Republic of Namibia

MINISTRY OF EDUCATION, ARTS AND CULTURE

NAMIBIAN SENIOR SECONDARY CERTIFICATE (NSSC)

AGRICULTURAL SCIENCE SYLLABUS

ORDINARY LEVEL

SYLLABUS CODE 6115

GRADES 10–11

FOR IMPLEMENTATION IN 2019
FOR FIRST EXAMINATION IN 2020

Ministry of Education, Arts and Culture
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Agricultural Science Syllabus Ordinary Level Grades 10–11

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TABLE OF CONTENTS

1. INTRODUCTION

The Namibian Senior Secondary Certificate Ordinary (NSSCO) level syllabus is designed as a two-year course leading to examination after completion of the Junior Secondary phase. The syllabus is designed to meet the requirements of the *National Curriculum for Basic Education (NCBE)* and has been approved by the National Examination, Assessment and Certification Board (NEACB).

The Namibia National Curriculum Guidelines, applicable at the stage of senior secondary education (Grades 10 and 11) and at equivalent stages of non-formal education, as a part of life-long learning, recognise the uniqueness of the learner and adhere to the philosophy of learner-centred education.

The Namibia National Curriculum Guidelines:

- recognise that learning involves developing values and attitudes as well as knowledge and skills
- promote self-awareness and an understanding of the attitudes, values and beliefs of others in a multilingual and multicultural society
- encourage respect for human rights and freedom of speech
- provide insight and understanding of crucial "global" issues in a rapidly changing world which affects quality of life: the AIDS pandemic, global warming, environmental degradation, distribution of wealth, expanding and increasing conflicts, the technological explosion and increased connectivity
- recognise that as information in its various forms becomes more accessible, learners need to develop higher cognitive skills of analysis, interpretation and evaluation to use information effectively
- seek to challenge and to motivate learners to reach their full potential and to contribute positively to the environment, economy and society

Thus the Namibia National Curriculum Guidelines should provide opportunities for developing essential skills across the various fields of study. Such skills cannot be developed in isolation and they may differ from context to context according to a field of study. The skills marked with an * are relevant to this syllabus.

The skills are:

- communication skills*
- numeracy skills*
- information skills*
- problem-solving skills*
- self-management and competitive skills*
- social and cooperative skills
- physical skills
- work and study skills*
- critical and creative thinking*

2. RATIONALE

Agricultural Science is a multidisciplinary subject that will, through the use of learner-centred teaching approaches, allow the learners to make use of the existing knowledge, and construct new ones so as to build understanding of crop and animal production, as well as processing and marketing of agricultural produce. This curriculum is designed to integrate cross-field, developmental objectives and content, thereby promoting entrepreneurial and management skills that will enhance the development of desirable attitudes and values.

3. AIMS

The main aim of the syllabus in the agricultural science area is therefore to provide a scientific background for our learners with the ambition of producing the much-needed agricultural scientists for the country. The subject, Agricultural Science, within the natural science area, promotes the following aims:

1 promote an appreciation of agricultural science as an applied science
2 stimulate an interest in and create an awareness of existing problems and opportunities in agriculture and rural development
3 stimulate positive attitudes by showing that efficient farming can be both a profitable and a rewarding occupation
4 demonstrate the value of agriculture to the family and community, so as to show how improved agriculture can contribute to the worldwide campaign of freedom from hunger
5 encourage the teaching, in a practical manner, of basic principles and skills in agricultural science and of efficient farm business management
6 ensure that schools take an active part in rural development by integration of agricultural activities into the school curriculum
7 develop and enhance respect for, understanding of, and tolerance of other people's beliefs, cultures and way of life
8 promote gender equity in the learning activities, by recognizing the realities of the roles played in agriculture
9 promote awareness of the impact of HIV/AIDS in the agricultural production
10 promote Information Communication Technology (ICT) as a tool to enhance understanding of the farm management
11 provide a basis, together with the basic sciences and mathematics, for more advanced studies in agricultural science

4. ADDITIONAL INFORMATION

4.1 Guided learning hours

The NSSCO level syllabuses are designed on the assumption that learners have about 130 guided learning hours per subject over the duration of two years, but this is for guidance only. The number of hours required to gain the qualification may vary according to local conditions and the learners' prior experience of the subject. The National Curriculum for Basic Education (NCBE) indicates that this subject will be taught for 8 periods of 40 minutes each per 7-day cycle, or 6 periods of 40 minutes each per 5-day cycle, over two years.

4.2 Prior learning

Learners beginning this course are not expected to have studied Agricultural Science previously.

4.3 Progression

NSSCO levels are general qualifications that enable learners to progress either directly to employment, or to proceed to further qualifications. Learners who are awarded grades C to A* in NSSCO are well prepared to follow courses leading to Namibia Senior Secondary Certificate Advanced Subsidiary (NSSCAS) level Agricultural Science.

4.4 Grading and reporting

NSSCO results are shown by one of the grades A*, A, B, C, D, E, F or G indicating the standard achieved, grade A* being the highest and grade G the lowest. 'Ungraded' indicates that the candidate has failed to reach the minimum standard required for a pass at NSSCO level.

4.5 Support materials and approved textbooks

NSSCO syllabuses, question papers and examiner reports are sent to all schools. Assessment manuals in subjects, where applicable are sent to schools. Approved learning support materials are available on the Senior Secondary Textbook Catalogue for Schools. The Senior Secondary Textbook Catalogue is available on the institution's (NIED) website (http://www.nied.edu.na).

5. LEARNING CONTENT

The content is divided into themes, topics and sub-topics as follow:

Theme 1: General agriculture

1.1 Agriculture as a career
1.2 Ways of improving agriculture
1.3 Environmental influences on agricultural practices
1.4 Principles of land tenure
1.5 Impact of HIV and AIDS on human resource and food production

Theme 2: Soil

2.1 Soil formation
2.2 Soil profile
2.3 Soil types
2.4 Soil texture and structure
2.5 Soil composition
2.6 Soil fertility
2.7 Soil erosion and conservation
2.8 Irrigation and soil drainage
2.9 Water resource management
2.10 Land preparation and soil tillage

Theme 3: Plant production

3.1 Principles of plant growth
3.2 Cereal crops (maize/millet/sorghum)
3.2.1 Cereal crop production in Namibia
3.2.2 Suitable cultivars
3.3 Crop protection
3.3.1 Pest control
3.3.2 Disease control
3.3.3 Weed control

Theme 4: Livestock husbandry

4.1 Principles of livestock production
4.1.1 Livestock anatomy
4.1.2 Livestock physiology
4.1.3 Livestock nutrition
4.1.4 Pasture and range management
4.2 Beef cattle
4.2.1 Breeds
4.2.2 Characteristics of beef cattle
4.2.3 Handling of beef cattle
4.2.4 The role of beef cattle in Namibia
4.2.5 Health and diseases
4.2.6 Record keeping
4.2.7 Marketing

Theme 5: Livestock and crop breeding

5.1 Monohybrid inheritance
5.2 Selection

Theme 6: Community-based natural resource management

6.1 Conservancies
6.1.1 Management of conservancies in Namibia
6.1.2 Legislation governing conservancies in Namibia
6.1.3 Conservancies and wildlife councils
6.2 Conservation of community forestry in Namibia
6.3 Community-based tourism

Theme 7: Farm structure and machinery

7.1 Fencing
7.2 Farm tools and machinery
7.2.1 Simple farm tools
7.2.2 Farm machinery
7.3 Water supply
7.3.1 Tools and fittings
7.3.2 Water pumps
7.3.3 Maintenance of water installations

Theme 8: Agricultural economics

8.1 Principles of agricultural economics
8.2 Farm records and accounts
8.3 Farm budgeting
8.4 Marketing of agricultural produce

Theme 1: General agriculture

TOPIC	**GENERAL OBJECTIVES** *Learners will:*	**SPECIFIC OBJECTIVES** *Learners should be able to:*
1.1 Agriculture as a career	• recognise the need for Namibian people to be trained in different careers related to agriculture	• identify career paths in agriculture such as agricultural extension officers, veterinary officers, farm managers, crop protection advisors, sales persons for agricultural inputs, agriculture engineers, farm mechanics, agronomists and fisheries officers • state the roles of the above career paths in improving agricultural production in Namibia
1.2 Ways of improving agriculture	• understand the role of the government of the Republic of Namibia in the improvement of the agricultural sector	• define *sustainable agriculture* (maximising the benefits of natural resources for the present generation without limiting future generations to do the same) • define *agricultural research* • discuss examples of agricultural research activities that lead to the improved production of agricultural commodities in Namibia (research on improved crop varieties, animal feeding, animal health, genetic improvement) • describe the value of education in agriculture and how this contributes to the improvement of food and cash crop production • discuss ways of adding value to agricultural products for sustainability: (preservation, processing, culturing, cooking, freezing, cooling, canning, drying) • discuss how agriculture can bring about the much-needed development and better living conditions for rural people in Namibia • explain how the government/ministry of Agriculture can help in the development of rural communities

TOPIC	GENERAL OBJECTIVES *Learners will:*	SPECIFIC OBJECTIVES *Learners should be able to:*
1.3 Environmental influences on agricultural practices	• understand the effects of environmental factors on agricultural activities in Namibia	• explain the effects of the following environmental factors on agriculture: - *temperature* – its effects on plant growth - *humidity* – its effect on the rate of water loss from plants and as a factor in fungal disease attack - *rainfall* – the variation in distribution, effectiveness, reliability and intensity - *wind* – its effects on rate of evaporation and transpiration, soil erosion and physical damage to plants • suggest ways that farmers can minimise the effects of temperature, humidity, rainfall and wind on agriculture • describe the water cycle and the significance of ground water resources • describe the importance of water conservation, including the process of mulching and minimum tillage
1.4 Principles of land tenure	• acquire knowledge of different land tenure systems and know the types of land use in Namibia	• describe the main features of land tenure systems applicable in Namibia: rented land, state land, leasehold, freehold and communal land tenure • describe methods of land use such as shifting cultivation, settled arable land, unenclosed and enclosed grazing systems
1.5 Impact of HIV/AIDS on human resource and food production	• analyse the effects of HIV/AIDS on human resources and resultant food production	• state how different age groups can become victims of HIV/AIDS: newborns, teenagers and the elderly • discuss the effects of the HIV/AIDS pandemic on the turnout and productivity of workers within the agricultural sector in Namibia • explain how the impact of HIV/AIDS reduces the output from a farm

The practical activities, approaches and demonstrations required for Grade 10-11 Theme General agriculture are listed below. These are considered basic and all learners should be exposed to them as a minimum requirement.
• *visit any nearby farm and observe how farm machines work to accelerate food production through technology* • *investigate the role of agricultural extension workers in improving food production in Namibia* • *conduct a simple survey in your area to find out how agriculture may have improved the lives of rural communities in Namibia* • *carry out experiments to demonstrate the effects of environmental factors on Agriculture in Namibia* • *dramatise role play on the negative impact HIV/AIDS might have on food security in Namibia*

Theme 2: Soil

TOPIC	**GENERAL OBJECTIVES** *Learners will:*	**SPECIFIC OBJECTIVES** *Learners should be able to:*
2.1 Soil formation	• understand the factors affecting the weathering of rocks and ultimately soil formation	• identify the agents of physical, chemical and biological weathering • describe the formation of soil: - through physical, chemical and biological weathering processes - through the decay of dead matter
2.2 Soil profile	• recognise a simple soil profile	• state what is meant by a *soil profile* • describe various soil horizons/layers: top-soil, sub-soil, weathered parent materials, parent rock in terms of colour, organic matter and texture
2.3 Soil types	• recognise the different types of soil used in agricultural production	• describe the main characteristics of clay soil, sand soil and loam soil in terms of particle size, pore space, water retention, temperature, cultivation and plant growth
2.4 Soil texture and structure	• acquire knowledge of the texture and structure of soil	• distinguish between soil texture and soil structure • describe soil texture in terms of different soil particles: sand, silt and clay • explain what is meant by a *soil crumb* • explain the importance of forming and maintaining a good crumb structure for optimum plant growth
2.5 Soil composition	• know and understand the composition of different soil types	• describe the components of different types of soil (sand, clay and loam) in terms of mineral particles, organic matter, air, water and living organisms

TOPIC	**GENERAL OBJECTIVES** *Learners will:*	**SPECIFIC OBJECTIVES** *Learners should be able to:*
2.6 Soil fertility	• understand the importance of plant nutrients, the nitrogen cycle and soil pH	• describe the major functions of the following plant nutrients: nitrogen, phosphorus, potassium, calcium, magnesium, and sulfur • describe the symptoms of nutrient deficiency in nitrogen, phosphorus and potassium • state **one** organic and **one** inorganic source of nitrogen, phosphorous and potassium • identify and explain factors affecting soil pH such as rainfall, irrigation, application of fertilisers or manure, removal of crop residue, bacterial/microbial actions and parent materials • describe the nitrogen cycle in terms of: - decomposition by type of microorganism - nitrogen fixation in the roots - absorption of nitrogen compounds and their conversion to proteins - the role of different types of microorganism in decay and the return of nitrogen to the soil or the atmosphere (names of individual bacteria are **not** required) • explain the negative effects of salt on plant growth • describe how to make compost from garden refuse and other available organic substances • explain the effects of overuse of fertilisers • explain the significance of legumes in maintaining soil fertility

TOPIC	GENERAL OBJECTIVES *Learners will:*	SPECIFIC OBJECTIVES *Learners should be able to:*
2.7 Soil erosion and conservation	• understand methods of conserving soil	• list the types of soil erosion: splash erosion, sheet erosion, rill erosion, gully erosion • describe how to control soil erosion on agricultural land, with reference to humus content and loss of biodiversity
2.8 Irrigation and soil drainage	• know the various irrigation and drainage methods used in Namibia	• define *irrigation* • describe methods of irrigation applicable in Namibia: flood irrigation, furrow irrigation, sprinkler irrigation and drip irrigation • explain the need for irrigation and its effect on crop yield and quality • explain what is meant by *leaching* • discuss the effects of leaching on plant growth • define *drainage* • discuss the necessity of draining waterlogged agricultural land • describe how soil is drained using ditches and pipe drains
2.9 Water resource management	• understand the importance of managing water resources	• state what is meant by *water resource management* • discuss sustainable methods of managing water resources such as the use of drip irrigation, earth dams, catchment area, pollution control
2.10 Land preparation and soil tillage	• understand the principles and practices of land preparation and soil tillage	• discuss methods of preparing and tilling the land/soil • state the advantages and disadvantages associated with methods of land preparation and soil tillage • describe reasons for choosing specific tillage methods

The practical activities, approaches and demonstrations required for Grade 10-11 Theme* Soil, *are listed below. These are considered basic and all learners should be exposed to them as a minimum requirement.
• *dig a pit, observe, identify and discuss various soil horizons (top-soil, sub-soil and underlying materials) in terms of colour, organic matter and texture* • *visit surrounding areas of the school and observe signs of weathering processes where applicable*

Theme 3: Plant production

TOPIC	GENERAL OBJECTIVES *Learners will:*	SPECIFIC OBJECTIVES *Learners should be able to:*
3.1 Principles of plant growth	• acquire knowledge and skills on the principles of plant growth in relation to plant structure and physiological processes	• state the conditions necessary for plant growth and their importance • explain the absorption of plant requirements from the soil, including the principles of diffusion, osmosis, the passage of water and dissolved mineral salts through vascular tissues • explain the concept of *turgor* and *plasmolysis* • describe the structure and function of root hairs • explain how the structure of a leaf is related to function • outline gas exchange by diffusion through stomata • describe the significance of carbon dioxide in the process of photosynthesis and the importance of photosynthesis for plant growth • discuss the significance of respiration in plant growth • define *translocation* as the movement of dissolved food materials made in leaves to other parts of the plant • discuss the significance of translocation in plant growth and explain the principles of modification of different parts of plants to form food storage organs and the type of food materials stored • define *transpiration* in terms of water loss from the stomata and discuss its significance in plant growth • describe the structure and functions of the flowers of a maize plant and of a bean plant • describe the mechanism of pollination in maize plants (wind pollination) and bean plants (insect pollination) • describe the process of fertilisation in a **named** plant • describe asexual reproduction from stem tubers: Irish potato/yam and from stem cuttings: sweet potato/cassava

TOPIC	GENERAL OBJECTIVES *Learners will:*	SPECIFIC OBJECTIVES *Learners should be able to:*
3.2 Cereal crops		
3.2.1 Cereal crop production in Namibia	• acquire knowledge and necessary skills on the methods of producing cereal crops in Namibia	• explain what is meant by a *cereal crop* • explain what is meant by *seed viability* • outline the importance of viable seeds • discuss factors that determine plant spacing and planting depth of cereal crops • describe the methods employed in the cultivation of **one** of the following cereal crops: maize, millet, sorghum, rice, oats, wheat or barley including: - soil and climatic requirements - seed-bed preparation, sowing or planting time, planting depth, plant spacing and seed rate - application of fertilisers (organic and inorganic) - recognition of crop maturity, harvesting, storage and marketing • explain reasons for the suitability of cereal crops for local conditions
3.2.2 Suitable cultivars	• understand the different characteristics of a chosen cultivar	• explain what is meant by a *cultivar* • identify specific cultivars of a chosen crop • explain reasons for choosing a particular cultivar

TOPIC	GENERAL OBJECTIVES *Learners will:*	SPECIFIC OBJECTIVES *Learners should be able to:*
3.3 Crop protection		
3.3.1 Pest control	• obtain knowledge about the common pests affecting crops in Namibia including their control methods	• describe the following four types of pest and the nature of the damage they cause: - biting and chewing pests (e.g. grasshoppers, locusts, termites, leaf miners, army worms and beetles) - piercing and sucking pests (e.g. aphids, Bagrada bugs, mealy bugs and scale insects) - boring pests(e.g. weevils, stalk borer and American bollworm (*Helicoverpa armigera*)) - soil pests: nematodes/eelworms, cutworms • describe chemical, biological and cultural methods in controlling the types of pests above • describe Integrated Pest Management (IPM) as an ecosystem-based strategy which focuses on long-term prevention of pests or their damage through a combination of techniques • discuss the advantages and disadvantages of chemical, biological and cultural methods of pest control
3.3.2 Disease control	• acquire knowledge of crop diseases, their modes of infection and control	• describe the mode of infection, harmful effects, prevention and control of **one** plant disease from each of the following groups: - bacterial diseases: bacterial wilt, bacterial blight or black rot - fungal diseases: damping off of seedlings, downy mildew or maize and sorghum smut - viral diseases: mosaic on sorghum, maize streak or groundnut rosette

TOPIC	GENERAL OBJECTIVES *Learners will:*	SPECIFIC OBJECTIVES *Learners should be able to:*
3.3.3 Weed control	• understand the effect of weeds on plants and ways of controlling them	• identify a **named** weed species affecting crops in Namibia • investigate and describe its harmful effects and the mode of spread • describe biological, cultural, mechanical and chemical weed control • discuss the cost-effectiveness of the methods of weed control

The practical activities, approaches and demonstrations required for Grade 10-11 Theme Plant production are listed below. These are considered basic and all learners should be exposed to them as a minimum requirement.
• *sow or plant seed of different cereal crops according to the required time of season, depth and space* • *conduct an experiment to determine the germination percentages* • *make compost from garden refuse and other available organic substances* • *illustrate the negative effects of salt on plant growth by means of an experiment*

Theme 4: Livestock husbandry

TOPIC	GENERAL OBJECTIVES *Learners will:*	SPECIFIC OBJECTIVES *Learners should be able to:*
4.1 Principles of livestock production		
4.1.1 Livestock anatomy	• develop an understanding of the anatomical structures of farm animals	• describe the structure of the digestive system of a **named** ruminant and a **named** non-ruminant (not poultry) • describe the structure of the reproductive system of a **named** farm animal (not poultry)
4.1.2 Livestock physiology	• acquire knowledge and understanding of the physiological processes of farm animals	• describe the processes of digestion and absorption in the alimentary canal of a ruminant and non-ruminant animal • explain the significance of microorganisms and enzymes in the digestive system of ruminants (reference to specific enzymes is not required) • state the functions of the reproductive parts of a **named** male and a **named** female farm animal (not poultry) • describe the role of male and female hormones in the reproductive systems of farm animals • describe the oestrus cycle, signs of heat, heat period and gestation period • discuss the advantages of artificial insemination • describe the processes of fertilisation and birth in a **named** farm animal (not poultry) • define *lactation* • explain the importance of colostrum • explain what is meant by *weaning* • explain how breeding cycles can be managed to increase yield from farm animals

TOPIC	GENERAL OBJECTIVES *Learners will:*	SPECIFIC OBJECTIVES *Learners should be able to:*
4.1.3 Livestock nutrition	• understand the nutritional requirements of livestock	• state the sources and functions of the following nutrients: carbohydrates, protein, fat, vitamins, minerals, fibre and water • differentiate between the types of animal supplementary feeds: concentrates and roughages: including their formulation, quality and dangers of contamination • discuss the importance of supplementary feeding • describe the change in nutritive value of forage with age • describe the nutritional content and feeding practices, including: the importance of a balanced ration, maintenance ration, production ration and the importance of adequate water supply • outline the suitability of different rations to the ages and stages of development of livestock • describe the symptoms of nutrient deficiency in farm animals • describe appropriate corrective measures for nutrient deficiencies in farm animals

TOPIC	GENERAL OBJECTIVES *Learners will:*	SPECIFIC OBJECTIVES *Learners should be able to:*
4.1.4 Pasture and range management	• acquire knowledge and understanding of pasture and range management	• explain what is meant by the term *pasture and range management* • discuss the methods of pasture and range management, including their advantages and disadvantages • describe the vegetation of grazing lands in Namibia, including grasses and legumes for grazing and bushes for browsing • describe **one** local grass species and **one** other pasture plant including their methods of propagation and establishment • define *stocking rate, carrying capacity* and describe dangers of overstocking • describe improvement of pasture by the use of fertiliser, lime and drainage • Explain the value of non-grass species to the pasture and livestock
4.2 Beef cattle		
4.2.1 Breeds	• acquire knowledge and understanding of different types of beef breeds	• identify the most important breeds of beef cattle, such as Afrikaner, Brahman, Bonsmara, Sanga and Hereford • list the cattle breeds recommended by the Ministry of Agriculture for farming purposes in Namibia • discuss reasons for the recommended breeds in Namibia
4.2.2 Characteristics of beef cattle	• understand the general characteristics of beef cattle	• describe the general characteristics of beef cattle
4.2.3 Handling of beef cattle	• acquire knowledge and skills on the handling of animals	• explain the reasons for carrying out different handling practices in beef cattle farming • explain how to carry out different handling practices in beef cattle farming and the tools used
4.2.4 The role of beef cattle in Namibia	• understand the role of beef cattle farming in Namibia	• explain the contribution of beef cattle farming to the economy of the country • discuss the importance of beef products such as meat and hides (leather)

TOPIC	GENERAL OBJECTIVES *Learners will:*	SPECIFIC OBJECTIVES *Learners should be able to:*
4.2.5 Health and diseases	• acquire knowledge and skills on the types of diseases and parasites affecting beef cattle	• identify diseases, (foot and mouth disease, red water, heart water, tuberculosis, lung sickness, brucellosis and anthrax) and parasites (round worms and ticks) affecting cattle in Namibia in general • describe symptoms, causes and control of **one** of the common diseases and **one** of the parasites listed above • distinguish ways in which diseases are spread: air-borne, water-borne, infectious, contagious and vectors • discuss legislation about animal diseases with specific reference to notifiable diseases and animal movement
4.2.6 Record keeping	• understand the importance of record keeping in beef cattle farming	• explain the importance of record keeping in cattle • describe examples of beef cattle records such as register, record sheets, and ear tagging including the use of the use of computer technology where applicable
4.2.7 Marketing	• acquire skills on different aspects of marketing beef cattle and their products	• identify countries that import beef and/or beef cattle products from Namibia • state the requirements for the export of beef cattle and beef products to regional and international markets including European market • Explain how the Veterinary Cordon Fence (VCF) affects the beef industry

***The practical activities, approaches and demonstrations required for Grade 10-11 Theme Livestock husbandry are listed below. These are considered basic and all learners should be exposed to them as a minimum requirement*.**
• *slaughter and dissect a farm animal, observe and identify the parts of the digestive system and the reproductive system (ensure to minimise the pain, distress and suffering of an animal at the time of killing and that the animal does not present any signs of consciousness)* • *prepare a production ration, maintenance ration and a balanced ration of named farm animals* • *carry out a grassland survey and describe the vegetation of that grazing land* • *visit a nearby farm and carry out different handling practices*

Theme 5: Livestock and crop breeding

TOPIC	**GENERAL OBJECTIVES** *Learners will:*	**SPECIFIC OBJECTIVES** *Learners should be able to:*
5.1 Monohybrid inheritance	• understand the concepts and practices related to monohybrid inheritance	• define the following terms: *chromosome, gene, allele, inheritance, homozygous, heterozygous, dominant and recessive* • explain the meaning of *genotype* and *phenotype* and assess their importance in livestock and crop breeding • calculate the results of simple genetic crosses • describe the reproductive technology that can be used to increase variation, improve characteristics, improve resistance to drought, pests and diseases and develop new breeds of animals and plants
5.2 Selection	• obtain knowledge of the process of selection in livestock and crop breeding	• discuss the role of artificial selection in the production of improved varieties of livestock and crops of economic importance • describe how breeding can improve yield, disease resistance, hardiness and appearance in livestock and crops • discuss the possible consequences of using genetic engineering in livestock and crop breeding (modification)

Theme 6: Community-based natural resource management

TOPIC	**GENERAL OBJECTIVES** *Learners will:*	**SPECIFIC OBJECTIVES** *Learners should be able to:*
6.1 Conservancies		
6.1.1 Management of Conservancies in Namibia	• acquire knowledge of the importance of conservancies to Namibian society	• explain what is meant by *conservancies* • discuss the history of community-based natural resource management in Namibia • discuss the importance of conservancies to commercial farmers and areas of communal land in Namibia • discuss the role of farmers in conservation of wildlife resources • identify three conservancies in different regions from the updated list of registered conservancies in Namibia
6.1.2 Legislation governing conservancies in Namibia	• have knowledge of current legislation which enables conservancies to use, manage and benefit from communal land	• explain the principle behind the laws relating to ownership of registered conservancies over-huntable game animals and birds • discuss the government's conditions of acceptance for the establishment of conservancies for communal use • describe the requirements for communal farmers to apply for permits to use protected and specially protected game and forests in their local areas
6.1.3 Conservancies and wildlife councils	• understand the difference between conservancies and wildlife councils	• compare and contrast the functions of the conservancies and wildlife councils in Namibia

TOPIC	GENERAL OBJECTIVES *Learners will:*	SPECIFIC OBJECTIVES *Learners should be able to:*
6.2 Conservation of community forestry in Namibia	• understand the importance of empowering local communities to manage forest resources in a sustainable way for their improved livelihood	• explain the meaning of *community forests* and the role of traditional authorities in forest management • describe the main steps for the establishment of community forests by interested communities in Namibia • discuss the benefits obtained by the communities from well managed community forests • discuss the requirements for communities to obtain rights to register community forests • discuss the causes and consequences of the loss of biodiversity including causes and problems of deforestation • discuss the role of farmers in conservation of forest resources
6.3 Community-based tourism	• acquire knowledge about community based tourism policy of Namibia	• describe ways in which communities can benefit from the tourism industry to promote social and economic development • explain how tourism provides opportunities for income generation for local communities and the promotion of entrepreneurship • describe how tourism helps to provide knowledge and skills to rural residents as they engage in tourism-related activities

Theme 7: Farm structures and machinery

TOPIC	**GENERAL OBJECTIVES** *Learners will:*	**SPECIFIC OBJECTIVES** *Learners should be able to:*
7.1 Fencing		
7.1.1 Types of fencing	• understand the importance and use of different types of fence	• describe types of fence suitable for different purposes :e.g. keeping livestock contained, keeping predators out, marking boundaries and controlling grazing
7.1.2 Fence construction	• acquire knowledge of the construction of fences	• describe materials available for fencing and their advantages and disadvantages • describe methods of fence construction and the treatment of fencing posts
7.2 Farm tools and machinery		
7.2.1 Simple farm tools	• acquire knowledge and skills in the use of simple farm tools	• describe the use and maintenance of the saw, hammer, screwdriver, file, spanner, sprayers and hand tools used in cultivation of land • state the advantages and disadvantages of simple hand tools used for cultivation
7.2.2 Farm machinery	• understand the use of farm machinery used in agriculture to maximise production	• identify farm machines and equipment, such as ploughs, harrows, planters and combine harvesters

TOPIC	GENERAL OBJECTIVES *Learners will:*	SPECIFIC OBJECTIVES *Learners should be able to:*
7.3 Water supply		
7.3.1 Tools and fittings	• acquire knowledge and skills on the use of various tools and materials in water supply systems	• identify and explain the use of the following tools: pulley, block and tackle, pipe spanners and vice-grip • identify and explain the uses of the different fittings used in water installation: pipe nipple, nipple adapter, T-piece, reducer, elbow joint and tap washers
7.3.2 Water pumps	• acquire knowledge and skills on different water pumps	• identify different water pumps used for supplying water to farmers: motor-driven pump, submersible pump, hand pump, Blake hydram pump • state the functions of the basic parts of the water pump
7.3.3 Maintenance of water installations	• understand the importance of regular checking and cleaning of water installations	• explain the necessity of regular cleaning and maintenance of water installations • describe the cleaning and maintenance of water installations

***The practical activities, approaches and demonstrations required for Grade 10-11 Theme Farm structures and machinery are listed below. These are considered basic and all learners should be exposed to them as a minimum requirement*.**
• *construct a fence using available fencing materials* • *demonstrate the use of various tools used in the installations of water supply systems* • *demonstrate how to replace the basic parts of water pumps, e.g. handle, rod and valves* • *demonstrate the cleaning and maintenance of water installations*

Theme 8: Agricultural economics

TOPIC	GENERAL OBJECTIVES *Learners will:*	SPECIFIC OBJECTIVES *Learners should be able to:*
8.1 Agricultural economics		
8.1.1 Principles of agricultural economics	• understand the general principles of agricultural economics	• state the meaning of the term *agricultural economics* • discuss factors of production such as land, capital, labour and entrepreneurship • explain the principles of *supply and demand, diminishing returns, risks and uncertainty*, opportunities and choices facing the farmer, decision-making based on understanding economic factors • discuss the influence of family size and a balanced national population on agricultural economics
8.1.2 Farm records and accounts	• obtain knowledge on the importance of keeping records and managing of farm financial accounts for a variety of farming enterprises	• state different types of farm records such as inventory, production and financial • outline the reasons for keeping farm records • describe how to keep farm records • explain financial accounts relating to farming enterprises, e.g. crop production including inputs and yields, cost and returns and calculating profit and loss • explain the differences between fixed and variable costs and state examples for each
8.1.3 Farm budgeting	• acquire skills on different aspects of budgeting	• state types of information for budgeting including prices of inputs, outputs and expected yield • compare gross and net margin • calculate the gross margin obtained from specific crops, (maize), or animals, (poultry) • explain the preparation of budgets as an aid to planning and control • draw up a simple budget
8.1.4 Marketing of agricultural produce	• understand the importance of agricultural marketing	• classify marketing agents and their functions • explain various ways in which marketing channels pose problems in agricultural production

The practical activities, approaches and demonstrations required for Grade 10–11 Theme Agricultural Economics are listed below. These are considered basic and all learners should be exposed to them as a minimum requirement.
• *draw up a simple budget and calculate the gross margin*

6. ASSESSMENT OBJECTIVES

The assessment will include, wherever appropriate, personal, social, environmental, economic and technological applications of Agriculture in modern society. The Agricultural Science syllabus must require that all candidates demonstrate the following objectives in the context of the content and skills prescribed. Within each of the assessment objectives the assessment must take account of the candidates' ability to communicate clearly and logically, using specialist vocabulary and conventions where appropriate.

The three assessment objectives in Agricultural Science are:

A Knowledge with understanding
B Handling information, application and problem solving
C Practical and investigative skills

A description of each Assessment Objective follows:

A. Knowledge with understanding

Learners should be able to demonstrate agricultural knowledge and understanding in relation to the use of:

- correct terms, symbols, quantities and units
- facts, concepts, principles, patterns, models and theories
- techniques, procedures and principles of safe agricultural practices
- technological applications with their social, economic and environmental implications

The curriculum content defines the factual material that candidates need to recall and explain. Questions testing these objectives will often begin with one of the following words: sketch, identify, define, name, list, indicate, give examples, state, describe, compare, explain, distinguish, outline and give reasons.

B. Handling information, application and problem solving

Learners should be able to use oral, written, symbolic, graphical and numerical forms of presentation, to:

- locate, select, organise and present information from a variety of sources
- translate information from one form to another
- use information to identify patterns, report trends and draw inferences
- present reasoned explanations for phenomena, patterns and relationships
- make predictions and propose hypotheses
- solve problems, including some of a quantitative and qualitative nature

These skills cannot be precisely specified in the curriculum content as questions testing such skills are often based on information which is unfamiliar to the candidate. In answering such questions, candidates are required to use principles and concepts that are within the syllabus and apply them in a logical, deductive manner to a novel situation. Questions testing these skills will often begin with one of the following words: discuss, deduce, compare and discuss, find, estimate, interpret, evaluate, predict, relate, suggest, calculate or determine.

C. Practical (experimental and investigative) skills

Learners should be able to:

- understand and follow instructions
- use and organise techniques, apparatus and materials
- make and record observations and measurements
- interpret and evaluate experimental observations and data
- plan investigations

7. SCHEME OF ASSESSMENT

The assessment will consist of school based-assessment and a terminal end-of-year examination.

All candidates should be entered for papers 1 and 2 as they are compulsory.

Paper 1: Theory			
Paper	**Description of paper and types of questions**	**Duration of paper**	**Marks**
Paper 1: Section A	This section will consist of compulsory, multiple choice, short and structured questions. The questions will test skills and abilities mainly in assessment objectives A and B.	2 hours	90
Section B	This section will consist of four optional free-response questions. Candidates answer **two** out of **four** questions. Each question worth 15 marks. The questions will test skills and abilities mainly in Assessment Objectives A and B with some application questions that will test Assessment Objective C.		30
Total Marks			**120**
Weighting			**70%**
Paper 2: School Based Assessment (SBA) of practical skills			
Paper	**Description of paper and types of questions**	**Duration**	**Marks**
Paper 2	The purpose of this component is to test appropriate skills in Assessment Objective C. This is a continuous assessment of candidates' practical work. The coursework can be done continuously throughout the five terms. It consists of at least four practical exercises carried out over the course and a practical investigation, which could be up to three practical exercises. Each practical exercise will be marked out of 15 marks. A practical investigation will be marked out of 30 marks. These practical exercises will be submitted for external moderation at the end of grade 11.	**Five** terms	
Total Marks	4 practical skills: 60 1 investigation skills:30		**90**
Weighting	4 practical skills: 20% 1 investigation skills:10%		**30%**

Weighting of papers

All learners will be entered for papers 1 and 2 specified below.
Learners will be graded from **A* - G** depending on their abilities and achievements.

Weighting of papers	**Percentages**
Paper 1 Theory Paper 2 (School-Based Assessment of Practical Skills)	70% 30%

NB: Teachers may not undertake school-based assessment without the written approval of the National Examination, Assessment and Certification Board of Namibia. Teachers will therefore have to undergo special in-service training in assessment and moderation of coursework before entering candidates.

8. SPECIFICATION GRID

Weighting of assessment objectives and papers

Assessment objectives	**Weighting in Examination Overall**	**Paper 1 120 Marks**	**Paper 2 90 Marks**
A. Knowledge with understanding	30%	50	-
B. Handling information, application and problem solving	40%	70	-
C. Practical (Experimental and Investigative) Skills	30%	-	90
	100%	**120 Marks**	**90 Marks**
	Total Marks		**210**

9. GRADE DESCRIPTIONS

The scheme of assessment is intended to encourage positive achievement by all learners. Grade descriptions are therefore provided for judgmental Grades A, C, and F to give a general indication of the standards of achievement likely to have been shown by learners awarded particular grades. The descriptions must be interpreted in relation to the content specified by the Agricultural Science syllabus but are not designed to define that content. The grades awarded will depend in practice upon the extent to which the learner has met the assessment objective overall. Shortcomings in some aspects of the assessment may be balanced by better performance in others.

*At **Grade A** the learner is expected to:*

- recall a wide range of knowledge from all areas of the syllabus
- use detailed scientific knowledge and understanding in a range of applications relating to scientific systems or phenomena
- use a wide range of scientific and technical vocabulary throughout their work
- explain how theories can be changed by new evidence and identify some areas of uncertainty in agriculture
- select and collate information from a number of sources and present it in a clear, logical form
- solve problems in situations that may involve a wide range of variables
- process data from a number of sources to identify patterns or trends
- generate a hypothesis to explain facts, or find facts to support a hypothesis.

*At **Grade C** the learner is expected to:*

- recall a range of scientific information from all areas of the syllabus
- use and apply scientific knowledge and understanding in some general contexts
- use appropriate scientific and technical vocabulary in a range of contexts
- explain how scientific theories can be modified by new scientific evidence
- select a range of information from a given source and present it in a clear, logical form
- identify patterns or trends in given information
- solve problems involving more than one step, but with a range of variables
- generate a hypothesis to explain a given set of facts or data.

*At **Grade F** the learner is expected to:*

- recall facts contained in the syllabus
- indicate the correct procedure for a single operation
- select and present a single piece of information from a given source
- solve a problem involving one step, or more than one step if structured help is given
- identify a pattern or trend where only minor manipulation of data is needed
- recognise which of two given hypotheses explains a set of facts or data.

10. GLOSSARY OF TERMS USED IN SCIENCE PAPERS

It is hoped that the glossary (which is relevant only to science subjects) will prove helpful to learners as a guide, i.e. it is neither exhaustive nor definitive. The glossary has been deliberately kept brief not only with respect to number of terms included but also to the descriptions of their meanings. Learners should appreciate that the meaning of a term must depend in part on its context.

Define (the term(s) …)	is intended literally, only a formal statement or equivalent paraphrase being required.
State	implies a concise answer with little or no supporting argument, e.g. a numerical answer that can readily be obtained by inspection.
List	requires a number of points, generally each of one word, with no elaboration. Where a given number of points are specified, this should not be exceeded.
Explain	(a) *Explain* may imply reasoning or some reference to theory, depending on the context. It is another way of asking candidates to give reasons for something. The candidate needs to leave the examiner in no doubt **why** something happens. (b) *Give a reason/give reasons* is another way of asking candidates to explain **why** something happens.
Describe	requires the candidate to state in words (using diagrams where appropriate) the main points of the topic. It is often with reference either to particular phenomena or to particular experiments. In the former instance, the term usually implies that the answer include reference to (visual) observation associated with the phenomena. In other contexts, describe should be interpreted more generally, i.e. the candidate has greater discretion over the nature of the organisation of the material to be included in the answer. Describe and explain may be coupled, as may state and explain.
Discuss	requires the candidate to give a critical account of the points involved in the topic.
Outline	implies brevity, (i.e. restricting answers to giving essentials).
Predict	implies that the candidate is not expected to produce the required answer by recall but by making a logical connection between other pieces of information. Such information may be wholly in the question or may depend on answers extracted in an earlier part of the question. Predict also implies a concise answer, with no supporting statement required.
Deduce	is used in a similar way to predict except that some supporting statement is required, e.g. reference to a law or principle, or the necessary reasoning is to be included in the answer.

Suggest	is used in two main contexts, i.e. either to imply that there is no unique answer (e.g. in chemistry, two or more substances may satisfy the given conditions describing an 'unknown'), or to imply that candidates are expected to apply their general knowledge to a 'novel' situation, one that may be formally 'not in the syllabus').
Find	is a general term that may variously be interpreted as calculate, measure, determine, etc.
Calculate	is used when a numerical answer is required. In general, working should be shown, especially where two or more steps are involved.
Measure	implies the quantity concerned can be directly obtained from a suitable measuring instrument, (e.g. length, using a rule, or mass, using a balance).
Determine	often implies that the quantity concerned cannot be measured directly but is obtained by calculation, substituting measured or known values of other quantities into a standard formula, (e.g. the Young modulus, relative molecular mass).
Estimate	implies a reasoned order of magnitude statement or calculation of the quantity concerned, making such simplifying assumptions as may be necessary about points of principle and about the values of quantities not otherwise included in the question.
Sketch	when applied to graph work, implies that the shape and/or position of the curve need only be qualitatively correct, but candidates should be aware that, depending on the context, some quantitative aspects may be looked for, (e.g. passing through the origin, having an intercept, asymptote or discontinuity at a particular value). In diagrams, sketch implies that a simple, freehand drawing is acceptable; nevertheless, care should be taken over proportions and the clear exposition of important details.
Analyse	is used when information should be examined to discover patterns or relationships.
Differentiate/ Compare	to explain the resemblances, similarities or differences between two or more numbers, objects, or figures by considering their attributes/characteristics; or to determine if two or more items, entries or variables are the same and if not, identify differences and give a reason for your answer.
Classify	to arrange or organise according to systematic groups, classes, properties, characteristics or categories.
Investigate	examine a problem in a systematic way.
Distinguish	tell apart, show or indicate the difference between, find out what is unique about a material or situation.

ANNEXE A: ASSESSMENT CRITERIA FOR COURSEWORK (SCHOOL-BASED ASSESSMENT-SBA)

To be read together with the *Distance Training Manual* obtainable from MoEAC (DNEA).

Introduction and aims of coursework In Agricultural Science

Paper 2 will be based on four practical exercises and one practical investigation and will be compulsory for all learners of Agricultural Science. The teacher's assessment of practical work should aim at evaluating skills and abilities essential to the study of Agricultural Science that are not measured by theory examination. Each practical exercise should be marked out of 15 marks, while a practical investigation should count out of 30 marks leading to an overall mark of 90.

Moderation

- **Internal moderation**

  When several teachers in a centre are involved in internal assessment, arrangements must be made within the centre for all candidates to be assessed to a common standard. It is essential that, within each centre, the marks for each skill assigned within different teaching groups (e.g. different classes) are moderated internally for the whole entry before they are subjected to external moderation.

- **External moderation**

  The internal coursework assessment will be externally moderated. Individual Candidate Record Cards and Coursework Assessment Summary Forms must be received by the DNEA in Windhoek no later than 31 October of each year. These forms must be accompanied by a sample of written components undertaken by candidates and the instructions for practical work prepared for candidates by the assessor or teacher. The sample should cover the full ability range. Where there are ten or fewer candidates, all the coursework that contributed to the final mark for all the candidates must be sent to DNEA for moderation purposes. If there are more than ten candidates, all the coursework that contributed to the final mark for ten of them will be required. The centre should select candidates covering the whole mark range, with the marks spaced as evenly as possible, from the highest mark to the lowest. If appropriate, the samples should be selected from the classes of different teachers offering Agricultural Science at this level. All records and supporting written work should be retained until after publication of results. Examples of both coursework forms for paper 2 are included at the back of this syllabus.

- **Paper 2: Practical skills (90 marks)**

The Agricultural Science teacher is required to assess the practical work carried out by learners during the first **five** terms of the Senior Secondary programme. This entails keeping a record for all learners, showing the operations carried out and the marks awarded. Much essential 'field work' in Agricultural Science has no written component, but exercises should be designed to generate some written work, e.g. plans, records of results, etc. At least one practical skill must assess the planning of an investigation as stated in the assessment objective C. Each practical exercise should be assessed according to the criteria stated in **Annexe B.**

- **Examples of tasks suitable for assessment of practical exercises in Agricultural Science.**

Vegetable production, animal husbandry, soil and crop husbandry offer many opportunities to assess the learners' practical work.

The following are a few examples as a guide to the teacher:

- digging, and the preparation of rough tilth
- preparation of a seed bed
- seed sowing (drills left open for checking depth and spacing)
- fertilising (calculation of quantities, placement, top dressing)
- transplanting and shading
- mulching
- weeding
- pruning
- growing of cereal and root crops
- crop protection (spraying, pest and disease control)
- harvesting and storage of crops
- care of livestock, including routine hygiene measures (clean water, feed, removal of litter)
- maintenance of cages, pens, nest-boxes in clean and tidy condition
- slaughtering and dressing chickens
- handling of animals (de-horning, castration and branding)

Note: Tasks that may be of a potential hazard to learners should be done under a supervision of the teacher e.g. **pruning**, **slaughtering chickens** and handling of cattle when **branding**, **de-horning** and **castration**.

ANNEXE B: ASSESSMENT OF COURSEWORK

(i) Criteria for assessment of practical exercises

The following five criteria should be assessed and marked out of a maximum of three marks.

1. Responsibility–the ability to assume responsibility for the task in hand, and to work on given instructions without detailed supervision and help
2. Initiative–the ability to cope with problems arising in connection with the task, to see what needs to be done and to take effective action
3. Technique–the ability to tackle a practical task in a methodical, systematic way and to handle tools skilfully and to good effect
4. Perseverance–the ability to see the task through to a successful conclusion with determination and sustained effort
5. Quality–the ability to attend to detail, so that the work is well-finished and well-presented

The final mark for paper 2 should be a maximum of 90 marks (i.e. 60 marks from practical exercises and 30 marks from practical investigation)

Guide to marking practical work

1 Responsibility

• follows written or verbal instructions without the need for help • carries out appropriate safety procedures • works well in a group, assumes responsibility easily and leads in the group	3
• follows written or verbal instructions with a little help • is aware of the need for safety procedures but has difficulty in recognising them without guidance • works within the group, shows responsibility for the work	2
• follows written or verbal instructions with considerable help • shows little regard for safety procedures, even when told • works alone, shows some responsibility for the work	0–1

2 Initiative

• offers solutions or explanations for unexpected problems • recognises, and is able to anticipate problems • solves problems without help • comments on imperfections of practical work	3
• offers solutions or explanations for unexpected problems after seeking advice • solves problems with help • recognises faults in experimental methods, given some indicators	2
• is uncertain how to proceed and requires considerable help • recognises only the most obvious errors in experimental methods after guidance given	0–1

3. Technique

• approaches tasks methodically and systematically • handles tools/apparatus skilfully and confidently • carries out practical procedures with dexterity	3
• handles tools/apparatus effectively • carries out practical procedures adequately	2
• handles tools/apparatus clumsily • carries out practical procedures with difficulty	0–1

4. Perseverance

• completes all the required practical tasks and attendant written work • has a positive attitude and is well motivated • carries out repetitive procedures willingly	3
• completes the required practical tasks and attendant written work with a little encouragement • carries out repetitive procedures willingly	2
• does not complete the required practical tasks and attendant written work • is somewhat disinterested/impatient when carrying out work and is disinclined to repeat procedures	0–1

5. Quality

• performs practical work thoroughly, pays attention to detail and produces a very good final result • produces accurate, clear and neatly presented written work	3
• performs practical work thoroughly for the most part and produces a satisfactory to good final result • produces mostly accurate and clearly presented written work	2
• performs practical work in a rushed and superficial way and shows little concern for the finished product • produces inaccurate and poorly presented written work	0–1

(ii) Criteria for assessment of practical investigation

This should address the parts of Assessment Objective C where candidates produce a hypothesis, plan and carry out an investigation. The data collected is recorded, analysed and conclusions made. A written report is required and the limitations of the investigations noted.

The candidates will carry out the investigation and write a report. Not exceeding 1000 words. The teacher evaluates and marks the report and awards an overall mark out of 30.

The type of work required to test investigative skills

The main aim of the investigation is that it should be done by the individual candidate, in connection with some particular study problem. It should not be confused with the writing up of class exercises.

Principles to be followed when finding suitable topics:

a) The work must be investigatory. Candidates should find the information for themselves by direct observation and measurement.

b) It is the teacher's responsibility to guide the candidates or even to select problems that suit the candidate's investigatory abilities. The teacher must also suggest methods of investigation that are likely to be effective. Candidates are not research workers but, when given appropriate guidance, they can learn how to carry out investigations for themselves.

c) The nature of the problem to be investigated should be stated and discussed by the candidate in the introduction.

d) Time allocated to investigation work should be approximately 5 periods of 40 minutes, including homework. This should be enough to achieve a good standard. Candidates should be discouraged from spending so much time on their projects that their normal classwork suffers.

e) Candidates will not necessarily solve all the problems they tackle, but they should make a worthwhile attempt to do so. When problems fail to yield positive results, candidates should be encouraged to discuss their actual findings and comment on the implications. Good investigation work by candidates often leads them to understand the difficulties and subtleties of the problem and this can be very educational. For some candidates, negative results can be depressing, and teacher must use their judgement when guiding them, so that they do not become discouraged.

Examples of acceptable investigations

Investigations can be based on a variety of topics. The following examples are intended as a guide, but teachers may wish to help their candidates to devise investigations of their own along similar lines.

Field experiments

- Comparison of sowing depths, to discover effects; minimum, optimum and maximum depths
- Thinning of root crops; no thinning, thinning to various spacing, effects upon total yield and size of roots produced
- Planting population in relation to yield; spacing of plant stations and rows, comparison to find optimum spacing
- Spraying versus not spraying; effects on infestation with disease or pest organisms, effects on yield, cost effectiveness
- Top-dressing versus not top-dressing; various treatments and effects, comparison of cost and yields
- Fertiliser trials; organic versus inorganic, effects of differing application rates upon yields, diminishing returns
- Rationing of livestock feed versus ad-lib feeding; effects on production, cost-effectiveness
- Effects of different levels of nutrition on young stock (e.g. broiler chickens); measurement of live weight gain under different rationing regimes, effects on health, cost-effectiveness

In the case of field trials, it is often useful to have a group of candidates involved, in order to make possible replication of treatments on plots in different parts of the garden or field. This improves the statistical accuracy of the trial. However, each candidate's contribution must be assessed and **individual reports must be written**.
When different treatments are tried, the effect upon yield of produce is often a factor to be measured. The cost-effectiveness of alternative treatments should also be worked out, to see which one is the most profitable.

Attention should be paid to the presentation of results in a clear and concise form, i.e. tabulation or graphical representation. Reasons should always be given for treatments carried out, method tried, or conclusions reached.

An example of how the practical exercises may be integrated within the practical investigation

A candidate has decided to carry out an investigation into the effect of nitrate fertiliser on the yield of cabbages. Having proposed a hypothesis with the scientific reasons behind it and planned a suitable investigation, the practical work is carried out. The first practical assessment could involve the preparation of the soil seed bed.
The second assessment could involve the planting and the spacing of cabbages and the application of the nitrate fertiliser. The third assessment could involve harvesting and measuring the cabbage yield. The recording of the data, subsequent analysis and limitations are then written up as part of the practical investigation.

The degree of guidance by the teacher
This calls for skill on the part of the teacher. Ideally, the candidate should be free to choose a topic for the investigation and to decide on the methods to be used. In practice, the candidate will need help, because of inexperience. The teacher should never leave the candidate in doubt for long about what to do next, so that the candidate does not lose interest in or enthusiasm for the investigation.

The layout of the investigation report
Title: The report should have a clear title. This should appear on the first page, together with the name of the candidate and the name of the school.
Contents: A list of contents should be included, showing clearly the main sections of the report and the numbers of pages where they appear. Lists of tables, graphs and photographs can also be included, if appropriate.
Introduction: This should state the objective(s) of the investigation, the questions to be asked or a hypothesis, and describe briefly the plans for carrying it out. Sources of material, such as reference books or people interviewed, should be acknowledged. Details of the time (with dates) and the place where the investigation was carried out should be given.
Methodology: A description of the investigation. Relevant details of the methods used to plan, sample, measure, collect and analyse data.
Presentation of data findings: Data collected should be presented in this section as tables, charts, graphs or histograms. They must always be labelled with brief description of the data.
Findings and the conclusions: The conclusions of the investigation should be summarised in a few paragraphs. The findings should be compared to the original plan set out in the introduction. Limitations of the data should be noted and suggestions made for improvements. Help received from other people should be acknowledged.

Criteria for the assessment of the practical investigation

The practical investigation should be marked using the following criteria:

Criteria	Marks Available
1. The selection of relevant questions (hypothesis) for the investigation	5
2. The planning of the investigation and the principles on which it is based	5
3. The handling of evidence	5
4. The ability to make deductions from evidence or the data acquired	5
5. The ability to recognise limitations of the investigation	5
6. Description of practical, presentation, layout and originality (candidate's own work)	5

Guide for marking against the investigation report criteria

1. The selection of relevant questions (hypothesis) for the investigation	Marks
Relevant questions (hypothesis) selected without guidance, appropriate and clearly stated	5
Relevant questions (hypothesis) selected without guidance, appropriate but poorly expressed.	4
Relevant questions (hypothesis) selected with guidance, appropriate and clearly stated	3
Relevant questions (hypothesis) selected with guidance, appropriate but poorly expressed	2
Relevant questions (hypothesis) selected with considerable guidance	1
Relevant questions (hypothesis) provided to the candidate	0
2. The planning of the investigation and the principles on which it is based	Marks
Investigation well planned, without guidance, showing evidence that the relevant principles are understood	5
	4
Investigation adequately planned, with some guidance, relevant principles understood	3
	2
Investigation plan sketchy, plan produced with considerable guidance or no evidence that principles are understood	1
Investigation plan are provided for the candidate	0

3. The handling of evidence	Marks
Results are presented neatly and clearly in a table, appropriate method of analysis chosen, graphs and or histograms accurate and correctly presented (i.e. correct scale, axis, labelling etc.)	5
	4
Results are presented neatly and clearly in a table, inappropriate method of analysis chosen, graphs and or histograms inaccurate and incorrectly presented	3
	2
Results not presented in a table, inappropriate method of analysis chosen, graphs and or histograms inaccurate and poorly presented	1
	0
4. The ability to make deductions from evidence or the data acquired	Marks
Comprehensive deductions based on the evidence, conclusions given with reasons	5
Several deductions based on the evidence, conclusions given with reasons	4
Few deductions base on the evidence, one conclusion given	3
Few deductions base on the evidence, no conclusion given	2
One deduction, no elaboration	1
Tasks carried out with considerable help, inaccurate observations and records	0
5. The ability to recognise limitations of the investigation	Marks
All major limitations identified, assessed and improvements suggested	5
	4
Several limitations identified, assessments or improvements suggested	3
	2
One or two limitations identified but no assessment superficial, no improvements given	1
	0
6. Description of practical, presentation, layout and originality (candidate's own work)	Marks
Clear, full description of the aims and nature of the topic; work neat and well presented; layout as required by the syllabus; candidate's own work	5
	4
Description of the aims and nature of the investigation given, lacking in either neat presentation or layout not as required by the syllabus, candidates own work	3
	2
Outline only of the aims and nature of the investigation; poorly presented, layout not as required by the syllabus, candidate's own work	1
	0

ANNEXE C: PHYSICAL AND CHEMICAL CONCEPTS AND PROCESSES
For the purpose of assessment, learners will be expected to demonstrate:

1. an understanding of temperature, pressure, evaporation and relative humidity
2. an understanding of the terms element, mixture, compound, atom, molecule and ion
3. an understanding of the terms acid, base and pH value
4. an understanding of energy transfer/conversion

ANNEXE D: MATHEMATICAL REQUIREMENTS

Calculators may be used in all parts of the assessment.

Learners should be able to:

1. add, subtract, multiply and divide
2. understand mean values, decimals, fractions, percentages and ratios
3. understand the relationship between surface area and volume
4. use direct and inverse proportion
5. draw charts and graphs, including histograms, from given data
6. interpret charts and graphs
7. select suitable scales and axes for graphs

ANNEXE E: TERMINOLOGY, UNITS, SYMBOLS AND PRESENTATION OF DATA FOR AGRICULTURAL SCIENCE

These will be used by Principal Examiners during the setting of papers. Learners should be made aware of the terminology during teaching and practical work.

This section follows the practice laid down in the following documents:
Association for Science Education booklet, *SI Units, Signs, Symbols and Abbreviations (1981)*

Institute of Biology, Biology Nomenclature, Standard Terms and Expressions used in the Teaching of Biology (2000)

1. Numbers

The decimal point will be placed on the line, e.g. 52.35.
Numbers from 1000 to 9999 will be printed without commas or space.
Numbers greater than or equal to 10 000 will be printed without commas. A space will be left between each group of three whole numbers, e.g. 4 256 789.

2. Units

The International System of Units will be used (SI units). Units will be indicated in the singular and not in the plural, e.g. 28 kg.

(a) SI units commonly used in Agricultural Science are listed below.

N.B. Care should be taken in the use of *mass* and *weight*. In many agricultural contexts, the term *mass* is correct, e.g. dry mass, biomass.

Quantity	***Name of units***	***unit symbol***
length	metre	m
	kilometre	km
	centimetre	cm
	millimetre	mm
	micrometre	μm
mass	tonne (1000 kg)	t
	kilogram	kg
	gram	g
	milligram	mg
	microgram	μg
time	year	y
	day	d
	hour	h
	minute	m
	second	s
amount of substance	mole	mol

(b) Derived SI units are listed below.

energy	kilojoule	kJ
	joule	J
	(calorie is obsolete)	

(c) Recommended units for area, volume and density are listed below.

area	hectare = 10^4 m^2	ha
	square metre	m^2
	square decimetre	dm^2
	square centimetre	cm^2
	square millimetre	mm^2
volume	cubic kilometre	km^3
	cubic metre	m^3
	cubic decimetre (preferred to litres)	dm^3
	litre	dm^3 (not l)
	cubic centimetre	cm^3
	cubic millimetre	mm^3
density	kilogram per cubic metre	kg/m^3 or $kg\ m^{-3}$
	gram per cubic centimetre	g/cm^3 or $g\ cm^{-3}$

(d) Use of Solidus

The Solidus (/) will be used for a quotient, e.g. m/s for minutes per second.

3. Presentation of data

(a) Tables

(i) Each column of a table will be headed by the physical quantity and appropriate SI unit, e.g. time/min. There are three acceptable methods of stating units, e.g. metres per sec or m per s or m s^{-1}.

(ii) The column headings of the table can then be directly transferred to the axes of a constructed graph.

(b) Graphs

(i) The independent variables will be plotted on the x-axis (horizontal axis) and the dependent variable on the y-axis (vertical axis).

(ii) Each axis will be labelled with the physical quantity and the appropriate SI unit, e.g. time/min.

(iii) The graph is the whole diagrammatic presentation. It may have one or several curves plotted on it.

(iv) Curves and lines joining points on the graph should be referred to as 'curves'.

(v) Points on the curve should be clearly marked as crosses (x) or encircled dots (⊙). If another curve is included, vertical crosses (+) may be used to mark the points.

(c) Pie Charts

These should be drawn with the sectors in rank order, largest first, beginning at 'noon' and proceeding clockwise. Pie charts should preferably contain no more than six sectors.

(d) Bar Charts

These are drawn when one of the variables is not numerical, e.g. numbers of eggs of different colours. They should be made up of narrow blocks of equal width that do **not** touch.

(e) Column Graphs

These are drawn when plotting frequency graphs from discrete data, e.g. frequency of occurrence of nests with different numbers of eggs. They should be made up of narrow blocks of equal width that do **not** touch.

(f) Histograms

These are drawn when plotting frequency graphs with continuous data, e.g. frequency of occurrence of stems of different length or chicks of different masses. The blocks should be drawn in order of increasing or decreasing magnitude and they **should** be touching.

ANNEXE F: COURSEWORK ASSESSMENT FORMS

Annexe F1: Individual Candidate Record Card (ICRC) for practical exercises

Please read the instructions printed overleaf and the General Coursework Regulations before completing this form.

Centre Number						**Centre Name**				**November**	2	0		
Candidate Number						**Candidate Name**				**Teaching Group/Set**				
Brief description of practical exercise taken						**1 Responsibility - following instructions**	**2 Initiative - coping with problems**	**3 Technique - tackling tasks systematically and skilfully**	**4 Perseverance - seeing a task through to the end**	**5 Quality -attending to details**				
Total						(max. 12)	(max. 12)	(max. 12)	(max. 12)	(max. 12)	(max. 60)			

Annexe F2: Individual Candidate Record Card (ICRC) for practical investigation

Please read the instructions printed overleaf and the General Coursework Regulations before completing this form.

Title:

……

……

Centre Number						Centre Name:	November		2	0		
Candidate Number						Candidate name:	Teaching Group/Set					
Criteria							Marks					
1. The selection of relevant questions (hypothesis) for the investigation												
2. The planning of the investigation and the principles on which it is based												
3. The handling of evidence												
4. The ability to make deductions from evidence or the data acquired												
5. The ability to recognise limitations of the investigation												
6. Description of practical, presentation, layout and originality (candidate's own work)												
Total							(max. 30)					
Overall total marks for practical skills (4 practical exercises and 1 practical investigation)							(max. 90)					

Instructions for completing individual candidate record cards

Complete the information at the end of the form

- Ensure that the individual candidate record card is printed on both sides (i.e. one side for the 4 practical exercises and the other side for a practical investigation).
- The investigation topic for each candidate should be entered on top of each individual candidate record card for practical investigation.
- Mark each practical exercise and investigation for each candidate according to the instructions given in the syllabus booklet.
- Enter marks and total marks in the appropriate spaces. Complete any other sections of the form required.
- Ensure that the addition of marks is independently checked.
- It is essential that the marks of candidates from different teaching groups within each centre are moderated internally. This means that the marks awarded to all candidates within a centre must be brought to a common standard by the teacher responsible for coordinating the internal assessment (i.e. the internal moderator), and a single valid and reliable set of marks should be produced which reflects the relative attainment of all candidates in the coursework component at the centre.
- Attach this form to the candidate's practical exercises, and retain until required for external moderation. Further detailed instructions about external moderation will be sent in early October of the year of examination. See also instructions on the Coursework Assessment Summary Form (CASF).

Annexe F3: Coursework Assessment Summary Form (CASF)

Please read the instructions printed overleaf and the general coursework regulations before completing this form.

Centre Number						**Centre Name**		**November**	**2**	**0**		

Candidate Number	**Candidate Name**	**Teaching Group/ Set**	**Total Marks for Practical Exercises** (max. 60)	**Total Marks for Practical Investigation** (max. 30)	**Total Mark (DNEA and OMR)** (max. 90)	**Internal Moderated Mark**

Name of teacher completing this form		**Signature**		**Date**						
Name of internal moderator		**Signature**		**Date**						

Instructions for completing the Coursework Assessment Summary Form (CASF)

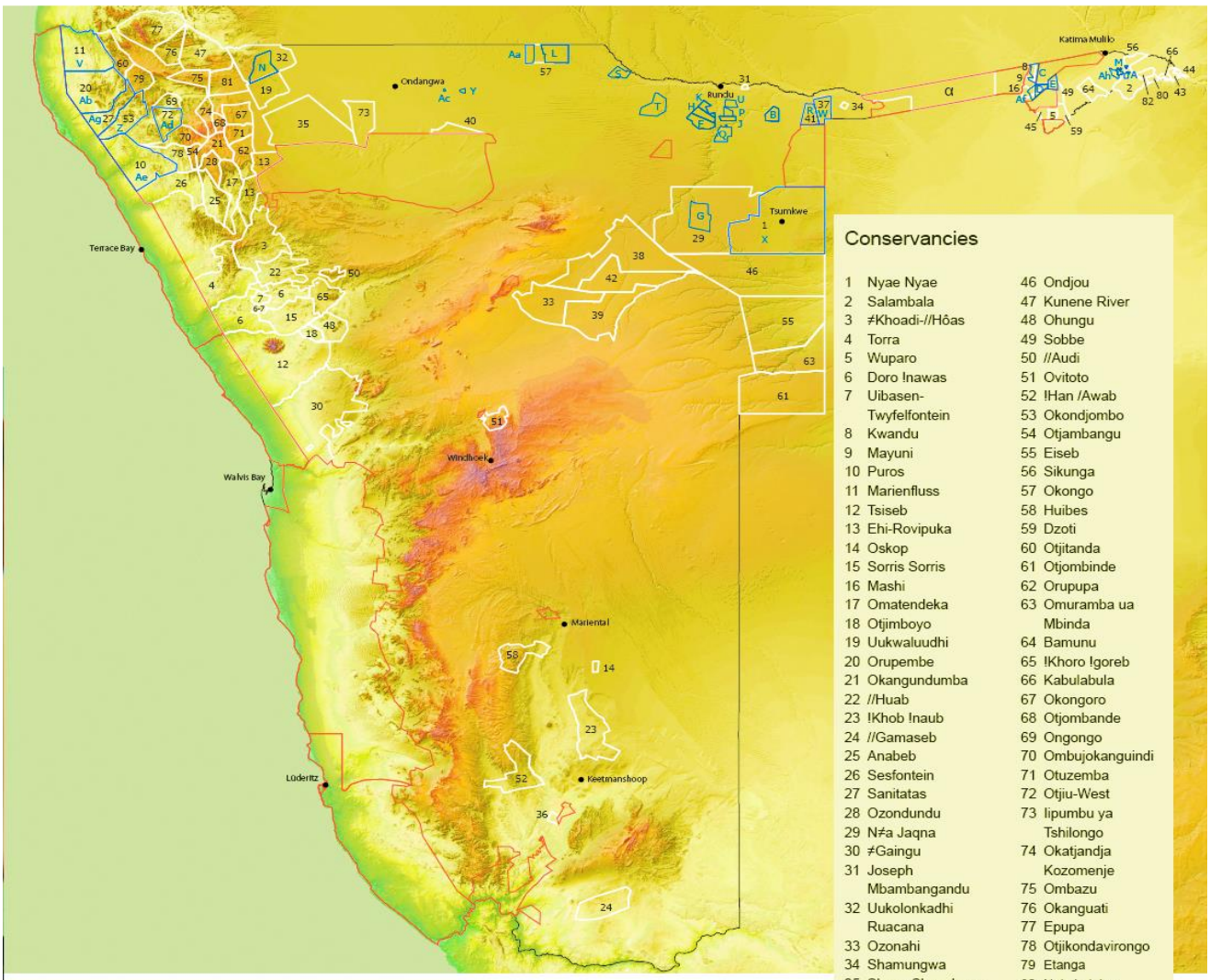
1. Complete the information at the head of the form.
2. List the candidates in an order which will allow ease of transfer of information to a computer printed Coursework Mark Sheet MS1 at a later stage (i.e. in candidate index number order, where this is known. Show the teaching group or set for each candidate. The initials of a teacher may be used to indicate a group or set.
3. Transfer each **candidate's Mark** from his or her **Individual Candidate Record Card** to this form as follows:
    a) Where there is a column for, **Total Marks for Practical Exercises** enter the marks for practical exercises initially awarded (i.e. before internal moderation took place).
    b) Where there is a column for, **Total Marks for Practical Investigation** enter the marks for practical exercises initially awarded (i.e. before internal moderation took place).
    c) In the column headed '**Total Mark (DNEA and OMR)**, enter the total (practical exercises + investigation) mark awarded before internal moderation took place.
    d) In the column headed '**Internal Moderated Mark'**, enter the total (practical exercises + investigation) mark awarded after internal moderation took place.
4. Both the teacher completing the form and the internal moderator (or moderators) should check the form to ensure all additions and transcriptions are correct before signing the bottom portion.

ANNEXE G: CONSERVANCIES AND COMMUNITY FORESTS ACROSS NAMIBIA

Community conservation in Namibia 2016

he distribution of conservancies and community forests across Namibia

At the end of 2016, there were 82 registered communal conservancies and 32 registered community forests in Namibia and one community association in a national park, covering 165,182 km². [The lists below follow the chronological sequence of registration]



Conservancies

1 Nyae Nyae
2 Salambala
3 ≠Khoadi-//Hôas
4 Torra
5 Wuparo
6 Doro !nawas
7 Uibasen-Twyfelfontein
8 Kwandu
9 Mayuni
10 Puros
11 Marienfluss
12 Tsiseb
13 Ehi-Rovipuka
14 Oskop
15 Sorris Sorris
16 Mashi
17 Omatendeka
18 Otjimboyo
19 Uukwaluudhi
20 Orupembe
21 Okangundumba
22 //Huab
23 !Khob !naub
24 //Gamaseb
25 Anabeb
26 Sesfontein
27 Sanitatas
28 Ozondundu
29 N≠a Jaqna
30 ≠Gaingu
31 Joseph Mbambangandu
32 Uukolonkadhi Ruacana
33 Ozonahi
34 Shamungwa
35 Sheya Shuushona
36 !Gawachab
37 Muduva Nyangana
38 Otjituuo
39 African Wild Dog
40 King Nehale
41 George Mukoya
42 Okamatapati
43 Kasika
44 Impalila
45 Balyerwa
46 Ondjou
47 Kunene River
48 Ohungu
49 Sobbe
50 //Audi
51 Ovitoto
52 !Han /Awab
53 Okondjombo
54 Otjambangu
55 Eiseb
56 Sikunga
57 Okongo
58 Huibes
59 Dzoti
60 Otjitanda
61 Otjombinde
62 Orupupa
63 Omuramba ua Mbinda
64 Bamunu
65 !Khoro !goreb
66 Kabulabula
67 Okongoro
68 Otjombande
69 Ongongo
70 Ombujokanguindi
71 Otuzemba
72 Otjiu-West
73 Iipumbu ya Tshilongo
74 Okatjandja Kozomenje
75 Ombazu
76 Okanguati
77 Epupa
78 Otjikondavirongo
79 Etanga
80 Nakabolelwa
81 Ombombo
82 Lusese

α Kyaramacan Association

6-7 Doro !nawas/ Uibasen-Twyfelfontein Joint Management Area

Community Forests

A Bukalo
B Hans Kanyinga
C Kwandu
D Lubuta
E Masida
F Mbeyo
G Mkata
H Ncamagoro
J Ncaute
K Ncumcara
L Okongo
M Sikanjabuka
N Uukolonkadhi
P Cuma
Q Gcwatjinga
R George Mukoya
S Kahenge
T Katope
U Likwaterera
V Marienfluss
W Muduva Nyangana
X Nyae Nyae
Y Ohepi
Z Okondjombo
Aa Omufitu Wekuta
Ab Orupembe
Ac Oshaampula
Ad Otjiu-West
Ae Puros
Af Sachona
Ag Sanitatas
Ah Zilitene

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