

CHAPTER 3

AGRICULTURAL SCIENCES

The following report should be read in conjunction with the Agricultural Sciences Paper 1 and Paper 2 question papers for the NSC November 2021 examination.

3.1 PERFORMANCE TRENDS (2017–2021)

The number of candidates who sat for the Agricultural Sciences examination in 2021 increased by 27 835 compared to that of 2020, i.e. a 30% increase of the cohort.

The table below indicates no definite trend in the pass rate at 30% (Level 2) over the past five years with improvements or declines within a narrow band of only four percentage points at Levels 3 or 4. However, the trend in the pass rate at 40% (Level 3) reflects steady improvement since 2017.

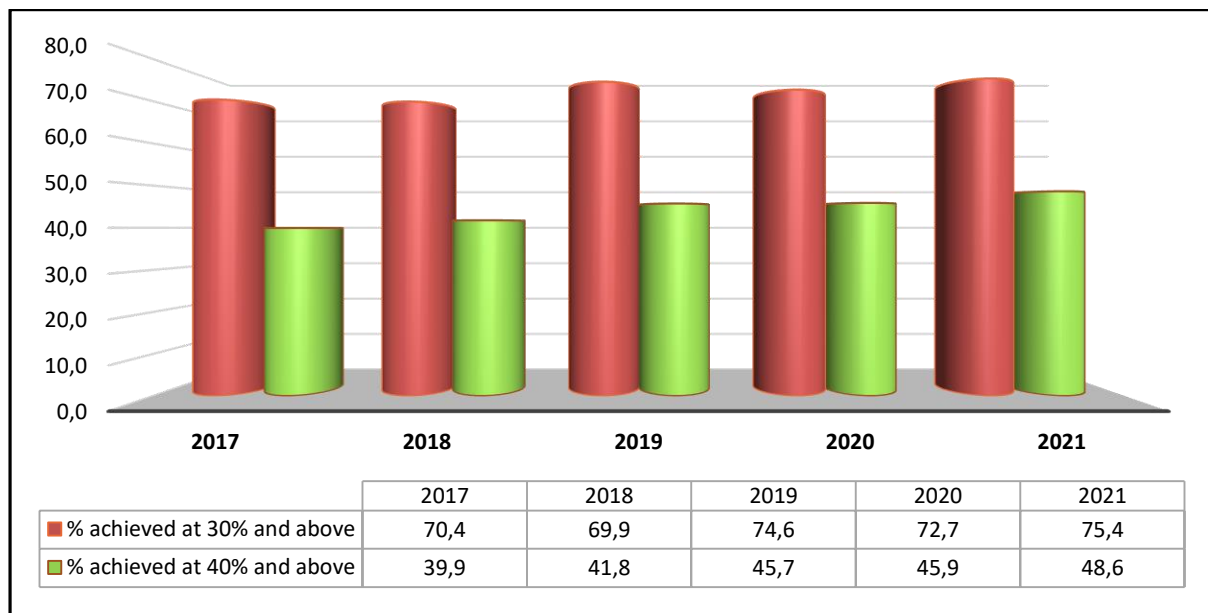
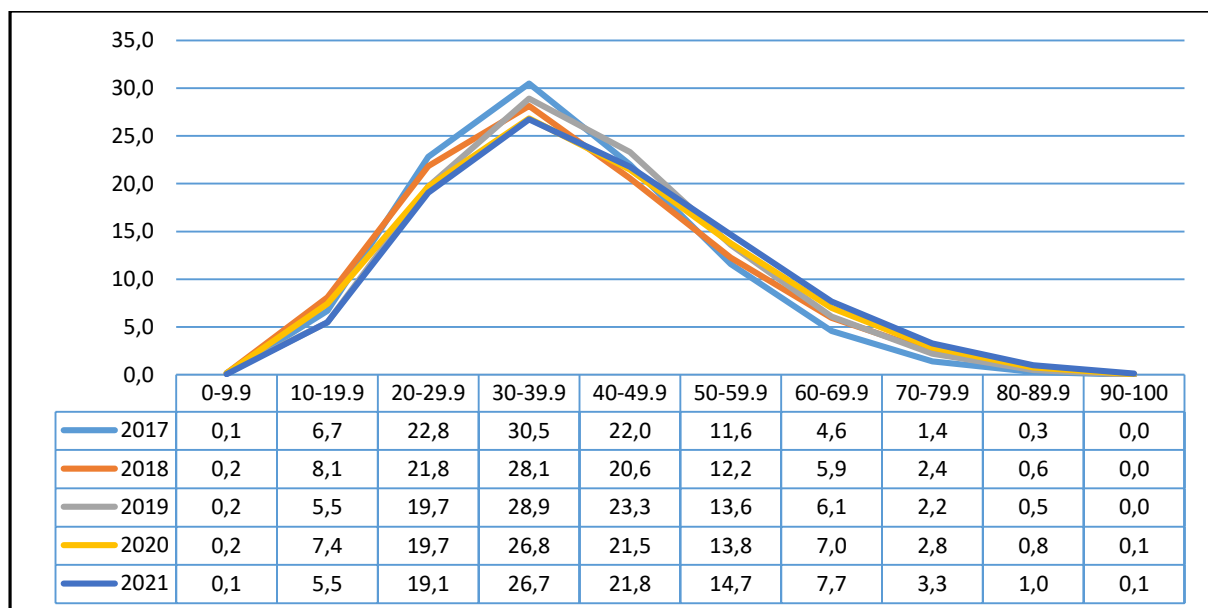
Candidates who passed at 30% (Level 2) improved from 72,7% in 2020 to 75,4% in 2021. There was a corresponding improvement at 40% (Level 3) from 45,9% to 48,6%. Given the increase in the size of the cohort, the number of passes increased considerably by 23 531 at 30% (Level 2) and by 16 194 at 40% (Level 3).

The percentage of distinctions (over 80%; Level 7) remained constant at approximately 1%. This converts into an increase in the total number of distinctions from 865 in 2020 to 1 364 in 2021.

The results reflected above were despite the challenging circumstances brought about by the Covid-19 pandemic over the past two years which affected teaching and learning activities of the 2021 cohort. This appears to have been the result of constructive intervention strategies by teachers and subject advisors as well as schools and provincial education departments. The resourcefulness and diligence of the above-average candidates also contributed to the overall performance in the subject.

Table 3.1.1 Overall achievement rates in Agricultural Sciences

Year	No. wrote	No. achieved at 30% and above	% achieved at 30% and above	No. achieved at 40% and above	% achieved at 40% and above
2017	98 522	69 360	70,4	39 353	39,9
2018	95 291	66 608	69,9	39 800	41,8
2019	92 680	69 132	74,6	42 385	45,7
2020	96 155	69 916	72,7	44 114	45,9
2021	123 990	93 447	75,4	60 308	48,6

Graph 3.1.1 Overall achievement rates in Agricultural Sciences (percentage)**Graph 3.1.2 Performance distribution curves in Agricultural Sciences (percentage)**

3.2 OVERVIEW OF CANDIDATE PERFORMANCE: PAPERS 1 AND 2

General comments

Although extensive intervention initiatives were implemented by provinces throughout the year, the plight of the current cohort must be recognised. Continuous content delivery was compromised by disruptions, unavoidable curriculum adjustments and a reduced assessment programme. Despite these challenges, a fair percentage of candidates were proficient in addressing the requirements of all subquestions.

However, widening of the achievement gap between capable and weaker groups of candidates was noticeable this year. This should not be surprising in the context of two abnormal years this cohort experienced in Grades 11 and 12. Capable or motivated candidates with appropriate resources might have appreciated the opportunity to study independently while less proficient candidates or those lacking resources, might have preferred greater access to teachers

The inability of weaker candidates to deal effectively with even the less challenging parts of questions is a clear indication of the impact of the disruptions on teaching and learning processes within the educational environment. The unsatisfactory performance in Section A of both papers, which deal with terminology and concepts, is indicative of the above-mentioned.

Language barriers linked with poor comprehension skills: Despite the subject-specific language being used in Agricultural Sciences, many candidates continue to experience difficulty in understanding the requirements of questions. Weaker candidates tend to provide incomplete or unclear responses to questions requiring explanations or comments. They often rely on the commonly used responses offered in marking guidelines, and use them inappropriately in different contexts.

Inability to analyse the relevant information provided, to answer specific subquestions: This is especially relevant in the Genetics and Calculations in Animal Nutrition sections of the papers, where the more capable candidates are able to extract and respond to the relevant information while weaker candidates find this process challenging, often misinterpreting what is expected from them.

Although there was a slight improvement of learners' ability to draw a graph, which was evident in Paper 1, learners still cannot successfully identify the independent and dependent variables, including the units in both Paper 1 and Paper 2 where the X- and Y-axes were swapped around as seen in Paper 2 which was quite challenging for learners.

General suggestions for improvement

There are several factors that contributed to poor subject knowledge and poor performance by candidates in the 2021 NSC Agricultural Sciences papers. The following general recommendations for improvement are applicable to both papers in 2022:

- (a) **The importance of formative testing:** Tests should assess learning to provide directions for remedial measures. Self-assessment and peer assessment with immediate feedback on errors provides learners with an opportunity to increase their understanding of the problem. They also become exposed to valid alternative responses and different, easier approaches to solving problems.
- (b) **Basic concepts & terminology:** Learners need to be exposed to the basics of each topic for them to engage effectively with the content in that topic. The process of conceptualising and understanding these concepts is more than merely rote-learning of the definitions. Terminology should form an integral part of teaching and learning and needs to be emphasised on a regular basis. Teachers are advised to make the teaching of terminology interesting by engaging learners in the identification of key concepts for each topic and then guiding them on how to formulate shorter definitions without losing the context. They can also make use of short puzzles based on these terms, thus utilising the art of learning through play.

Teachers are advised to use the following strategies to improve the teaching of basic concepts and terminology:

- Use new concepts and terms in sentences and in short scenarios to illustrate their meaning.
- Engage learners in the identification of new terms and in finding their meanings from the textbooks.
- Learners should be directed to first identify the new concepts for each topic and compile a glossary of terms in their notebooks after completion of the topic, with a brief but clear definition next to each term or concept. A separate notebook for this purpose may also be kept. By the end of the year, all learners should have a comprehensive glossary of all the relevant terms and concepts for all the topics.
- Agricultural Sciences terminology should be assessed daily using different forms of informal activities.
- Challenging or confusing terminology could be explained by using illustrations or posters. These posters can be pinned on notice boards in the classroom so that learners are exposed to them on a regular basis.

- (c) **Enhancing learners' skills in accurately interpreting specific subquestions and using information that is relevant:** It is essential that learners have a good understanding of the instructional verbs as emphasised in the *Examination Guidelines*. Teachers must explain the context in which key verbs such as 'deduce', 'justify', 'explain' and 'suggest' are used and the expected depth in the answer that is expected for each. The marking guidelines of past examination papers can be used to show how the responses to similar questions can differ because of the key verb used in the question. A variety of instructional verbs must be used in both informal and formal assessment tasks. It is recommended that these informal tasks lean mostly towards developing conceptual skills, as this will enable learners to develop a better understanding of the requirements of each question.
- (d) **Skills to be assessed:** Assessment should be of such a nature that it challenges the learners' ability to think beyond what is presented in the textbooks or by the teacher. Learners need to be guided on how to process data presented in different forms, be it tables, graphs, calculations or scenarios. Teachers need to sharpen their learners' analytical skills by exposing them to challenging informal and formal tasks.
- (e) **Real-life scenarios:** Learners show serious deficiencies in the processing of application questions and this is an indication of a lack in the depth of their subject knowledge. Learners need to be exposed to more real-life agricultural situations through visits to sites of practice. Where a practical demonstration is not possible, the use of videos that simulate the actual practice is recommended to enhance intensive learning.

Teachers are advised to include sources such as pictures, scenarios, case studies and short statements in their informal and formal assessment tasks, and demonstrate to learners on how to approach such questions. These tasks should test the application of theoretical knowledge into real farming practices. This could be done by first reading and/or analysing the source, leading them on how to find clues and thereafter associating the key information discovered, before finally attempting to answer the actual questions. In some instances, learners can be requested to formulate their own questions based on the source. This practice will allow learners to critically analyse the source. Teachers can then develop follow-up questions to extend learners' understanding of the content.

- (f) **Enhancing the interpretation of calculated values:** Examination papers in Agricultural Sciences contain some simple mathematical processes, e.g., drawing of

graphs, calculating percentages, conversion of values, expression into relevant units, use of formulae and substitution of values. Learners seem to lack appreciation of the magnitude of the various units, such as the difference between tons and kilograms. They also seem uncertain when to divide or multiply, how to convert monthly to daily needs or vice versa or change group needs to individual needs and vice versa.

Teachers are advised to give regular informal tasks on calculations incorporating the different versions. Teachers should not assume that learners have successfully engaged with these skills in other subjects or can successfully transfer these skills from other subjects to the study of Agricultural Sciences. Teachers are advised to first indicate to learners the importance of the various calculations to farming before showing them the actual skill of performing the calculations by applying the information that is given. Moreover, teachers are also advised to mark such calculations accurately paying much attention and emphasising the conversions, units, substitutions of values and formulae.

- (g) **Use of past NSC papers:** Learners must have access to past examination papers, but they should also be alerted to the limitations of past papers. It should be noted that although questions in past papers may cover the same content, they may have different foci, e.g., a question which asks for a *comment* requires a different response to a question which asks for a *justification* or *suggestion*. Teachers are advised not to engage in whole question paper revision, it is better to consolidate questions from various papers into a bank of questions for each topic and then engage with question revision.
- (h) **Reference to the CAPS, Examination Guidelines and previous Diagnostic Reports:** Teaching and assessment must be informed by the content prescribed in the CAPS and the approach outlined in the *Examination Guidelines*. There might be aspects of the content that have never been assessed in recent question papers. However, it is important that teachers cover these aspects so that learners have a holistic understanding of a topic. It is also important that teachers use a variety of the prescribed textbooks to source information and then consolidate it for learners. It is also imperative that teachers take note of comments and recommendations in previous diagnostic reports.

3.3 OVERVIEW OF CANDIDATES' PERFORMANCE IN PAPER 1

General comments

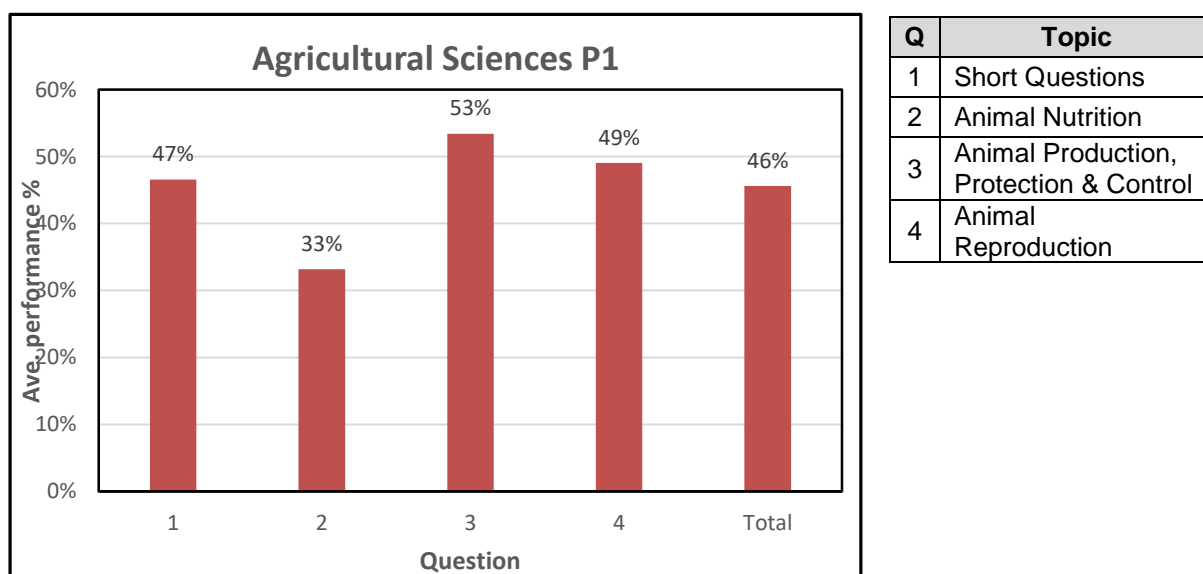
- (a) There is a noticeable improvement in the candidates' performance in Paper 1 compared to 2020. The number of candidates in levels 1 and 2 appears to have declined leading to an upward inclination towards levels 3, 4 and 5. The number of candidates who have attained levels 6 and 7 has increased in real terms, due to the higher number that wrote this examination, but still accounts for only 1% of the cohort.
- (b) The question where candidates performed best was Q3 followed by Q4 and Q1. Q2 which was the best performed question in 2020, was the worst performed in 2021.
- (c) There is still a challenge of writing the correct formula in Q2 where candidates write an acronym for a formula on digestibility co-efficiency and end up dividing by DME instead of DMI. In addition, a large number of learners failed to interpret both the Digestibility Coefficient and Pearson Square questions accurately. Candidates lack understanding of the 'dry matter concept'. Some lack understanding of the Pearson Square method and based their response on the Nutritive Ratio instead, as noted in Q2.5.1 and Q2.5.3.

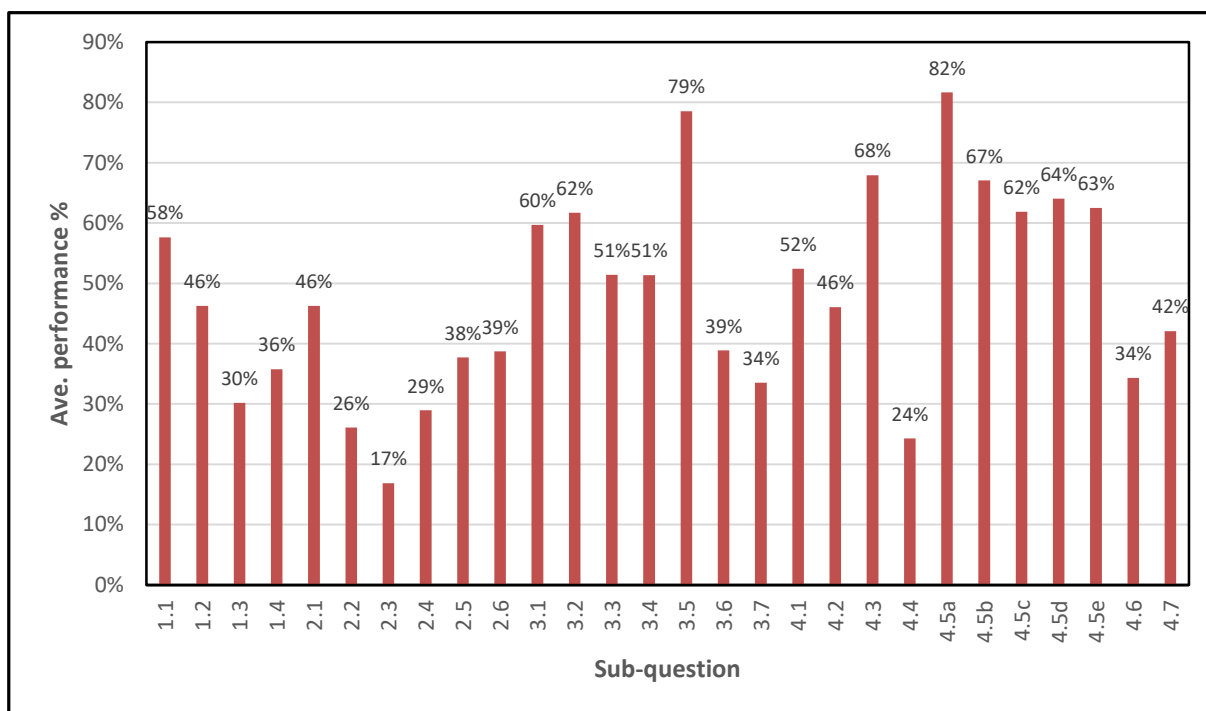
- (d) The majority of candidates have now mastered the drawing of a graph but still have a challenge with the interpretation of graphs. In Q3.3 and Q4.2 they struggled to make deductions based on the information presented in graphs.
- (e) Answering as per instruction is still a challenge for some candidates. In Q4.5 where they were required to write only the letters of the statements, they lost marks as they ignored the instruction and wrote the statement instead of the letter of the statement.
- (f) Questions requiring reasoning, motivation or justification were still poorly answered by most candidates. This is an indication that candidates are not sufficiently exposed to these types of questions in the classroom.
- (g) The language of learning and teaching has proved to be a challenge to most candidates as they were not able to respond appropriately to the instruction verbs used in questions. They also appear to experience difficulty with the spelling of terms.

3.4 DIAGNOSTIC QUESTION ANALYSIS FOR PAPER 1

The following graph is based on data from a random sample of candidates. While this graph might not accurately reflect national averages, it is useful in assessing the relative degree of challenge of each question as experienced by candidates.

Graph 3.4.1 Average performance per question in Paper 1



Graph 3.4.2 Average performance per subquestion in Paper 1

Sub-Q	Topic	Sub-Q	Topic
1.1	Multiple Choice	3.5	Methods for medication in farm animals
1.2	Match Columns	3.6	Different organisms harmful to animals
1.3	Terminology	3.7	Poisonous plants
1.4	Replace incorrect words	4.1	Identification of secondary sex organs
2.1	Feed intake	4.2	Hormone levels
2.2	Pars of the alimentary canal	4.3	Bar Graph
2.3	Mineral deficiency	4.4	Synchronisation of oestrus
2.4	Calculation of feeds	4.5a	Stages of mating
2.5	Digestibility coefficient	4.5b	Stages of mating
2.6	Fodder Flow planning	4.5c	Stages of mating
3.1	Heat Stress in dairy cattle	4.5d	Stages of mating
3.2	Effect of environmental temperature	4.5e	Stages of mating
3.3	Production systems	4.6	Parturition
3.4	FMD in farm animals	4.7	Multiple births

3.5 ANALYSIS OF LEARNER PERFORMANCE IN INDIVIDUAL QUESTIONS IN PAPER 1

QUESTION 1: SHORT QUESTIONS (ANIMAL SCIENCES)

Common errors and misconceptions

- In Q1.1.2 many candidates failed to identify the structures that are well functioning in the alimentary canal of a young ruminant. They showed a lack of understanding of the structural differences of an *Adult Ruminant* to a *Young Ruminant*.
- In Q1.1.3 a large number of candidates failed to identify calcium, magnesium and sulphur as minerals that are needed by animals in large quantities. These form part of macro-elements. Candidates lacked a basic understanding of them and some opted for options which have micro-elements such as iron, copper and zinc.

- (c) In Q1.1.5 many candidates did not seem to know the difference between *pandemic* and *endemic* as they responded by giving D as the answer.
- (d) In Q1.1.6 most candidates failed to eliminate 'electric spray race' from the combination as it was the only expensive modern technology which subsistence livestock farmers could not afford.
- (e) In Q1.1.7 many candidates could not pick the statement that is a disadvantage of the free-range system.
- (f) In Q1.1.8 option B which is a *point of balance*, was the popular answer given instead of C, *the flight zone*.
- (g) In Q1.2.1 most candidates did not see that the question asked for putrefaction in the stomach and not in the small intestines.
- (h) In Q1.2.4 many candidates displayed lack of knowledge, understanding and exposure to different housing systems of fowls.
- (i) In Q1.2.5 most candidates were not able to differentiate between layers lining the uterus (endometrium, perimetrium, myometrium) and embryonic membranes (chorion, allantois and amnion) surrounding the foetus.
- (j) The majority of candidates gave *net/metabolic energy* as an answer instead of *gross energy*.
- (k) In Q1.3.2 some candidates wrote *pathogen/parasites* instead of *vector*.
- (l) In Q1.3.5 some answered *heat detector* instead of *pedometer* thus showing a lack of understanding of different devices used to detect heat.
- (m) In Q1.4.1 many candidates did not recognise the function of Vitamin A and some wrote vitamin D, which was the underlined word to be changed.
- (n) In Q1.4.2 candidates failed to see that the question expected the response to be a *fixed handling facility to restrain animals* and they wrote *electric prod* as an answer.
- (o) In Q1.4.3 the incorrect answer, *penis*, was more popular than *urethra* which is the correct answer.
- (p) In Q1.4.4 a range of incorrect responses such as lack of *libido*, *cryptorchidism* and *congenital defects* were given as answers instead of *impotence*. Some committed a spelling error and wrote *importance*. They were marked down due to the word *importance* having a different/another meaning.
- (q) In Q1.4.5 many candidates opted for lack of *libido* instead of the correct response of *impotence*. It appears as if they were confused about these terms, as a lack of libido was obviously incorrect because the animal in this instance shows an interest in cows.

Suggestions for improvement

- (a) Subject advisors and teachers should compile a document that explains all the terms and concepts for various topics in the curriculum.

- (b) Teachers need to provide learners with a list of the terms that are relevant to the topic. They must then engage and guide learners on how to identify these terms. This list will form a 'road map' that will help learners gauge the extent of their knowledge and understanding of a topic.
- (c) Development of interesting games, like word puzzles, identification cards and PowerPoint presentations for the teaching of key concepts and improving the spelling of these concepts should be considered. Spelling tests should be considered especially for concepts that are not easy to pronounce or write out.
- (d) The use of electronic technology, such as smart boards and the internet, should be encouraged to improve the learners' enthusiasm for the subject. It is hoped that this will stimulate learners to explore other material pertaining to the subject.
- (e) Teachers should train learners on how to answer questions by guiding them on what the question expects.
- (f) Teachers should refrain from teaching selected parts of the curriculum but should be guided by the content addressed in CAPS. 'Selective teaching' hinders a full understanding of topics.
- (g) Teachers should form a cohesive unit in their clusters. They can support each other by addressing challenging topics and by suggesting different approaches to teach a topic so that it makes learning easy and enjoyable. These cluster units could also set common assessment tasks collectively.
- (h) Provincial coordinators, together with teachers, need to prepare revision packs that cover all the topics. Teachers should use material from these packs as informal tasks, in class revision sessions and as mock examinations.

QUESTION 2: ANIMAL NUTRITION

Common errors and misconceptions

- (a) In Q2.1.1 some candidates still classified the animals from the table even though the question only required the name. Others referred to animal in column A as *cattle/cow* instead of *pig*.
- (b) In Q2.1.2 candidates were expected to identify a reason from the table to substantiate their choice of farm animal but they ignored the instruction and wrote different reasons. This showed that they lacked data handling skills as well as the ability to follow instructions.
- (c) In Q2.1.3 many candidates struggled to provide structural differences in the large intestines between a pig and fowl. Others mentioned the general differences not relevant to the large intestines. They lacked an understanding of these structural differences compounded by the lack of knowledge of the differences between a pig and fowl. A number of candidates did not attempt this question which indicates that they were confused about what an appropriate response should entail. The presence of one caecum in a pig and two caeca in fowl, among other differences, were unknown to many candidates.
- (d) Candidates incorrectly based the structural difference of large intestines on the size, that is, bigger size for pigs and smaller size for fowl.

- (e) In Q2.2.2 many candidates wrote *duodenal juice/succus entericus* which is secreted and not deposited into the duodenum/small intestines. This shows that they did not understand the difference between secretion and deposition.
- (f) In Q2.2.3 most candidates did not know that lipase is the only fat digesting enzyme in the alimentary canal. Some offered amylase and any other enzyme that was not relevant to the question.
- (g) In Q2.2.4 most candidates were unable to give the reason for breaking down of fat. Some wrote functions of bile and others gave emulsification as an answer.
- (h) In Q2.4.1 many candidates gave subdivision of feeds (e.g. carbohydrate-rich or protein-rich concentrates or roughages) instead of main types of feeds which are concentrates and roughages. They continue to use the incorrect word *concentration*, instead of *concentrates*.
- (i) In Q2.4.2 few candidates incorrectly assumed that the purpose of feeding maize stalk (which is a protein-poor roughage with only 4% DP) to young ruminants is for growth, whereas growth and production require a protein-rich feed.
- (j) In Q2.4.3 some candidates calculated nutritive ratio instead of ratio required to mix two feeds in order to get 15% DP. Others struggled to write the correct ratio for the feed, i.e. 21 parts for fish meal and 6 parts for maize meal.
- (k) In Q2.5.1 many candidates did not notice that the % was not for the moisture content but for the DRY content of the feed. The common errors identified in the digestibility co-efficiency calculation were as follows:
 - Inability to convert percentages (%) to kilograms (kg)
 - Incorrect formula
 - Multiplying by 100% instead of 100
 - Incorrect unit in the answer (kg instead of %)
- (l) In Q2.6.3 many candidates could not work out the total feed available which was just a simple proportion problem thus showing their inability to do calculations.

Suggestions for improvement

- (a) Posters indicating the classification of each animal according to its name could be a useful teaching tool. In addition, diagrams of the alimentary canals alongside the classes and names would give learners the opportunity to establish the similarities and differences between the alimentary canals of animals in the various classes.
- (b) Various textbooks and the dissection of real animals for observation of the parts, similarities and differences and their roles in nutrition, can be used in this regard.
- (c) Carefully planned practical investigations and questionnaires will assist learners in developing an in-depth understanding of the content.
- (d) Giving more exercises with different scenarios is imperative to make learners aware of how to respond to questions.
- (e) Teachers are encouraged to give regular informal assessment on calculations, providing guidance on the use of correct formulae and following the correct steps

when substituting values. This will develop the learners' ability to make the correct calculation.

- (f) The implications of the calculated values should be explained to learners. This will enable learners to have a better understanding of the application of the results.

QUESTION 3: ANIMAL PRODUCTION, PROTECTION AND CONTROL

Common errors and misconceptions

- (a) In Q3.1.1 some candidates missed the trick of identifying the visible actions in the pictures and just gave general responses not in the picture, such as drinking water and swimming, by explaining how high the temperatures were in different weeks without indicating how the temperature requirement changed with increased age.
- (b) In Q3.1.2 many candidates provided similar inappropriate responses such as *protect animals from rain, heat or cold* which are all categorised as extreme environmental conditions.
- (c) In Q3.1.3 some candidates stated the general guidelines for transportation including licensed vehicle and driver, type and age of animals, number of animals in a vehicle and permit, although they were expected to provide the *requirements* of a vehicle that transports farm animals.
- (d) In Q3.2.2 only a few candidates were able to describe the relationship between dry matter intake, water intake and milk production as presented in the table provided. Others mentioned the temperature in their responses and the relationship that it has with water intake, which is not what the question required. The fact that this type of question is often based on temperature and water intake, may have led to confusion.
- (e) In Q3.3.1 many candidates struggled to correctly interpret the graph and were not able to identify the farmer representing the two production systems. Some misinterpreted the live weight as the time that animals will live or stay alive leading to responses such as long/short lifespan. This also affected justification in Q3.3.2.
- (f) In Q3.4.1 some candidates referred to bacteria as a *pathogen* causing the FMD instead of a *virus*.
- (g) In Q3.4.2 there were some candidates who wrote the general symptoms of FMD such as fever, lack of appetite, salivation and abortion overlooking the fact that the question was asking for the MAIN symptoms.
- (h) In Q3.4.3 candidates were asked to identify two roles of state from the scenario but many wrote vaccinations, culling and research, all of which were not in the given scenario.
- (i) In Q3.4.4 many candidates offered answers that have the same meaning, e.g. loss of income or loss of profit and as a result lost a mark. They were required to state two economic impacts of foot-and-mouth disease.
- (j) Some candidates misinterpreted Q3.6.1 by labelling organisms A, B, C and D rather than giving a term that describes them.

- (k) In Q3.6.2 instead of classifying the parasites as internal and external, many candidates wrote the names whilst others classified them according to their life cycles.
- (l) In Q3.6.3 some candidates failed to correctly identify organisms responsible for transmitting red water, heart water and RVF.
- (m) In Q3.7 some candidates incorrectly referred to *thorn apple* as *thorn tree*.

Suggestions for improvement

- (a) Teachers need to train learners not only to draw graphs accurately as per the current marking criteria/rubric, but also train them on how graphs are interpreted.
- (b) Learners should be encouraged to use the internet to access information about the tools, equipment and facilities used in different farming enterprises.
- (c) PowerPoint slides with pictures and videos on the facilities and tools could be prepared and used in the classroom, to arouse the interest of the learners.
- (d) Excursions or visits to farms could be organised in collaboration with local extension officers from the Department of Agriculture.
- (e) Collaboration among subject teachers in preparation and teaching will be very beneficial. These sessions could build capacity in the concepts and in the teaching of diseases and parasites on production enterprises (by making use of mind maps that group diseases/parasites based on the pathogens/vectors), modes of transmission, key symptoms as well as preventative and control measures.
- (f) Teachers should ensure that the learners understand the general and specific roles of the state that are applicable to proclaimed diseases.
- (g) Appropriate measures by farmers in the control and prevention of particular diseases and parasites should be clearly outlined.
- (h) Intensive revision of work using charts, scenarios and tables on diseases and parasites is necessary as the information is vast and likely to cause confusion.

QUESTION 4: ANIMAL REPRODUCTION

Common errors and misconceptions

- (a) In Q4.1.3 many candidates failed to mention that the cervix allows semen to pass to the uterus. Other candidates simply mentioned general responses such as the cervix opens up during mating which is not correct and not specific. This question proved to be a challenge as many failed to mention that a mucus plug forms to prevent microbial infections of the uterus. Candidates provided general responses such as the stimulation of thickness to prevent the foetus from falling which is incorrect.
- (b) In 2021, a number of candidates' responses indicated that most of them were unable to identify and interpret diagrams including accurately responding to calculation-based questions.
- (c) In Q4.2.1 some candidates gave a definition of an *oestrus cycle* instead of *oestrus*.

- (d) In Q4.2.2 some candidates responded correctly but gave an incorrect response for the reason in Q4.2.3 by referring to a high progesterone level when an animal is not pregnant. This shows that they do not understand the levels of hormones (progesterone and oestrogen) during pregnancy.
- (e) An inability to follow instructions in Q4.3 (drawing of a graph) was a common problem for those who failed to score the total mark. Common errors were the following:
 - Including *lactose* whereas the question only required *fat* and *protein*
 - Not plotting the graph only for the weeks in question
 - Incorrect labelling of the axis
 - Incomplete heading (showing only one variable)
 - Graph without a zero baseline
 - Absence of a unit (%)
 - Drawing of a histogram instead of a combined graph
- (f) In Q4.4.1 many candidates wrote *synchronisation* alone without *oestrus*, while others incorrectly identified the process as *artificial insemination*, thus causing them to respond incorrectly in Q4.4.2 which requested techniques or methods.
- (g) Failure to respond to the instruction in Q4.5 resulted in the loss of 5 marks as candidates wrote statements instead of letters, as the question had requested.
- (h) In Q4.6.3 candidates responded by giving cow-related problems like *inexperience* and *size of the pelvic area* instead of *calf problems causing dystocia*.
- (i) In Q4.7(b) candidates confused *fraternal* with *free-martin*.

Suggestions for improvement

- (a) Teachers are encouraged to contact institutions where various processes are practised so that learners can observe them to enhance their understanding of these reproductive processes.
- (b) In presenting the various processes such as *oestrus cycle*, *synchronisation of oestrus*, *artificial insemination*, *stages of pregnancy*, *embryo transfer*, *parturition* and other reproductive processes, teachers should use flow diagrams, schematic representations, projections and videos to identify the characteristics and the effects of various hormones in the different processes.
- (c) Enrichment and enhancement material should be sourced from various resources such as the slides from the ASAAE software.
- (d) Standardised formal tasks should be prepared, with the aim of raising the level of questioning and preparing the learners for questions that require analysis and reasoning.
- (e) The importance of learning the subject terminology must be emphasised.

3.6 OVERVIEW OF CANDIDATES' PERFORMANCE IN PAPER 2

General comments

- (a) Generally, candidates' performance in this paper was similar compared to 2020.
- (b) In 2021 candidates' responses indicated that most of them were unable to identify and interpret diagrams and perform calculations.

General suggestions for improvement

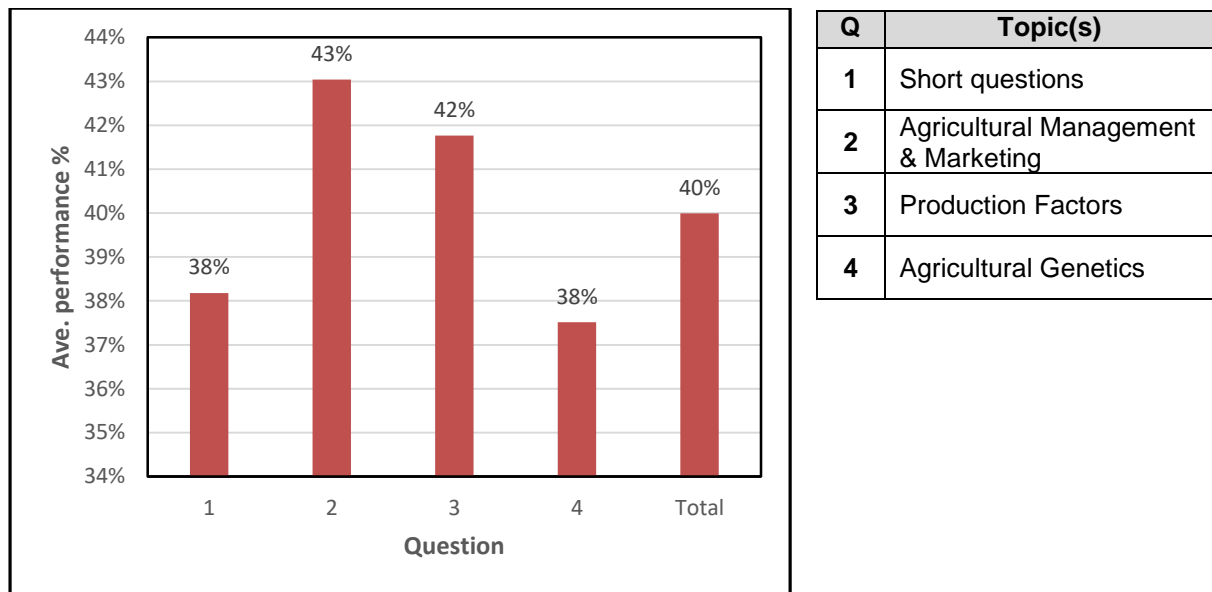
The following suggestions for improvement are proposed to address the decline in the performance of candidates:

- (a) In addition to textbooks, other resources such as agricultural magazines or the internet should be used to develop a comprehensive understanding of subject terminology.
- (b) Teachers should expose learners to regular and consistent informal assessment tasks or activities that will improve their confidence in dealing with the subject content.
- (c) Setting of quality-assured common tasks on more data response questions such as graphs and case studies to enhance interpretation and application is recommended.
- (d) Expose learners to simple mathematical calculations involving percentages, ratios, polygenic inheritance, mass, height and length, as well as their respective units. Calculations, pictures, graphs and tables are an integral part of the subject. It is recommended that all calculations commence with the formula/formulae given, then the correct substitution should be done, followed by the actual calculation and ultimately the correct answer. The final answer should also be re-checked, if time allows.
- (e) Although learners might have access to only one textbook, teachers should acquaint themselves with and use several available textbooks in their lesson preparation. Teachers and learners would thus be exposed to a wide range of possible activities.
- (f) Teachers need to broaden their knowledge and practical experience in certain areas of the curriculum so that they may be able to expose learners to practical situations, e.g. *Production Factors* in Paper 2 required candidates to understand different farm records, management skills, types of labour legislations and interpret tables.
- (g) Responses to short questions show that many learners still lack basic conceptual knowledge and teachers should use various approaches to expose and explain terminology and concepts to learners. Teachers must ensure that learners are exposed to the language in which they will be writing the examination, as many learners struggle with reading, understanding and interpreting questions. Such learners also find it challenging to express their responses correctly.

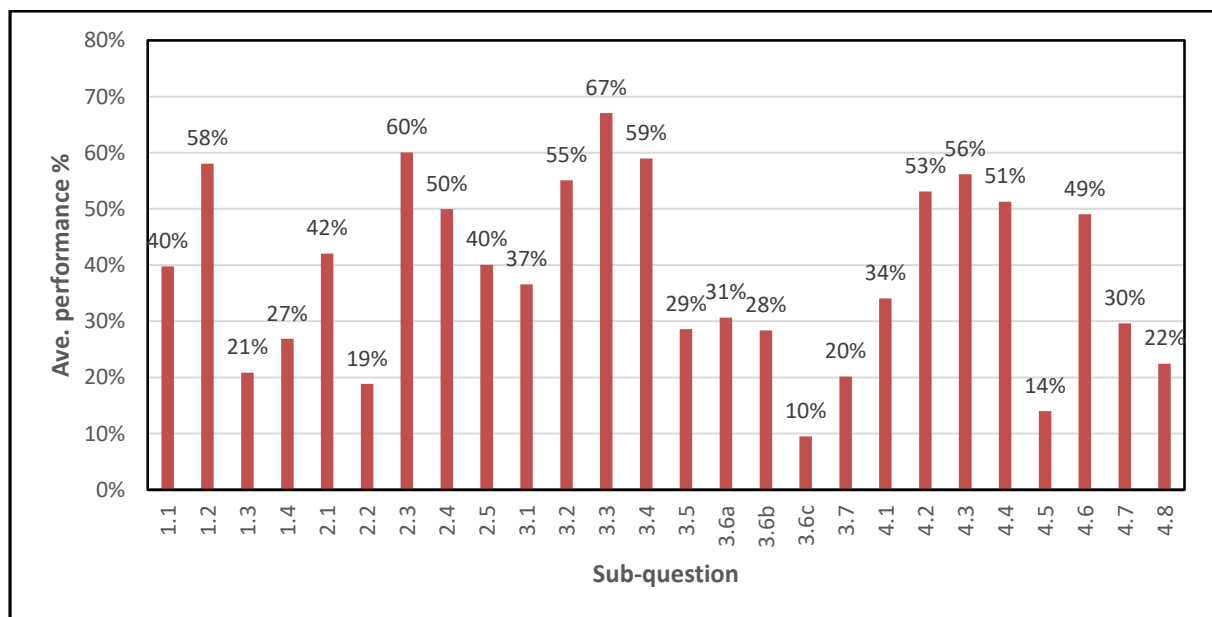
3.7 DIAGNOSTIC QUESTION ANALYSIS FOR PAPER 2

The following graph is based on data from a random sample of candidates. While this graph might not accurately reflect national averages, it is useful in assessing the relative degrees of challenge of each question as experienced by candidates.

Graph 3.7.1 Average performance per question in Paper 2



Graph 3.7.2 Average performance per subquestion in Paper 2



Sub-Q	Topic	Sub-Q	Topic
1.1	Multiple choice	3.5	Financial records- Balance sheet
1.2	Match Column	3.6a	Management skills
1.3	Terminology	3.6b	Management skills
1.4	Replacement of incorrect words	3.6c	Management skills
2.1	Marketing functions	3.7	Risk management
2.2	Co-operative marketing system	4.1	Genetics and Mendel's Laws
2.3	Supply & demand at different prices	4.2	Epistasis
2.4	Price elasticity and inelasticity	4.3	Monohybrid cross
2.5	Entrepreneurship	4.4	Punnet square – Monohybrid cross
3.1	Land as a production factor	4.5	Genetic Terminology
3.2	Identifying types of Labour	4.6	Estimated Breeding Values
3.3	Labour legislation	4.7	Breeding Systems
3.4	Types of Capital	4.8	Genetic modification

3.8 ANALYSIS OF CANDIDATES' PERFORMANCE IN INDIVIDUAL QUESTIONS IN PAPER 2

QUESTION 1: SHORT QUESTIONS (AGRICULTURAL MANAGEMENT AND GENETICS)

Common errors and misconceptions

- (a) Both Q1.1.4 and Q1.1.8 had a combination of distractors. One question was on marketing and the other was on production factors. Most candidates struggled to answer questions with combinations of multiple distractors.
- (b) In Q1.1.6 many candidates confused *loan* with *interest*. Most candidates chose option A which was a loan instead of option B which is interest.
- (c) In Q1.3.1 some candidates wrote *eco-labelling* instead of *green marketing*. Although these two concepts are related, the one is a type of marketing (green marketing) and the other (eco-labelling) involves a method to enhance green marketing.
- (d) Q1.1.7 many candidates lacked understanding of the management principles. Many of them opted for other responses instead of choosing *control* as a management principle applicable to farmers monitoring production and comparing results.
- (e) Q1.1.9 many candidates opted for duplication instead of identifying that the illustration provided depicted inversion. There seemed to be great confusion and misunderstanding of the causes of chromosome mutation.
- (f) Q1.1.10 some candidates could not identify from the responses given that if the sheep has 27 chromosomes then the number of autosomes will be 52, which excludes one pair of sex chromosomes.
- (g) In Q1.3.4 some candidates wrote *species breeding* instead of *species crossing* which was not acceptable since Question 1 requires accuracy on agricultural concepts.
- (h) Learners confused *Farm gate* marketing with *Farm stall* in Q1.4.1.
- (i) Q1.4.3 required candidates to write the *correct technique of genetic modification in plants*. However, many candidates wrote any technique instead of reading the statement and providing the correct answer.

Suggestions for improvement

- (a) Past NSC examination papers can be used effectively to enhance learners' understanding of concepts. It is a known fact that learners who understand concepts well enough, can use this information more effectively. The use of past examination papers also exposes learners to the different ways in which questions can be posed. The marking guidelines can illustrate how the responses to these questions will differ.
- (b) Teachers need to focus on all aspects of the content that are listed in both *CAPS* and the *Examination Guidelines*. There might be topics which have not been covered in recent question papers, but they remain important content topics.
- (c) Terminology is a very important part of teaching Agricultural Sciences. Teachers need to focus on actively teaching the terminology of all topics. This will enhance learner

understanding of the content. The use of word banks, word puzzles and other terminology exercises are strongly recommended.

- (d) It is noted from the 2021 paper that terminology questions on genetics were poorly attempted. It is possibly due to learners experiencing challenges in understanding genetics. Teachers are therefore advised to focus on terminology when teaching genetics, and pay careful attention to any weaknesses they may discover.

QUESTION 2: AGRICULTURAL MANAGEMENT AND MARKETING

Common errors and misconceptions

- (a) In Q2.1.1 picture B, most candidates could identify both the requested functions of marketing as being A) transport and D) processing/value adding.
- (b) In Q2.1.2 a few candidates confused the guidelines for *packaging* (B) with guidelines for *marketing*.
- (c) In Q2.1.3 most candidates recorded partial achievement. However, this content is well discussed in the textbooks and therefore it is disappointing to note answers such as *product*, *price*, and *transport*.
- (d) In Q2.2.1 most candidates struggled to identify co-operative marketing from the given picture. If learners read the leading statement with understanding, they might have achieved better.
- (e) In Q2.2.2, which was a follow-up to Q2.2, learners that had Q2.2.1 incorrect also did not achieve here.
- (f) In Q1.4.1 candidates opted for other terms besides *farm gate* as the marketing channel where a farmer sells at the point of production. This concept has been confused by many because they lack the basic terminology and understanding and responded with Farm Stall as their answer.
- (g) In Q2.2.3 many candidates seemed to have misunderstood this question and gave definitions instead of explaining how the principles will benefit farmers in the marketing system as depicted in Q2.2.1.
- (h) Q2.3 required candidates to draw a graph and interpret data from the graph. There were some successes; however, a large number of candidates struggled to identify the dependent and independent variable, thus swopping the X- axis and the Y-axis, which resulted in the loss of at least 4 to 6 marks.
- (i) In Q2.4.1 most candidates identified *price elasticity of supply* and *price inelasticity of demand* correctly from the graphs. This can be attributed to a good knowledge on the format of a demand and supply curve
- (j) In Q2.4.2 many candidates showed a lack of understanding on price elasticity of supply and price inelasticity of demand. They provided the *Law of Demand* and the *Law of Supply* instead of addressing *price elasticity* and *price inelasticity*. Candidates did not use the words *a small* change in price resulted in *a huge* change in the quantity supplied at (a). They also did not use the words *a huge* change in price resulted in *very little* change in the quantity demanded.

- (k) In Q2.5.2 most candidates provided the personal characteristics of an entrepreneur instead of deducing entrepreneurial success factors from the scenario. They also alluded to Q2.5.3 by identifying strengths and threats from the scenario, leaving them with confusion in response to Q2.5.3.

Suggestions for improvement

- (a) Learners must be taught that they need to understand the context and be able to interpret the data before they respond to questions set on them. They should be shown how the heading is derived from the given data and how to compose the heading.
- (b) Learners must be made to understand that if data or a scenario is given, unless indicated otherwise, the questions will be based on the data or scenario. Furthermore, it is important to interpret the leading statement, which will guide learners on the questions to follow.
- (c) Learners must be taught how to label and calibrate the axes correctly. This will help avoid the wrong curve being drawn. Teachers could use a number of examples to practically demonstrate the skills of labelling and calibrating axes.
- (d) When dealing with graphs on demand and supply, learners should be taught that the *Price* is always on the Y-axis and *Quantity* demanded/supplied is always on the X-axis. This will prevent confusion when drawing these graphs.
- (e) When teaching, emphasise the actual difference between elasticity and inelasticity of both demand and supply. Teachers should discuss examples of products that are elastic or inelastic and provide reasons why they are categorised as such.

QUESTION 3: PRODUCTION FACTORS

Common errors and misconceptions

- (a) In Q3.1.1 most candidates performed poorly because they could not interpret and link the graph to production factors and functions of land. Furthermore, candidates were not able to differentiate between economic characteristics of land and the function of land as a production factor.
- (b) In Q3.2.1 and Q3.2.2 there is still confusion on terminology with regards to types of labour. The following terminology should be addressed: skilled/unskilled labour, permanent/part-time/temporary labour and casual/seasonal labour, each with its own description and function.
- (c) In Q3.3 many candidates were not able to identify a violation or transgression of labourers' rights in the table and link it to a piece of legislation covered in the syllabus. Candidates might be conversant with legislative Acts governing the workers, but were not able to unpack or apply them to situations or scenarios.
- (d) In Q3.4.1 and Q3.4.2 candidates performed poorly because they could not link capital items in the table with types of capital which resulted in then failing to provide examples of fixed and movable capital.
- (e) In Q3.4.3 many candidates could not deduce the problem related to capital item A due to their inability to identify it as movable capital, as required in Q 3.4.1(b).

- (f) In Q3.5.1 and Q3.5.2 most candidates could not identify the type of financial record because they did not know elements of a cash flow budget, namely, closing/opening balance, income and expenditure.
- (g) Q3.6 is a typical example of an application-type of question. However, candidates could not link the content with the scenarios given.
- (h) In Q3.7 many candidates could not apply knowledge to a given scenario as required in Q3.7.1.

Suggestions for improvement

- (a) Many text books feature *types of farm labourers* under different headings. This can be confusing. Learners should be assisted to place them correctly by teaching them to always link *permanent*, *temporary*, *full-time* and *part-time* to TIME. Key words they must take note of should include *period*, *timespan*, *duration* and *time*.
- (b) Informal assessment tasks should expose learners to activities which will enable them to analyse, comprehend and interpret information. Application of knowledge should also be enforced with appropriate examples and exposure to real-life situations.
- (c) Case studies, diagrams and scenarios need to be included in assessment tasks at regular intervals during the school year, with the aim of exposing them to activities that would improve their skills in answering these types of questions. Such interventions could assist learners to improve their reading and understanding skills, the application of knowledge and an awareness of how to follow instructions.
- (d) Content knowledge is vital. Learners must become familiar with the risk management strategies. Once this is in place, case studies can be used as a tool to help them practise applying the knowledge learnt to a specific situation and hereby identify the risk management strategy in any given scenario.

QUESTION 4: BASIC AGRICULTURAL GENETICS

Common errors and misconceptions

- (a) Q4.1.1 was very poorly attempted. Many candidates could not identify the expected answer as 'Genetics' and some referred to *inheritance* or *heredity*.
- (b) In Q4.2 some candidates did not know and understand *epistasis*. They wrote their own interpretation of the given genotypes, e.g. black with no colour (which is not possible) for BBLI.
- (c) In Q4.4 many candidates earned marks for drawing a Punnet square. However, several could not identify the genotype of the parents of the first crossing, thus losing marks.
- (d) In answering Q4.5.1 most candidates confused the required terms with breeding systems instead of terminologies and in Q4.5.2 they struggled to put in context that the parents or cultivars were chosen because of their superior/desired characteristics.
- (e) In Q4.6.1 some candidates exhibited poor knowledge regarding breeding values. This was compounded by a lack of knowledge of criteria to improve hereditary characteristics. Many candidates could not make the association between the statement and what is indicated in the table (Q4.6.2).

- (f) In Q4.7 some candidates were challenged by the examples presented and struggled to apply knowledge regarding breeding systems with given examples, while in Q4.7.2 they responded incorrectly as a result of wrong identification in Q4.7.1(b).
- (g) In Q4.8.1 some candidates could not identify the technique used for genetic modification. There was confusion between *micro-injection* and *lipofection*.
- (h) In Q4.8.2 many candidates did not understand the meaning of *conventional* hybrid cultivars; hence, they were unable to differentiate between such and GMOs.

Suggestions for improvement

- (a) The key to mastering basic genetics is the understanding of terminology. Learners should be able to describe concepts and provide practical examples to illustrate their understanding of the terms and concepts.
- (b) Teachers should give special attention to basic crossing, genetic concepts and terminology in their teaching of this topic. Teachers must teach learners monohybrids, di-hybrid, and F1 and F2 crosses as included in the CAPS.
- (c) Teachers need to specify that any letter of the alphabet can be used to represent the alleles. However, if letters are given in a question, learners are advised to use them. It is therefore important for learners to ensure that they read and understand the preceding statements before answering questions on genetics.
- (d) In teaching breeding systems, learners should be taught examples of crossings that could have negative implications, as well as those examples with desirable outcomes. Diagrams representing animal breeding systems should be used to illustrate basic types of breeding methods.
- (e) Responses to questions on genetics suggest that there could be an underlying content gap amongst teachers. Subject advisers should convene workshops to address the shortcomings in content knowledge in this regard.
- (f) The teaching of genetics should be enhanced by providing practical examples within the learning site as it applies to plants, flowers and livestock.
- (g) There should also be integration with Life Sciences, as genetics is taught comprehensively in Life Sciences.

CHAPTER 4

BUSINESS STUDIES

The following report should be read in conjunction with the Business Studies Paper 1 and Paper 2 question papers for the NSC November 2021 examinations.

The year 2021 was the second in the move to 2 two-hour papers of 150 marks each. Each paper assesses separate and distinct disciplines as outlined in the *2021 Examination Guidelines*, as follows:

	MAIN TOPICS	SUBTOPICS
PAPER 1	Business Environments	Macro environment: Impact of legislation Macro environment: Business strategies Business sectors and their environments
	Business Operations	Human Resources function Quality of performance
PAPER 2	Business Ventures	Management and leadership Investment: securities/opportunities Investment: insurance Forms of ownership Presentation and data response
	Business Roles	Ethics and professionalism Creative thinking and problem solving Social responsibility (CSR/CSI) Human rights, inclusivity and environment Team performance; conflict management

4.1 PERFORMANCE TRENDS (2017–2021)

The number of candidates who sat for the Business Studies examination in 2021 increased significantly by 36 798 compared to that of 2020, i.e. a 17,7% increase of the cohort.

There was a most encouraging improvement in the pass rate this year, while a steady upward trend in pass rates is evident from 2018–2021.

Candidates who passed at 30% (Level 2) improved from 77,9% in 2020 to 80,5% in 2021. There was a corresponding improvement in the pass rate at 40% (Level 3) from 57,0% to 60,4% over the past two years.

Given the increase in the size of the cohort, the number of passes achieved at 30% (Level 2) and at 40% (Level 3) increased considerably by 35 009 and 29 298 respectively. Furthermore, the percentage of distinctions (over 80%; Level 7) improved from 3,6% to 5,2% which converts into an increase in the total number of distinctions from 7 454 in 2020 to 12 680 in 2021.

The results reflected above were despite the challenging circumstances brought about by the Covid-19 pandemic over the past two years which affected the teaching and learning activities of the 2021 cohort. This appears to have been the result of constructive intervention strategies by teachers and subject advisors as well as schools and provincial education departments. The resourcefulness and diligence of the above-average candidates also contributed to the overall performance in the subject.