

## **5<sup>th</sup> Year Ag Science Test - Potatoes** (Total = 158m)

### **Short Questions:** (70m)

1. Give 3 characteristics of certified potato seeds. (10m)
2. Give 3 methods of weed control when growing potatoes without using herbicides. (10m)
3. Give 3 benefits of sprouting before planting potatoes. (10m)
4. What is earthing up? Give 2 advantages of earthing up. (10m)
5. What family is the potato plant a member of? Name 2 other members of that family? (10m)
6. What county in Ireland does potato seed production usually happen in? Give 2 reasons for this? (10m)
7. Name the part of the potato plant that (a) is eaten (b) grows above the ground (c) gets infected by blight spores. (10m)

### **Long Questions:**

1. Describe potato production under the following headings. (3 points per heading): (48m)
  - (a) Sowing Dates
  - (b) Soils & Climate
  - (c) Cultivations (i.e. machinery used to prepare the soil)
  - (d) Harvesting (dates & machinery used)
  - (e) Yield
  - (f) Storage
  - (g) Pests
  - (h) Diseases
2. Read the passage below and answer the following questions (40m)

### **Could GM potatoes prove resistant to blight?**

*December 24 2018 04:00 PM  
Irish Farming Independent*

Potatoes in Ireland are typically sprayed with fungicide 10 to 12 times per year, due to the constant threat of late blight.

Late blight disease is controlled well, but this is expensive and there is an environmental impact.

"We've never met a farmer that likes to spray. It's a necessary part of the business. If there is an alternative, they are interested," said Dr Ewen Mullins, crop scientist at Teagasc.

Teagasc carried out a study of a GM potato engineered to be resistant to late blight.

This involved cutting a gene from a wild potato species and inserting it into a conventional potato.

"Many wild potatoes have strong resistance to late blight, but also many have traits we don't want," said Dr Mullins.

"Scientists in the Netherlands developed the GM potato line and through the EU funded AMIGA project we were able to examine the agri-environmental impact of this novel potato variety."

The GM potato reduced the environmental impact of potato production by up to 95pc.

Late blight strains have the potential to overcome the genetic resistance, but more modern gene editing techniques can rapidly generate new crop varieties.

"It is much faster than traditional breeding. Breeding a new potato variety can take 12 to 13 years. With this approach, this can be reduced to 2-3 years," said Dr Mullins.

A recent decision by the European Court of Justice has, however, taken the option of gene-edited crops off the table for European seed companies, and likely European farmers too.

Lab research using gene editing will continue in Europe, but trialling new gene edited crops in the field is likely to hit the buffers.

"We had editing projects in play. Our goal at Teagasc is to deliver solutions through practice. The customer is the man or woman driving the tractor," said Dr Mullins, adding that breeding programmes will continue to use gene editing to improve genetic understanding of crop varieties.

"There was overwhelming evidence that gene editing was more precise and faster. So it was a surprising decision" he said.

"But is it a negative? It doesn't much matter [at Teagasc], because the law is the law and we have to get on with it."

- (a)** In this article what do the letters GM Stand for? (4m)
- (b)** What desirable trait does the "Wild Potato" have? (4m)
- (c)** In the text we are told "The GM potato reduced the environmental impact of potato production by up to 95pc." Explain how you think this is possible? (8m)
- (d)** Why is the research currently stopped? Do you think there are underlying reasons for this is? (8m)
- (e)** Breeding programmes to improve disease resistance are proposed as a way to improve sustainability. Can you suggest two other ways of improving sustainability in potato production? (8m)
- (f)** Is Teagasc a reliable source of information for farmers? Give a reason for your answer. (8m)

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### *Marking Scheme*

#### Short Questions: (70m)

*Marks are awarded as 4+3+3 = 10. Award 4 marks for first correct answer and 3 for every subsequent answer.*

8. Give 3 characteristics of certified potato seeds. (10m) **True to Type/Free from Potato Cyst Nematode/Free from Viral Diseases/Higher Yield (Any 3)**
9. Give 3 methods of weed control when growing potatoes without using herbicides. (10m) **Using Certified Seed/Crop rotation/Picking by hand/Growth encouragement (e.g. prep of seedbed,timely sowing& harvest)/Earthing Up/Shading**
10. Give 3 benefits of sprouting before planting potatoes. (10m) **Fast plant emergence/Outcompete weeds/Good headstart especially in cold soils/higher yield**
11. What is earthing up? Give 2 advantages of earthing up. (10m) **Pushing soil up around the growing potato plant. Adv. (Any 2) Prevents greening of potatoes/prevents spread of diseases e.g. blight/prevents weeds germinating/keeps soil loose/increased yield**
12. What family is the potato plant a member of? Name 2 other members of that family? (10m) **Solanaceae. Other Members: Tobacco/Tomato/Peppers/Night Shade**
13. What county in Ireland does potato seed production usually happen in? Give 2 reasons for this? (10m) **Donegal. Reasons: Windy&Cool/Low Aphid Population stops Spread of Viruses/Isolated, stops spread of airborne diseases**
14. Name the part of the potato plant that (a) is eaten (b) grows above the ground (c) gets infected by blight spores. (10m) **(a) Tuber (b) Haulm (c) Leaf**

#### **Long Questions:**

3. Describe potatoes under the following headings(3 points heading) (48m)  
**Each section is worth 6 marks(3x2)**

- (i) Sowing Dates: **Feb 1<sup>st</sup> earlies/Mar 2<sup>nd</sup> earlies/Apr maincrop/maincrop when frost subsides**
- (j) Soils & Climate: **deep/well cultivated soils/loams/pH 5.5 -6/stone free**
- (k) Cultivations: **Plough 22cm/Rotavate/De-stoner/Ridger**
- (l) Harvesting: **May earlies immature/Maincrop Sep/Oct/Elevator Digger**
- (m) Yield: **1<sup>st</sup> Earlies(7-10 tonne/ha)/ 2<sup>nd</sup> Earlies (15-25 tonne/ha)/ Maincrop(30-40 tonne/ha)**
- (n) Storage: **Cool/Dry/Well ventilated/Pest proof/Frost proof**
- (o) Pests: **Wireworms eat tubers/kill with insecticide/Slugs eat tubers/kill with slug pellets/Aphids spread viral diseases/kill with insecticide or ladybird**
- (p) Diseases: **Blight(fungal disease blotchy leaves, black tubers)/ Viruses spread by aphids(Leaf roll, leaf mosaic, virus x, virus y) Bacterial (Blackleg/Common Scab/Brown Rot/Ring Rot)**

4. Read the passage below and answer the following questions (40m)

- (g) In this article what do the letters GM Stand for? (4m) **Genetically Modified**
- (h) What desirable trait does the “Wild Potato” have? (4m) **Blight Resistance**
- (i) In the text we are told “The GM potato reduced the environmental impact of potato production by up to 95pc.” Explain how you think this is possible? (8m) **(Any 2x4)Reduced use of chemical sprays(fungicides)/Reduced use of fuel in tractors during spraying/Reduced use of fertilizer to achieve same yield**
- (j) Why is the research currently stopped? Do you think there are underlying reasons for this is? (8m) **Decision by European Court of Justice/Concern over ethics of use of GMOs/Potential harm of GMOs in food chain**
- (k) Breeding programmes to improve disease resistance are proposed as a way to improve sustainability. Can you suggest two other ways of improving sustainability in potato production? (8m) **Breed for other traits e.g Pest Resistance, higher yield/ Only use certified seeds/Remove Groundkeepers**
- (l) Is Teagasc a reliable source of information for farmers? Give a reason for your answer. (8m) **Yes/Government Funded Organisation/Everything they publish is research based**