PDST
Professional Development Service for Teachers | An tSeirbhís um Fhorbairt Ghairmiúil do Mhúinteoirí

LEAVING CERTIFICATE
AGRICULTURAL SCIENCE

Webinar 2

Here are some example narratives for conducting the IIS in different contexts. The suitability of the topic is evaluated using the suggested template from Appendix 2 of the NCCA Guidelines for Completing the Individual Investigative Study.

<table>
<tr><th colspan="2">Example 1:</th></tr>
<tr><td colspan="2">Topic selected by student in response to the brief:
Natural fertiliser sources for barley

Research question:
Could barley farmers benefit from the increased use of natural sources of nitrogen?

Suggested research:
- The benefits and drawbacks of using slurry and manure in the growth of barley (financial and environmental sustainability)
- Case studies showing successful use of slurry and manure in cereal production

Suggested experiments:
- Extension of SPA LO 3.3.2h - investigate the effect of nutrients on the growth of a sample of different plants and measure the biomass of these plants above and below ground. Use Natural sources of nitrogen (e.g. slurry, manure, seaweed) vs artificial sources (e.g. 18:6:12, CAN) and compare biomass above and below ground</td></tr>
<tr><td>Is this topic relevant to the brief?</td><td>Yes – natural fertiliser sources present a more sustainable option in terms of soil and plant health

Yes – this is relevant to sustainability in the barley industry</td></tr>
<tr><td>Does it provide opportunities to engage with the themes and learning outcomes of the specification?</td><td>Yes – LO 2.3a, 4.3.2a,</td></tr>
<tr><td>Are there a number of viewpoints that can be researched?</td><td>Yes – there are varying viewpoints on the benefits/drawbacks of natural vs artificial fertilisers in terms of productivity, mineral loss to water/air and environmental implications of same. For example:
https://www.teagasc.ie/media/website/publications/2016/No.-1,-MBourke.pdf

https://www.teagasc.ie/rural-economy/rural-development/diversification/organic-cereals/</td></tr>
<tr><td>Can the research question be investigated through research and experimentation?</td><td>Yes</td></tr>
<tr><td>Can primary data be collected safely in laboratory and/or field settings which support the formation of conclusion?</td><td>Yes – data can be gathered over a short timeframe (e.g. 3-4) weeks using barley seeds, seed trays and mineral sources. This experiment could be set up and monitored in a variety of locations (e.g. school science lab, home, garden etc)</td></tr>
<tr><td>Can the research question be pursued over an appropriate period of time (e.g. a season of production) in laboratory and/or field settings?</td><td>Yes – a few weeks of growth would be sufficient time to gather data on biomass</td></tr>
</table>

Example 2:

Topic selected by student in response to the brief:
Sustaining high-quality milk production through a grass-based dairy enterprise.

Research question:
Should farmers consider investing in grass-based budgeting and improved silage quality as the best methods of improving milk solids in a dairy enterprise?

Suggested experiments:

- Measure the composition and DM% of grass in grazing areas
- Compare the total milk solids for cows grazing different areas

I have already gathered data on the grass cover and DM % over the summer and measured total solids of milk samples from two cows on a farm I was studying. I was hoping to carry out the same experiment for autumn grass and winter silage. I am unable to access this farm at the moment so I have asked the farmer to gather data on grass samples for me using the same methods and to share with me the breakdown of milk solids for the same two cows off the milk dockets.

Is this issue relevant to the brief?	Yes
Does it provide opportunities to engage with the themes and learning outcomes of the specification?	Yes – sustainability, nutrition and other areas LO 4.3d, 3.3.3a,
Are there a number of viewpoints that can be researched?	Yes, there are a multitude of factors that can be considered as valid means of increasing milk solids and other factors that contribute to the production of high-quality milk. There are varying views on this issue
Can the research question be investigated through research and experimentation?	Yes
Can primary data be collected safely in laboratory and/or field settings which support the formation of conclusion?	Yes – initial data has been gathered by the student and any further data gathering can be conducted by the farmer and shared with the student for analysis
Can the research question be pursued over an appropriate period of time (e.g. a season of production) in laboratory and/or field settings?	Yes – grass covers and composition can be measured over the season as can milk solids from the same sample of cows

Example 3:	
Topic selected by student in response to the brief: Sustaining water quality on farms **Research question:** **Could water quality be improved by adjusting fertiliser application methods?** Suggested experiments: - Kick tests at local rivers/streams adjacent to farms to identify indicator species and analyse for water quality - Compare with spreading patterns of slurry and fertilisers on fields adjacent to river, as well as information on the distance left between the spreading zone and riverbank *I am unable to access the farm at the moment so I will gather the data from kick tests myself and ask the farmer to share the data on spreading to add to the analysis*	
Is this topic relevant to the brief?	Yes
Does it provide opportunities to engage with the themes and learning outcomes of the specification?	Yes, LO 2.3a
Are there a number of viewpoints that can be researched?	Yes, e.g https://smartfarming.ie/water/ http://watersandcommunities.ie/
Can the research question be investigated through research and experimentation?	Yes
Can primary data be collected safely in laboratory and/or field settings which support the formation of conclusion?	Yes – the student can gather the data from the river using a kick net and combine this with information shared by the farmer
Can the research question be pursued over an appropriate period of time (e.g. a season of production) in laboratory and/or field settings?	Yes – the kick test and sample analysis can be done in a day

Example 4:

Topic selected by student in response to the brief:
Farming practices and soil compaction

Research question:
Could farmers use more efficient practices for a sustainable soil structure?

Suggested research:

- Impacts of soil compaction by livestock and farm machinery on infiltration rate of soils, e.g. https://www.researchgate.net/publication/286292656_Influence_of_soil_compaction_by_farm_machinery_and_livestock_on_water_infiltration_rate_on_grassland
- Impacts of compaction on the properties of a soil, e.g. https://businesswales.gov.wales/farmingconnect/sites/farmingconnect/files/technical_article_-_better_soil_management_soil_compaction_final.pdf
- The importance of compaction management and mitigation options, e.g. https://www.teagasc.ie/environment/soil/research/square/compaction/
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Suggested experiments:

- Extension of SPAs LO 2.2.2b-d – gather soil(s) and compact in different ways, simulating compaction due to machinery and/or animals vs uncompacted soil. Compare results
- Extension of SPA LO 3.3.1c – sow seeds in the different samples of compacted/uncompacted soils and gather data for % germination

I am unable to access the farm I intended to gather soil samples from, so I am going to carry out this investigation using soil samples from the school grounds/my house/local field…. And using store bought seeds (e.g. grass, peas, cress, etc.)

Is this topic relevant to the brief?	Yes – this is relevant to sustainability in a wide variety of farming practices
Does it provide opportunities to engage with the themes and learning outcomes of the specification?	Yes – LO 2.2.2 and LO 3.3.1
Are there a number of viewpoints that can be researched?	Yes – the issue of soil compaction is a significant one as land use becomes more intensified with greater tillage demands and increasing dairy herd sizes
Can the research question be investigated through research and experimentation?	Yes
Can primary data be collected safely in laboratory and/or field settings which support the formation of conclusion?	Yes – data can be gathered in lab or home settings
Can the research question be pursued over an appropriate period of time (e.g. a season of production) in laboratory and/or field settings?	Yes – data can be gathered in a short timeframe, e.g. 1 week

Example 5:

Topic selected by student in response to the brief:
Sustaining high-quality outputs and profits through monitoring programmes.

Research question:
Can monitoring programmes help improve outputs and increase profits on livestock farms?

I am unable to gather primary data this year related to this question. Therefore, I am going to analyse secondary data from the following sources for two production systems involved in Teagasc monitoring programmes:

The National Pig Herd Performance Report 2018:
https://www.teagasc.ie/media/website/publications/2019/teagasc_pig_herd_performance-report-2018.pdf

The Profit Monitor Analysis for Dairy Farms 2018:
https://www.teagasc.ie/media/website/publications/2019/teagasc_pig_herd_performance-report-2018.pdf

As a case study, I will analyse and compare the following outputs:
Dairy – comparison of milk constituents (solids, fat/protein, yield) vs grass utilised (hectares used, stocking rate, grass used in DM/ha) from 2017 and 2018 vs costs

Pigs – comparison of sow, growing pig, weaner and finisher performance vs production costs from the available data 2016-2018

I will then make comparisons across the two systems to draw conclusions on whether monitoring programmes help improve outputs and increase profits on livestock farms.

Is this issue relevant to the brief?	Yes
Does it provide opportunities to engage with the themes and learning outcomes of the specification?	Yes – sustainability, nutrition and other areas For example, LOs from section 4.3
Are there a number of viewpoints that can be researched?	Yes
Can the research question be investigated through research and experimentation?	Yes
Can primary data be collected safely in laboratory and/or field settings which support the formation of conclusion?	No – this student is unable to gather primary data so is using secondary data analysis instead
Can the research question be pursued over an appropriate period of time (e.g. a season of production) in laboratory and/or field settings?	Yes

Example 6:

Topic selected by student in response to the brief:
Sustainable milk quality and profits through increasing herd EBI.

Research question:
Can ongoing herd EBI improvements lead to consistent quality outputs in the dairy herd?

I am unable to gather primary data this year related to this question. Therefore, I am going to analyse secondary data from the following sources:

I am going to gather the following secondary data from a case study dairy farm for the last 5 years:

- *Herd EBI*
- *Average milk yield*
- *Average milk solids (fat, protein)*
- *Other details associated with milk production, e.g. cost of collection, milk prices, management of animals, breeding programme*

I am going to compare the changes in herd EBI with changes in milk outputs. I will then draw conclusions on the impact of herd EBI on dairy outputs both in terms of quantity, quality, and profit.

Is this issue relevant to the brief?	Yes
Does it provide opportunities to engage with the themes and learning outcomes of the specification?	Yes – sustainability and production For example, LOs from section 4.3.1, 4.3.2
Are there a number of viewpoints that can be researched?	Yes
Can the research question be investigated through research and experimentation?	Yes
Can primary data be collected safely in laboratory and/or field settings which support the formation of conclusion?	No – this student is unable to gather primary data so is using secondary data analysis instead
Can the research question be pursued over an appropriate period of time (e.g. a season of production) in laboratory and/or field settings?	Yes