



LEAVING CERTIFICATE EXAMINATION

2001

AGRICULTURAL SCIENCE

HIGHER AND ORDINARY LEVELS

CHIEF EXAMINER'S REPORT

1. Introduction

The assessment in Agricultural Science comprises two components:

- (i) school assessment of practical work;
- (ii) terminal written examination.

School Assessment – 100 marks

The school assessment is focused on the practical and laboratory work undertaken by the candidates over the duration of their course of study in this subject. There is a common assessment for Higher and Ordinary level candidates.

Written Examination - 300 marks

The written examination consists of **nine** questions, with candidates required to answer any **six** questions. Q.1 carries 60 marks while all other questions carry 48 marks each.

2. PERFORMANCE OF CANDIDATES

The total numbers of candidates taking the Higher and Ordinary level papers in Agricultural Science in 2001 are shown in Table 1.

Table 1: Total numbers of candidates taking Agricultural Science in 2001

Higher Level	Ordinary Level	Total
2146	769	2915

The total number of candidates taking Agricultural Science in the Leaving Certificate examination in 2001 is similar to recent years. Details of candidate numbers for the years 1996-2001 are outlined in **Table A1** in the Appendix.

The numbers and percentages of candidates obtaining each grade in the school assessment are shown in Table 2. A total of 2901 candidates were monitored.

Table 2: Grade distribution of candidates for the school practical assessment

Grade	A	B	C	D	E	F
Number	693	1129	785	274	17	3
Percentage	23.9	38.9	27.1	9.4	0.6	0.1

The final grade distributions, i.e. including the results from the written paper, for both Higher and Ordinary levels are shown in Table 3. The grade distributions for both examinations for the years 1998-2001 are shown in Table A2 in the appendix.

Table 3: Percentage of candidates achieving each grade in Leaving Certificate Agricultural Science 2001

Higher Level			Ordinary Level		
Grade	Percentage	Cumulative Percentage	Grade	Percentage	Cumulative Percentage
A1	2.1	63.5	A1	0.0	35.8
A2	3.5		A2	0.5	
B1	5.9		B1	1.2	
B2	8.9		B2	2.0	
B3	9.0		B3	4.4	
C1	11.3		C1	7.3	
C2	11.4		C2	9.1	
C3	11.4		C3	11.3	
D1	11.3		28.5	D1	
D2	9.0	D2		14.4	
D3	8.2	D3		16.4	
E	6.8	8.0	E	15.9	21.8
F	1.2		F	5.1	
NG	0.0		NG	0.8	

Details of the average mark per question and the popularity of individual questions are given in Tables 4 and 5. The performance of candidates is given as the average mark per question, while popularity is given as the percentage of candidates attempting each question. Data for Higher level candidates given in Table 4, and quoted later in the report, are based on a random sample of 120 scripts, approximately 6% of the total. Data for Ordinary level candidates given in Table 5, and quoted later in the report, are based on a random sample of 60 scripts, approximately 8% of the total.

Table 4: Performance of candidates and popularity of questions in Higher level Agricultural Science in 2001

Question No.	PERFORMANCE		POPULARITY	
	Average Mark per Question	Rank Order	Attempts(%)	Rank Order
1	31.8	3	95.0	1
2	23.2	5	66.6	6
3*	20.3	6	85.0	2
4	18.7	7	43.3	9
5	34.8	1	76.7	4
6	31.9	2	81.7	3
7	16.5	9	51.7	7
8	27.8	4	50.8	8
9	18.6	8	68.3	5

* Data for both Q.3 options combined

Table 5: Performance of candidates and popularity of questions in Ordinary level Agricultural Science in 2001

Question No.	PERFORMANCE		POPULARITY	
	Average Mark per Question	Rank Order	Attempts(%)	Rank Order
1	34.7	1	96.6	1
2	20.3	5	38.3	8
3 (1)	19.7	6	68.3	4
3 (2)	22.3	2	43.3	7
4	19.5	7	88.3	2
5	21.0	4	60.0	6
6	21.3	3	63.3	5
7	9.2	10	35.0	9
8	18.8	8	73.3	3
9	13.0	9	28.3	10

3. Analysis of papers

(a) Assessment of candidates' practical work

Guidelines were issued to schools on the in-school assessment of practical work. These guidelines are based on the criteria outlined in 'Rules and Programme for Secondary Schools' and on assessment Form A. Monitoring of the Agricultural Science Practical Assessment took place from 8 May to 18 May 2001, inclusive.

A total of 13 monitors were appointed to visit schools, interview a sample of candidates and carry out moderation if required.

In all, 170 centres were monitored and general moderation was required in 43 of these centres.

Details of the grades obtained by candidates in this part of the examination are outlined in Table 2 above.

Plant and Animal Identification Associated with Agriculture

In this area many candidates did not meet the expected outcomes of the syllabus. Candidates need to be familiar with the identification of a range of agriculturally important plants and animals (vertebrate and invertebrate). There is also a need for improvement in plant collection, presentation and classification.

Experience with Crops, Livestock, Housing and Farm Layout

There was a wide variation in the standard of work produced by candidates. The most popular student coursework presented was related to the candidate's home farm. Other popular student coursework related to silage, wheat, beef production, sucklers and sheep. Less common student coursework included farm safety, REPS, horses, greyhounds and organic farming. More unusual work included ostrich farming, geese, reed beds and tulip growing.

The use of inappropriate data from the Internet was encountered. Student coursework should be based on their own practical experience. Most candidates had good farm plans and farmyard layouts and were able to answer questions about their farm plan and layout, animal housing, grazing systems and anti-pollution measures.

Investigations

A range of investigations, both field and laboratory, was evident. Candidates had a reasonable knowledge of soil science. Many candidates presented a wide range of investigations on plant physiology, animal physiology and food tests. Extensive evidence of dissections, laboratory tests and anatomy of farm animals was found by the monitors. Genetics, ecology and microbiology were generally found to be the areas receiving least attention and investigations in these areas were carried out in a very limited way. Some schools had no investigations in any of these areas.

(b) Analysis of terminal written examination

HIGHER LEVEL

Q.1

Average mark = 31.8

Attempts 95.0%

This was the most popular question on the paper and it was the third highest scoring.

Part	Comment
(a)	Candidates could not distinguish between the two definitions. Many candidates stated one definition correctly.
(b)	Candidate answering on 'an animal pathogen' was good. 'Plant pathogen' was well answered, 'blight' being the example most commonly stated by the candidates.
(c)	Most candidates stated 'xylem' and 'phloem', but the understanding of 'collenchyma' was poor.
(d)	This part was well answered. In some cases candidates confused 'tillering' with 'tilling'.
(e)	Some candidates stated 'acid nature', but the idea of 'slow release' was not known.
(f)	This was a well answered item, though some candidates omitted the name of the animal.
(g)	Many candidates stated 'earthworm' and one characteristic – 'segmented' being the most common. 'Characteristic' was confused with 'effects on soil'.
(h)	This item was very well answered by most candidates.
(i)	Candidates made a poor attempt at this part.
(j)	Some candidates had a vague idea of 'transport' and 'defence'.

Q.2

Average mark = 23.2

Attempts 66.6%

- (a) A good standard was achieved for part (i), but answering of part (ii) failed to reach a satisfactory standard. Very few candidates had 'loam' for drought, giving 'clay' instead. A number of candidates stated 'sandy' correctly for the second answer, although 'loam' was also given.
- (b) For 'field capacity' many candidates had a waterlogged soil, while some had the vague idea of water being in the soil. The average mark awarded was 4 out of a total of 8 marks.
- For 'permanent wilting point' most candidates were awarded 4 marks for stating that water was gone from the soil, but the idea of the plant dying was seldom given for the remaining 4 marks.
- (c) The experiment was answered very well. Most candidates scored the full 16 marks.

Q.3

Average mark = 20.3

Attempts 85.0%

(The statistics given for this question are for both options combined.)

Option one

This was the less popular of the two Q.3 options.

- (a) The experiment was well attempted, with a good knowledge of the procedure being evident. Some explanations were found to be not very precise.

- (b) Very poor definitions were given for the terms by candidates. 'Aerobic' and 'anaerobic' were explained simply as 'with oxygen' and 'without oxygen', respectively. Most candidates did not state a second point. A large number of candidates did not give the correct name of the organelle in part (ii). Some candidates ignored it altogether.
- (c) The diagram of the leaf was generally good, but the labelling was below standard. Most of the answers consisted of a diagram and one or two named (or labelled) parts. The adaptation usually matched the part, but wasn't always given.

Option two

This was quite a popular question, although the standard of answering varied greatly.

- (a)
 - (i) Candidate answering was good, with most stating the required two points.
 - (ii) A large proportion of candidates gave a description of the 'transpiration stream' without referring to the actual evaporation from the leaf.
 - (iii) Many candidates gave the 'transport of food', but 'phloem' or the direction of movement were seldom stated. 'Water transport' was also given frequently.
 - (iv) Candidates' knowledge of 'embryo transplantation' was very vague.
- (b) Many answers consisted of long descriptions of the making of silage and hay. Candidates included material not relevant to the question and did not refer to the conservation processes. Some candidates answered as for two separate questions, without making any comparison.
- (c) Some candidates had 'roll' for cows, with no reference to the rumen. Candidates' answering for 'the pig' was poor, with answers like 'soaking grain' or 'adding molasses' being common.

Q.4 Average mark = 18.7 Attempts 43.3%

This was the least popular question on the paper and it was the third lowest scoring.

- (a) Many candidates who attempted this question described the flocculation experiment using lime instead of the requested experiment.
- (b) This part was very well answered, with many candidates being awarded 20 out of the 24 marks. There was confusion in some cases with a photosynthesis experiment, where oxygen and light were given as elements.
- (c) Most candidates were awarded 16 out of the 24 marks. Marks were lost by candidates as a result of a poor knowledge of recording results or writing up the survey.
- (d) This part was rarely attempted, and answering by those candidates who attempted it failed to reach a satisfactory standard. The 'burning peanut' experiment was stated, while other candidates confused this experiment with the 'sugar test'.

Q.5 Average mark = 34.8 Attempts 76.7%

This was the highest scoring question on the paper.

- (a) A majority of candidates gave three of the required five points.
- (b) Most answers were well laid out, with a number of points given separately under the 'indoor' and 'outdoor' headings. Candidates frequently scored full marks in this part of the question.
- (c)
 - (i) Almost all candidates stated the required one point, 'colostrum' or 'leader-follower' being the most common.
 - (ii) Candidates did not make reference to growth rates and gave vague answers about feeding.

- (iii) Many candidates stated the required two points. A large number of candidates used the same two points as in part (i).

Q.6

Average mark = 31.9

Attempts 81.7%

This was the second highest scoring question and it was the third most popular.

- (a) A common problem was the over-elaboration on calf rearing. Target weights were not given and many candidates gave long answers, with the second year squeezed into a few lines.
- (b) This part was well answered, with most candidates giving three of the required four points. The idea of 'assistance' and 'a vet' were very common. 'Bull choice' and 'calf size' were rarely given.
- (c) All candidates could name a tillage crop.
- (i) Most candidates had one of the required two points on soil (correct pH was stated by less than half of the candidates).
- (ii) Most candidates stated the required one point in relation to a tillage operation.
- (iii) Candidates' knowledge of 'fertiliser requirements' was vague.
- (iv) Approximately half of all the candidates stated the correct yield.

Q.7

Average mark = 16.5

Attempts 51.7%

This was the lowest scoring question on the paper.

- (a) Answering of 'crosses' was better than in previous years.
- (b) (i) Candidates poorly understood the concept of 'crossing-over'.
- (ii) Many candidates stated the common example of 'roan' in cattle to illustrate this point.
- (iii) Many candidates confused this with variation in an evolutionary context.
- (iv) Candidates used examples to illustrate this point – 'blood groups' was not a popular choice as an example.

Q.8**Average mark = 27.8****Attempts 50.8%**

- (a) (i) Most candidates had the idea of 'fixation of nitrogen' and scored full marks.
- (ii) Vague statements, like 'growing along the ground', were common.
- (iii) Candidates made more reference to 'minerals' or 'nutrients' than to 'protein'.
- (iv) This was well understood by most candidates who attempted it, but some candidates gave the opposite theory of 'produces too much nitrogen'.
- (b) Many candidates confused this with the nitrogen cycle. Those who picked the correct carbon cycle stated two or three of the required six points, e.g. 'respiration', 'decay' and 'burning of fossil fuels'.
- (c) The answering was very good here, with many candidates stating three of the required four points, 'breed' and 'age of cow' being the most popular points.

Q.9**Average mark = 18.6****Attempts 68.3%**

- (a) Most candidates scored full marks, stating 'redwater' or '*Babesia*' or both and the role of the 'tick'.
- (b) Many candidates stated one point in relation to the idea of 'waterlogged', but did not link this to the growth of rushes and sedges. A small number of candidates stated the lack of competition from grasses.
- (c) Candidates demonstrated very little understanding of 'the need for wilting'.
- (d) A number of candidates had a reference to photosynthesis, but did not go on to explain the reason for the differing levels of the gas throughout the day.
- (e) This part of the question was well answered, with many candidates linking the extra production of milk to frequency of milking.

ORDINARY LEVEL

Q.1

Average mark = 34.7

Attempts 96.6%

This was the best answered question on the paper and it was also the most popular.

Part	Comment
(a)	Most candidates stated the required one point, e.g. 'softens' or 'wets' food, without a reference to 'chemical' or 'enzyme'.
(b)	The common answers to this item included 'good drainage', 'aeration' and 'poor for plants'. Some candidates confused 'properties' with 'components'.
(c)	'Friesian' was a very common answer for both questions. 'Heifer' appeared quite frequently, possibly intended to be 'Hereford', as an example of a beef breed.
(d)	Diagrams were very poor, with little distinction being made between the seed heads. Many candidates drew or described the seed rather than the seed head.
(e)	Most candidates gave one point – nitrogen fixation. Few candidates gave a correct second point; many gave vague answers like 'good for grass'.
(f)	Many candidates confused 'product' with 'by-product'. 'Sugar' was a common answer, as were 'beetroot' and 'sugar cane'.
(g)	Few candidates displayed an understanding of the concept of 'earthing-up'. 'Blight' was seldom mentioned. Answers like 'easier to dig' and 'easier to sow' were common, where candidates were obviously confusing 'earthing-up' with drill making.
(h)	Most answers were based on the idea of 'irritation' or 'spreading disease'. Some candidates answered with reference to 'internal parasites'.
(i)	A reference to food chains was given by most candidates.
(j)	Many candidates stated one correct point – 'dandelion' and 'daisy' being the most common – while 'grasses' was the most common wrong answer.

Q.2

Average mark = 20.3

Attempts 38.3%

- (a) Most candidates stated two factors, without explanation. Vague references to water and air were quite common, although the earthworm was mentioned occasionally and, when it was, its role was usually explained as 'boring through' the soil.
- (b) This part posed a problem for most candidates, with a lot confusing the required experiment with the experiment to find the percentage of water. Very few candidates gave more than two of the required four points, with very few making any attempt at a calculation or giving any form of result. A small number of candidates made an attempt at a field method, again only stating two points in most cases.
- (c) This part was well answered, with most candidates stating at least two of the required four points. Despite the precise wording of the question, a number of candidates included 'air' or 'water' or both in their answer.

Q.3 - Option one**Average mark = 19.7****Attempts 68.3%**

- (a) (i) This part was well answered question, with many candidates stating the two required points.
- (ii) Most candidates stated the idea of preventing a 'deficiency' or 'boosting growth'. A majority of candidates gave one of the required two points.
- (iii) Autumn ploughing was not clearly understood, with few candidates knowing the reasons behind it. A small number of candidates had the idea of 'easier work in spring' or 'disease control'.
- (b) This part was well answered, with the majority of candidates stating two of the three points required on hedgerows. 'Shelter', 'boundary' and 'habitat for wildlife' were the usual answers given.
- (c) Many candidates showed a lack of understanding of 'catch crops'. Some candidates managed to state one point – 'food for animals' – of the required two points.

Q.3 - Option two**Average mark = 22.3****Attempts 43.3%**

This was the less popular of the two options but it was the better answered and was the second highest scoring question on the paper.

- (a) While many candidates showed a good knowledge of the management of a cow, there were many answers that described the management, and feeding, of the newborn calf. Most candidates stated at least one point of the required three.
- (b) (i) This item was well answered, with a large majority of candidates describing 'paddock' or 'strip' grazing. Most candidates stated the required three points, with diagrams included in many answers.
- (ii) Good attempts were made on mixed grazing but most candidates failed to state the required three points. The most common answers were 'sheep grazing around dung' or 'sheep grazing low'.

Q.4**Average mark = 19.5****Attempts 88.3%**

This was the second most popular question on the paper.

- (a) This was very well answered, with most candidates stating the required four points.
- (b) Many candidates stated one point for the 'squeeze' method and the 'visual' method. The pH method was seldom given.
- (c) The silage requirements were very poorly understood. Many candidates gave amounts in 'round bales' or 'ad lib'. Some candidates concentrated on how to feed the animals.

Q.5 **Average mark = 21.0** **Attempts 60.0%**

- (a) This experiment was very well answered by most candidates. Full marks were achieved quite often.
- (b) Many candidates described the 'starch test' or the 'burning feathers' experiment, instead of the test for protein.
- (c) Many candidates described the use of a 'quadrat'. Some candidates went on to describe a qualitative survey of grassland. There was seldom any reference to measuring mass of grass, weight of cattle, etc.
- (d) Few candidates attempted this part of the question; those who did had a good knowledge of the 'Resazurin test'. Some candidates misinterpreted the question and described hygienic milking methods.

Q.6 **Average mark = 21.3** **Attempts 63.3%**

- (a) Most candidates stated the three points required, with 'easy to monitor', 'disease prevention' and 'mortality' being the most common answers. Very few answers contained any reference to 'resting pasture' or 'prevention of poaching'.
- (b) Many candidates stated the three required points, with most opting for 'lamb rearing'. 'Castration' and 'tail docking' were seldom given.
- (c) While many candidates failed to name the enterprise, most stated the other three required points. Some candidates went off the point to describe 'performance testing' instead of 'bodily characteristics', while other candidates gave a mixture of characteristics for two different enterprises, e.g. beef farming and dairying.

Q.7 **Average mark = 9.2** **Attempts 35.0%**

This was the lowest scoring question on the paper and it was the second least popular.

- (a) The definitions were poorly attempted and below the standard outlined by the syllabus. 'Allele' was not understood, with a few candidates defining a gene. Examples were not included in most answers. Most candidates were able to define 'gamete'. Very few candidates stated what a hybrid is, with some candidates describing it as 'a cross'.
- (b) Many candidates showed a poor understanding of crosses. A large number of genotypes were stated, with the parents, gametes and F1 all the same. There was no phenotype given in most cases.

Q.8**Average mark = 18.8****Attempts 73.3%**

- (a) A very significant number misinterpreted this part of the question and, instead of factors that influence FYM composition, candidates wrote about the uses and benefits of FYM. Of those candidates who understood the question, most stated two of the required four points correctly, the most common answers being 'use of straw', 'nutrient level' and 'amount of urine'.
- (b) This part was well answered, with most candidates referring to 'dry', 'prevent entry of pests' and 'cool'. Some omitted the name of the cereal or gave 'potatoes', but still managed to gain marks for other points stated.
- (c) Again, some candidates named a cereal instead of a root crop (mainly barley), but still gained marks under the other headings. Most, however, did well on this part.
- (i) Many candidates referred to 'free draining' and 'deep loamy', without mentioning pH.
- (ii) Many candidates stated only one of the required two points. Most candidates referred to the idea of 'spray' only, while 'blight' was frequently mentioned by those candidates who discussed the growing of potatoes.
- (iii) Most candidates stated only one of the required two points.

Q.9**Average mark = 13.0****Attempts 28.3%**

This was the least popular question on the paper and it was the second lowest scoring.

- (a) Most candidates stated one point, for example 'low fertility' or 'grasses all gone'. A small minority of candidates managed to state the required two points.
- (b) Some answers were excellent while other candidates confused the 'iron pan' with the 'plough pan'.
- (c) Many candidates stated the required two points, including differences in rainfall, soil type and amount of sunshine.
- (d) This part was frequently attempted by candidates but was poorly answered. Some typical answers were: 'the pig eats more in cold weather and gains weight' and 'pigs lose weight by sweating in a warm place'.
- (e) This part was poorly answered, with few answers containing any reference to 'respiration'. Vague statements about carbon dioxide being in the blood or coming from the lungs were common.

4. Overall comments

- In general, definitions were poorly answered.
- Diagrams were found to be of a reasonable standard, but labelling was not of a good standard.
- Inconsistency was found in the answering of experiments. Some experiments were answered well by the candidates while others failed to reach an acceptable standard.
- Very few of the candidates attempted more than the required six questions. Many candidates did not attempt the required number of questions. A number of candidates attempted both Q.3 options.
- Genetics was unpopular and poorly answered, despite the new layout of the question.
- Reading and interpretation of questions by the candidates was found to be poor.
- Accurate figures or rates were rarely given.
- Names of animals and plants were found to be unsatisfactory, and candidates confused root crops with cereals.
- Most candidates gave over-elaborate descriptions of one or two points, to the exclusion of other valid points.

5. Recommendations for teachers and students

- It is always important for the candidate to read each question carefully and use the full time allocated in the examination.
- Candidates should ensure that all parts of a question are answered and that the required number of questions are attempted.
- Candidates are reminded that, if both Q.3 options are answered in the examination, only the one with the higher marks will be included in the final grade.
- Teachers should emphasise to candidates the importance of a structured answer. Where possible use the headings and useful information from the question. When not stated, more than one point is usually required in an answer.
- Candidates' knowledge of definitions and quality and labelling of diagrams need to be further improved.
- Candidates and teachers should ensure that all components of the practical assessment are present for the assessment and monitoring procedures.

Appendix

Table A1: Numbers of candidates taking Agricultural Science Higher level and Ordinary level in the years 1996-2001

Year	Higher Level	Ordinary Level	Total
1996	1728	782	2510
1997	1897	762	2659
1998	2119	726	2845
1999	2141	858	2999
2000	2269	701	2970
2001	2146	769	2915

Table A2: Grade distributions(%) in Agricultural Science Higher level and Ordinary level for the years 1998-2001

Higher level					Ordinary Level				
Grade	1998	1999	2000	2001	Grade	1998	1999	2000	2001
A	4.5	5.8	5.0	5.6	A	0.4	0.2	0.0	0.5
B	27.1	27.3	21.6	23.8	B	10.1	6.0	6.0	7.6
C	37.9	35.4	32.9	34.1	C	39.3	27.1	23.0	27.7
D	25.9	25.5	30.8	28.5	D	36.1	42.7	41.0	42.4
E	3.9	5.2	7.8	6.8	E	11.3	17.8	21.4	15.9
F	0.7	0.7	1.8	1.2	F	2.8	5.5	8.0	5.1
NG	0.0	0.1	0.0	0.0	NG	0.1	0.7	0.7	0.8

H485