industries where they can practice their profession.

Required aptitude and personality traits

Some of the skills and traits required by a diesel mechanic are:

- Electronic skills–Because of the technological advancement in diesel technology, diesel-powered engines can be made up of mechanical and electrical components;
- Analytical skills–analysis plays an essential role in diagnosing diesel engine malfunctions, even if the diesel mechanic utilises electronic diagnostic equipment;
- Troubleshooting skills–troubleshooting skills work directly with the mechanic's analytical skills to successfully repair diesel-powered engines;
- Interpersonal skills–dealing with consumers and other diesel mechanics is something that diesel mechanics need to face on a daily basis; and
- Leadership skills–for those who wish to obtain a leadership position at a diesel corporation, having the proper leadership skills is vital to increasing one's chances of being promoted.

Required school subjects

To enroll as a diesel mechanic, you must:

- be at least 16 years old.
- possess NQF Level 1 with a pass in Mathematics.

Training

Occupation in general

Many of the 50 public TVET colleges in South Africa offer the opportunity to train as a diesel mechanic and become a diesel mechanic artisan. It is, however, important to have the opportunity to do work-based learning at an approved workplace. It is therefore best to be contracted by an employer (where the practical work-based exposure can happen) who will then enroll the learner as an apprentice at a TVET college. There are also private TVET colleges offering diesel mechanic programmes.

Areas of specialisation

Area of specialisation	Relevant fields of study
diesel electrical fitter; diesel fuel injection mechanic; diesel fitter-mechanic; truck mechanic; diesel fuel injection technician; field service technician (diesel); snd diesel injector technician.	All short courses to specialise on top of the diesel mechanic artisan qualification.

Resources

1. https://durnacol.co.za/courses/diesel_mechanic/
2. https://www.vocational.co.za/merseta-diesel-mechanic-jobs-courses/

MILLWRIGHT

(OFO code 2021-671202)

Listed areas of specialisation

Machine tool millwright; millwright (electro mechanician); ground electro mechanician;	electro mechanician; and winder technician.

This sheet discusses the occupation: millwright in general. The areas of specialisation are less important and not a priority for agriculture and will not be discussed any further.

Overview

A millwright is a craftsperson or skilled tradesperson who installs, dismantles, maintains, repairs, reassembles, and moves machinery in factories, power plants and construction sites. In modern usage, a millwright is engaged with the erection of machinery. This includes such tasks as levelling, aligning, and installing machinery on foundations or base plates, or setting, levelling and aligning electric motors or other power sources such as turbines with the equipment, which millwrights typically connect with some type of coupling.

A millwright is a very versatile trade and covers both mechanical and electrical work. On the electrical side, it involves dismantling, fault detection and repairing of, for example, electric motors which the millwright will dismantle and test, checking wiring and determining power output and consumption. The millwright also maintains, reconstructs and installs heavy machinery, electrically driven machines and electronic control gear.

What does a millwright do?

Their primary function is to install and maintain heavy machinery. When machinery arrives at the job site, it must be unloaded, inspected, and moved into position. For light machinery, millwrights use rigging and hoisting devices such as pulleys and cables to lift and position equipment. For heavier jobs, they are assisted by hydraulic lift-truck or crane operators. To decide what type of device is needed to position machinery, millwrights must know the load-bearing properties of ropes, cables,

hoists and cranes. When installing machinery, millwrights fit bearings, align gears and wheels, attach motors and connect belts according to the manufacturer's instructions. They may use hand and power tools, cutting torches, welding machine, and soldering guns.

Millwrights must be very precise in their work and have good mathematical skills to measure angles, material thicknesses and small distances with tools such as squares, callipers and micrometres. When a high level of precision is required, such as on a production line, lasers may be used for alignment. Once machinery is installed, millwrights may do repair or preventive maintenance work such as oiling and greasing parts and replacing worn components.

Millwrights' contribution is key to the planning of complicated production processes. In large shops and plants, they may update machinery placement to improve the production process. They may even move and reassemble machinery each time a new production run start. In smaller factories, however, machinery is rearranged only to increase production and improve efficiency. Millwrights consult with supervisors, planners and engineers to determine the proper placement of equipment based on floor loads, workflow, safety measures and other important concerns.

The increasing use of automation in many industries means that millwrights are responsible for installing and maintaining more sophisticated machines. When working with this more complicated machinery, millwrights are assisted by computer or electronic experts, electricians, and manufacturers' representatives.

What to expect

The job can be physically demanding–you may have to work with heavy equipment and materials. The millwright must have:

- an in-depth knowledge of diagnostics and troubleshooting procedures;
- knowledge of maintenance and repair procedures; and
- problem-solving skills.

Today, it is expected of a millwright to have a good understanding of electronics and the setting and working with electronic equipment. Millwright is a relatively new occupation in South Africa and the learning programme is only offered by a few institutions.

Required aptitude and personality traits

Some of the skills and traits required by a millwright are:

- color vision;
- critical-thinking skills;
- physical stamina;
- physical strength;
- troubleshooting skills; and
- communication skills.

Required School Subjects

To enroll as a diesel millwright, you must:

- be at least 16 years old.
- NQF Level 1 with a pass in Mathematics.

Training

Occupation in General

Some of the 50 public TVET colleges in South Africa offer the opportunity to train as a millwright. It is, however, important to have the opportunity to do work-based learning at an approved workplace. It is, therefore, best to be contracted by an employer (where the practical work-based exposure can happen) who will then enroll the learner as an apprentice at a TVET college.

There are also private TVET colleges offering millwright programmes.

Resources

1. https://durnacol.co.za/courses/millwright/
2. https://www.artisantraining.co.za/millwright-courses/.

PRODUCTION/OPERATIONS SUPERVISOR

(OFO code 2021-312201)

Listed areas of specialisation

Production plant supervisor; beneficiation plant foreman; manufacturing foreman;	shift manager (production); and assembly supervisor.

The occupation: production and operations supervisor is found in every sector of the economy with in-house specialisation. This sheet interprets the occupation to be relevant to the agricultural sector. The areas of specialisation are not relevant to agriculture and will not be discussed any further.

Overview

The farm operations supervisor's primary role is to oversee all day-to-day operation details pertaining to people and processes in a farming/horticulture environment. These include safety, efficiencies and accountability, and quality. Additionally, this individual serves as a liaison between farm operations and all other business segments.

However, a production/operations supervisor is not always involved in the primary farming processes. They are also found in processing facilities such as packhouses, cooling warehouses or overseeing sorting and grading processes.

What does a production/operations supervisor do?

The following are some of the duties of a production/operations supervisor, irrespective of being in-field or in a processing environment:

- Drive organisation safety by working with staff to meet expectations through daily observations and discussions;

- Supervise farm operations;
- Ensure product is consistently pure, fresh, delicious and conforms to established GAP, OHASA and other guidelines and SOPs;
- Direct and coordinate the activities of farm/orchard and other processing plant employees;
- Ensure operations/harvest activities are timely and cost effective and that processing operations are suitably prepared and ready to receive fresh produce;
- Ensure proper use of all personal protective equipment as needed;
- Plan and establish work activities to meet farm operation expectations/sales needs;
- Mentor/develop farm employees through performance management including, timely and consistent feedback; coaching;
- Complete and submit time sheets effectively;
- Track farm employees time and attendance;
- Assist with interviewing, selecting, training and developing staff;
- Oversee daily safety/operations meetings;
- Conduct safety trainings and document compliance in coordination with farm manager;
- Issue equipment as needed (ladders, baskets, etc) and collect at end of day/season; and
- Track and report farm and processing performance through identified matrices.

What to expect

The work of a production/operations supervisor either on the farm or in processing facilities are crucial to the success of any farming operation–supervisors form the critical link between management and the workers. Whist the supervisor ensures that management's instructions are executed, they also have to have a good understanding of and empathy with the workers they oversee. It is the supervisor's task to bring workers together as a team, ensure they understand their tasks and are able to execute them accurately and responsibly. Supervisors also oversee the health and safety of workers and that processes comply with international standards and requirements.

Clearly, the production/operations supervisor must have a very good understanding of processes on the farm and processing units, must be fully dedicated to the task at hand and whilst being strict in overseeing production, be a "peoples' person".

The working hours of a production/operations supervisor are normally longer than that of workers in that the supervisor has to, before the shift start, plan the task ahead and allocate workers to execute the tasks and after the shift the supervisor will have administrative duties such as the recording of production performance for the day and writing reports to ensure that management is kept informed of developments/progress in the section that the supervisor oversee.

Required aptitude and personality traits

Some of the skills and traits required to be a production/operations supervisor are:

- Leadership skills;
- Critical-thinking skills;
- Physical stamina;
- Troubleshooting skills;

- Communication skills;
- Attention to detail; and
- Report writing.

Required School Subjects

Today, it is generally a requirement that a production/operations supervisor possess a NQF 4 qualification and the following are some advisable school subjects:

- Life sciences;
- Mathematical literacy; and
- Second language.

Training

Occupation in General

Training can be varied and can be at a range of NQF levels. The following are possibilities:

TVET colleges (public and private):

- Certificate programme in production.

Agricultural training institutes:

- Certificate or diploma programme in farm management.

Private training providers:

- Learnership programme in farm foreman/supervisor (AgriSETA);
- Occupational qualification in orchard and vineyard farm foreman (AgriSETA) (currently under review);
- Learnership programme in production line supervisor (FoodBev SETA); and
- Various short courses such as unit standard based skills programmes relevant to and designed for farm and operations supervisors.

Resources

1. www.agriseta.co.za
2. www.foodbevseta.co.za
3. www.fpmseta.org.za
4. https://southafricalists.com/agricultural-colleges-in-south-africa/

AGRICULTURAL TECHNICIAN

(OFO code 2021-314201)

Listed areas of specialisation

Field production officer;	animal breeding technician;
agricultural research technician;	poultry technical officer;
irrigation technician;	agricultural technical officer;
agronomy technician;	agricultural laboratory technician;
wool testing technician;	artificial insemination technical officer;
field crop technical officer;	seed research technician; and
horticultural technical officer;	agricultural technical advisor.
agricultural sampling officer;	

This sheet discusses the occupation: agricultural technician. All areas of specialisation are equally important and relevant.

Overview

As the world's population grows larger, it is important to improve the quality and yield of food crops and animal food sources. Agricultural technicians work in the forefront of this very important research area by helping scientists conduct experiments and advising farmers to optimise production.

Agricultural technicians are employed in all phases of the agribusiness industry. The growing importance of the agricultural technician in all spheres of agriculture is amplified by the rapid uptake of 4IR technologies in agriculture.

What does an agricultural technician do?

Agricultural technicians assist 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 set up and maintain laboratory equipment such as spectrometers, nitrogen determination apparatus, air samplers, centrifuges and pH metres to perform tests, and collect samples from crops or animals so testing can be performed. They prepare specimens or record data to assist scientists in biology or related life science experiments and examine animals and specimens to determine the presence of diseases or other problems. They maintain or repair agricultural facilities, equipment or tools to ensure operational readiness, safety and cleanliness.

They serve as technical advisors on soil and water conservation committees, and prepare data summaries, reports or analyses that include the results, charts or graphs to document research findings and results. 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.

What to expect

There are mainly three main kinds of agricultural technicians:

Agricultural resource technicians: they work together with the agricultural resource officer and are involved in the classification, description and plotting of a region's natural resources.

Agricultural extension technicians: they assist the agricultural extension officer, collecting agricultural information to determine the needs for agricultural extension. This information is then used to plan agricultural extension activities. They are also involved in the classification of agricultural resources and the planning of farms. They advise farmers on specific farming methods.

Agricultural research technicians: they help 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 mechanisation and the use of electronics and electricity.

Required aptitude and personality traits

Some of the skills and traits required by a production/operations supervisor are:

- Interest in agriculture - soil, plants and animals;
- Enjoy nature and working outdoors;
- Good communication and interpersonal skills;
- Work well with others;
- Practical and good problem-solving skills;
- Organised and observant;
- Enthusiastic and responsible;
- Patience and perseverance; and
- Good health and physical stamina.

Required School Subjects

Today it is generally a requirement that a production/operations supervisor possess a NQF 4 qualification, and the following are some advisable school subjects:

- Life sciences;
- Mathematics; and
- Physical sciences.

Training

Occupation in General

The minimum requirement is normally a diploma. These are generally offered by universities of technology, but universities can also offer relevant and related programmes. The following are some examples:

Mangosuthu University of Technology;
University of Pretoria;
Nelson Mandela University;
Tshwane University of Technology;
Central University of Technology; and
UNISA:

- N.Dip Agriculture: Resource Utilisation
- N.Dip. Agricultural Research: Botany;
- N.Dip. Nature Conservation;
- N.Dip. Analytical Chemistry;
- N.Dip. Agriculture: Animal Production;
- N.Dip. Veterinary Technology; or
- N.Dip. Food Technology.

Areas of Specialisation

Area of specialisation	Relevant fields of study
Field production officer; animal breeding technician; agricultural research technician; poultry technical officer; irrigation technician; agricultural technical officer; agronomy technician; agricultural laboratory technician; wool testing technician; artificial insemination technical officer; field crop technical officer; seed research technician; horticultural technical officer; and agricultural technical advisor/ agricultural sampling officer.	The areas of specialisation flow from training that has been concluded under the Occupation in General. Specialisations are attained through skills programmes to top up skills.

Resources

1. www.arc.agric.za
2. https://africa-agri.co.za/wp-content/uploads/2020/05/South-African-Agriculture-Associations-FINAL.pdf
3. https://careerplanet.co.za/careers-listing/agricultural-technician/

AGRICULTURAL MOBILE (EQUIPMENT) PLANT OPERATOR

(OFO code 2021-734101)

Listed areas of specialisation

Cotton picking machine operator;	chemical applicator;
farm equipment/machinery operator;	agricultural mobile equipment operator;
tractor driver;	harvester operator;
agricultural machine and equipment operator;	and rotary hoe operator.
agrichemical spraying/dusting operator;	

This sheet discusses the occupation: Agricultural Mobile Plant Operator in general. All areas of specialisation are equally important and relevant.

Overview

Agricultural mobile equipment is becoming more and more sophisticated. Many tractors today are directionally guided, not by an operator but through GPS technologies. This and other 4IR related advancements require of the agricultural mobile plant operator to acquire new and technologically more advanced skills.

Also, as farms become bigger, to take advantage of economies of scale, many farmers can no longer afford to operate the machines themselves.

The higher skills requirement for operators has led to a growing international demand for heavy-duty farm machine operators.

The increasing complexity of agricultural machines and mainstreaming of precision farming technologies on many agricultural machines and implements mean that most institutions that traditionally provided training in this field are not well equipped to provide this new type of training to

students. Most equipment manufacturers currently fill the gap by providing training to their channel partners, who in turn provide on-farm support to end-users.

What does an agricultural mobile plant operator do?

Mobile farm and forestry plant operators drive, tend, operate and monitor one or more types of special-purpose motorised, mobile machinery or equipment used in agricultural, horticultural and forestry operations.

Some of the duties of an agricultural mobile plant operator are:

- Driving and tending tractor-drawn or self-propelled special-purpose farm machinery to plough land and sow, fertilises, cultivate and harvest crops;
- Driving and tending tractor-drawn or self-propelled special-purpose forestry machinery to clear land, plant, harvest and carry trees and timber or perform other forestry operations;
- Preparing and positioning plant for operation;
- Adjusting speed, height and depth of implements.
- Operating plant to hold, lift and cut trees.
- Operating attachments to lift, swing, release and sort trees and logs, and operating auxiliary plant such as chipping machines and log splitting machines.
- Feeding felled trees into processors to strip limbs and cut into logs and loading logs onto stockpiles and into trucks; and
- Servicing machinery and performing minor repairs.

What to expect

The modern agricultural mobile plant operator can expect to work with technologically advanced equipment and should be prepared for it.

Most work is done outdoors in the fields where planting and harvesting take place.

The operator can also be expected to engage in basic, first line maintenance and repair of equipment.

Required aptitude and personality traits

- Hand-eye coordination and simple decision making;
- Ability to troubleshoot machinery issues;
- Run basic repairs on operating machinery; and
- Good driving ability.

Required School Subjects

As a minimum requirement given the advancement of the equipment, matric is ideal whilst the minimum entry to a TVET institution will be NQF level 1.

Subjects such as mathematics and science will be valuable.

Training

Occupation in General

Agricultural equipment operators will benefit from a National Certificate in Primary Agriculture in Plant Production at National Qualifications Framework Levels 1 to 4 offered at agricultural colleges and most TVET colleges. Training could also take place on the job with mentoring by an experienced operator.

On more sophisticated, electronically advanced equipment, the equipment manufacturer or its agents will be responsible for the training of operators as part of the sales agreement.

Areas of Specialisation

Area of specialisation	Relevant fields of study
Cotton picking machine operator; chemical applicator; farm equipment; machinery operator; agricultural mobile equipment operator; tractor driver; harvester operator; agricultural machine and equipment operator; rotary hoe operator; agrichemical spraying; dusting operator.	The areas of specialisation flow from training that has been concluded under the Occupation in General. Specialisations are attained through skills programmes and equipment manufacturer courses to top up skills.

Resources

1. https://www.greencareers.co.za/careers/agricultural-equipment-operator

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