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Abstract

The purpose of this project is to create a simple to use application for Teagasc Advisors to be able to assess nitrate and phosphate levels on farms. The application must print accurate clear results which are easily understood. These functions will be explained in detail throughout this document

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1.0 Introduction

The purpose of this project is to create a webapp for Teagasc advisors to be used to carry out nitrate assessments for farmers seeking to apply for a government scheme. This webapp should be able to successfully assess a farmer's application for the Teagasc advisor, greatly speeding up the process as it should carry out all calculations, whilst adhering to legal limits. The webapp should then produce a report at the end which will clearly display if they have breached any legal limits, or if the assessment was a success with a quick report summarizing. This application should record grassland stocking rates, whole farm stocking rates, offer Import/Export, storage, and livestock unit update features. This information should be stored and retrievable in a simple to read format.

2.0 Project Description

Teagasc Advisor App recently renamed Teagasc Nitrate Planner is aimed at Teagasc Advisors. The application is designed to exist with current technologies offering a simple fast assessment of smaller production farmers who are currently at a disadvantage with current systems. This application is unique as there is minimum required input, Record5 land feature only exists in this application, Livestock Unit per Hectare only exists in this application. This application will give the advisor the ability to swiftly assess farmers' nitrate needs, offer functionality to calculate Storage and Slurry calculations both on the farm and legal amounts. This application also needs to deliver a clear report at the end which can be easily understood by a farmer. Although this application offers functionality never seen before the main request of this application is to present a simple to read report for farmers clearly labelling their levels and requirements to remain in a legal category.

2.1 Users

There will be 2 main users of this application, the Advisor, and the Administrator. The Advisor will be the primary user of the app and it is designed to work under Teagasc specifications. The Administrator will exist mainly to add additional Advisors, with the other functionality of the application existing for the Advisor.

2.2 Advisors

Advisors in the context of this project are specialists who calculate the number of nitrates and phosphates produced on a farm, with their main responsibility to maintain farmers within their legal limits. Farmers can be expected to purchase additional stock or import/export which affects farm production. The Advisor in this case would have to assess the storage available, number of animals, amount of land to calculate a total nitrates figure, total potassium figure, required and legal storage, stocking rates. With these an Advisor can explain in detail the process a farmer must complete to return to the legal limit. This application is designed to greatly speed up this process whilst offering a simple report at the end.

2.3 Administrator

The Administrator will be in control of adding more Advisors to the application, as the application develops there may be further functionality available for the Administrator but at this current time the focus is on the functionality available to the Advisor.

3.0 Use Case

System Use Case

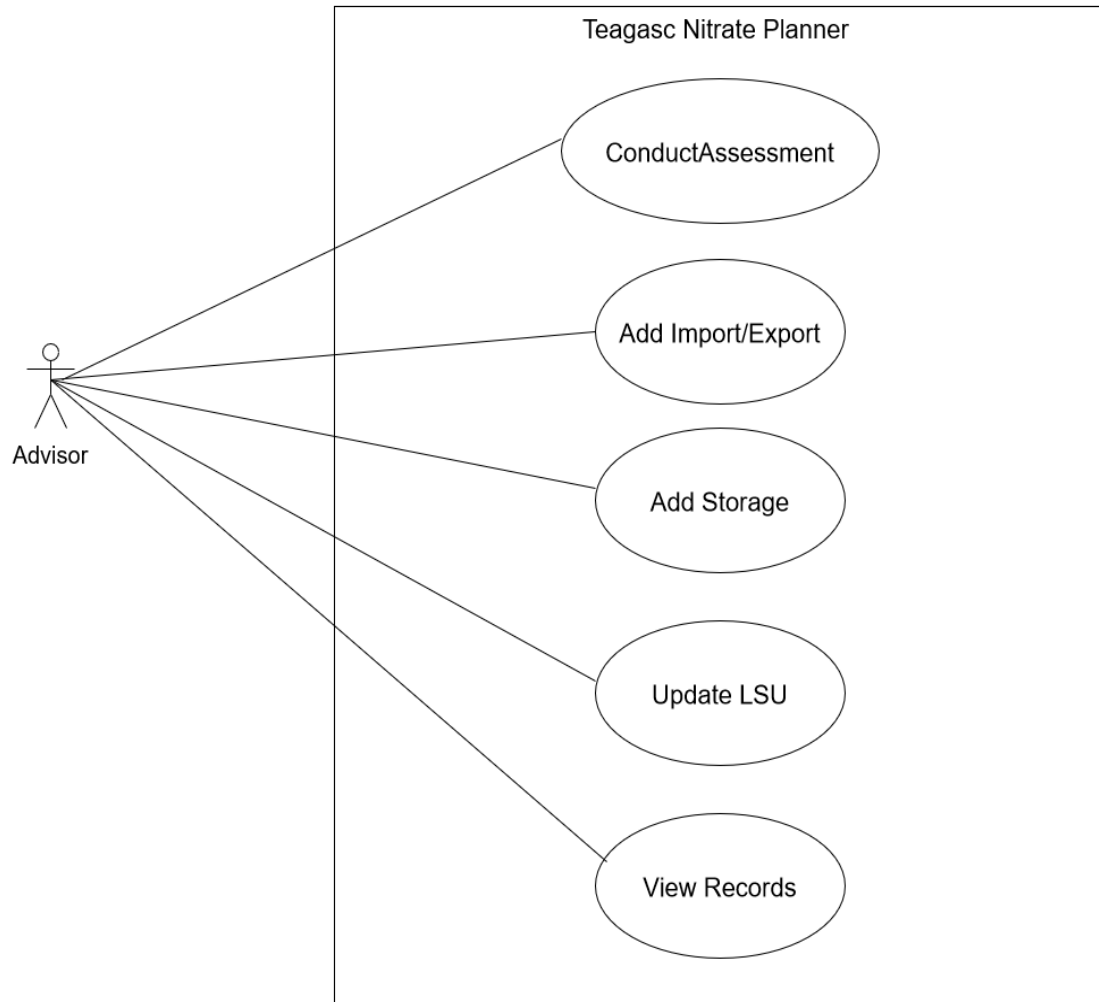


Figure 1: System use case

4.0 Individual Brief use cases

Name	Conduct Assessment
Actors	Advisor
Preconditions	The Advisor has logged in and selected Conduct Assessment
Activity	This use case begins when the Advisor selects the Conduct Assessment Feature, this is a process carried out over three pages recording the required information. On completion of this feature a report will be displayed.
Postconditions	The Advisor presents the report to the Farmer
Alternative	<ol style="list-style-type: none"> 1. The Advisor may enter invalid information <ol style="list-style-type: none"> a. The application will highlight the incorrect input 2. The Advisor enters a current existing herd number <ol style="list-style-type: none"> . The application will inform the user the herd number exists

Figure 2 Conduct Assessment use case

Name	Import / Export Nitrates
Actors	Advisor
Preconditions	The Advisor must be logged in. The Farmer has been assessed and possesses a whole farm stocking rate and a grassland stocking rate
Activity	The Farmer will inform the Advisor of the operation, either an import or an export of either farmyard manure or slurry that will directly affect the stocking rate. The Advisor enters the relevant information and a report is printed at the end of the process
Postconditions	The Advisor presents the report to the farmer
Alternative	<ol style="list-style-type: none"> 1. The Advisor may enter invalid information <ol style="list-style-type: none"> b. The application will highlight the incorrect input

Figure 3: Import/Exports use case

Name	Slurry Storage
Actors	Advisor
Preconditions	The Advisor must be logged in. The Farmer has been assessed and possesses a whole farm stocking rate and a grassland stocking rate
Activity	The Advisor will select the Storage feature The Advisor will select the current farmer The Advisor will then enter the information into the form (dimensions and location). The application will have already recorded the relevant information on the farmer to be able to calculate the Storage Capacity and the current on farm produce, clearly displayed on a report
Postconditions	The Advisor presents the report to the farmer
Alternative	<ul style="list-style-type: none"> 2. The Advisor may enter invalid information <ul style="list-style-type: none"> c. The application will highlight the incorrect input 2. The Farmer may have more than one Container <ul style="list-style-type: none"> a. The Advisor selects add another container at the bottom of the form and repeats the process

Figure 4: Add Slurry use case

Name	Update Livestock Unit (LSU)
Actors	Advisor
Preconditions	The Advisor must be logged in. The Farmer has been assessed and possesses a whole farm stocking rate and a grassland stocking rate
Activity	The Advisor will select the Updates feature and will be greeted with the list of animals owned by the current farmer. The advisor can reduce or increase the number of livestock dependent which will directly affect the Livestock unit per hectare
Postconditions	The Advisor will display the generated report at the end and inform the farmer
Alternative	None

Figure 5: Update Livestock Unit use case

Name	View Records
Actors	Advisor
Preconditions	The Advisor must be logged in. The Farmer has been assessed and possesses a whole farm stocking rate and a grassland stocking rate
Activity	The Advisor will select the View Records feature, which will display the reports from Conduct Grassland and the Add Storage features
Postconditions	The Advisor will display the generated report at the end and inform the farmer
Alternative	None

Figure 6: View Records use case

5.0 Brief Use Cases

Use case name : Record5Land

Actors : Advisor, System

Story : An Advisor is assessing a farmer determining record5 figure

Preconditions : The farmer has all the relevant data

Activity :

1. The Advisor selects the Conduct Assessment feature
2. The Advisor will enter the farmers personal information correctly and submit
3. The Advisor enters the farmers land information
4. The System will generate a record5 calculation
5. The calculation depends on the amount of land, type of land (tillage, grass) and if the land is owned or rented. If the land is rented, then the period will determine the result
6. The System will deduct record5 from the whole farm stocking rate

Use case name : Livestock unit per hectare

Actors: Advisors, System, Database

Story: An Advisor is assessing a farmer to determine the number of nitrates and manure / slurry produced on farm to determine if within legal limits and whether an import or export is possible or required

Preconditions: The Farmer has all the relevant data

Activity:

1. The Advisor is on the third page of the Conduct Grassland Assessment or selected the Update LSU feature
2. The Advisor will record the amount and breed of livestock owned by the farmer
3. The System will retrieve the figures from the database (nitrate, phosphate, livestock unit)
4. The System will calculate the livestock unit per hectare by dividing the type of animal, number of units and amount of land
5. The System will calculate the number of nitrates depending on breed and number
6. The System will display this on the Conduct Assessment report page or Update LSU Report page

6.0 Teagasc Application Visualised

This is a visualisation of the Teagasc Advisors Application created using the Django-extensions module. This returned a very large image and was difficult to fit into the document in a readable format. The full image can be viewed here clearly.

https://drive.google.com/file/d/1BYO5r_Mc3sUV0cMqeGIBk2CrH2tGelpZ/view?usp=sharing

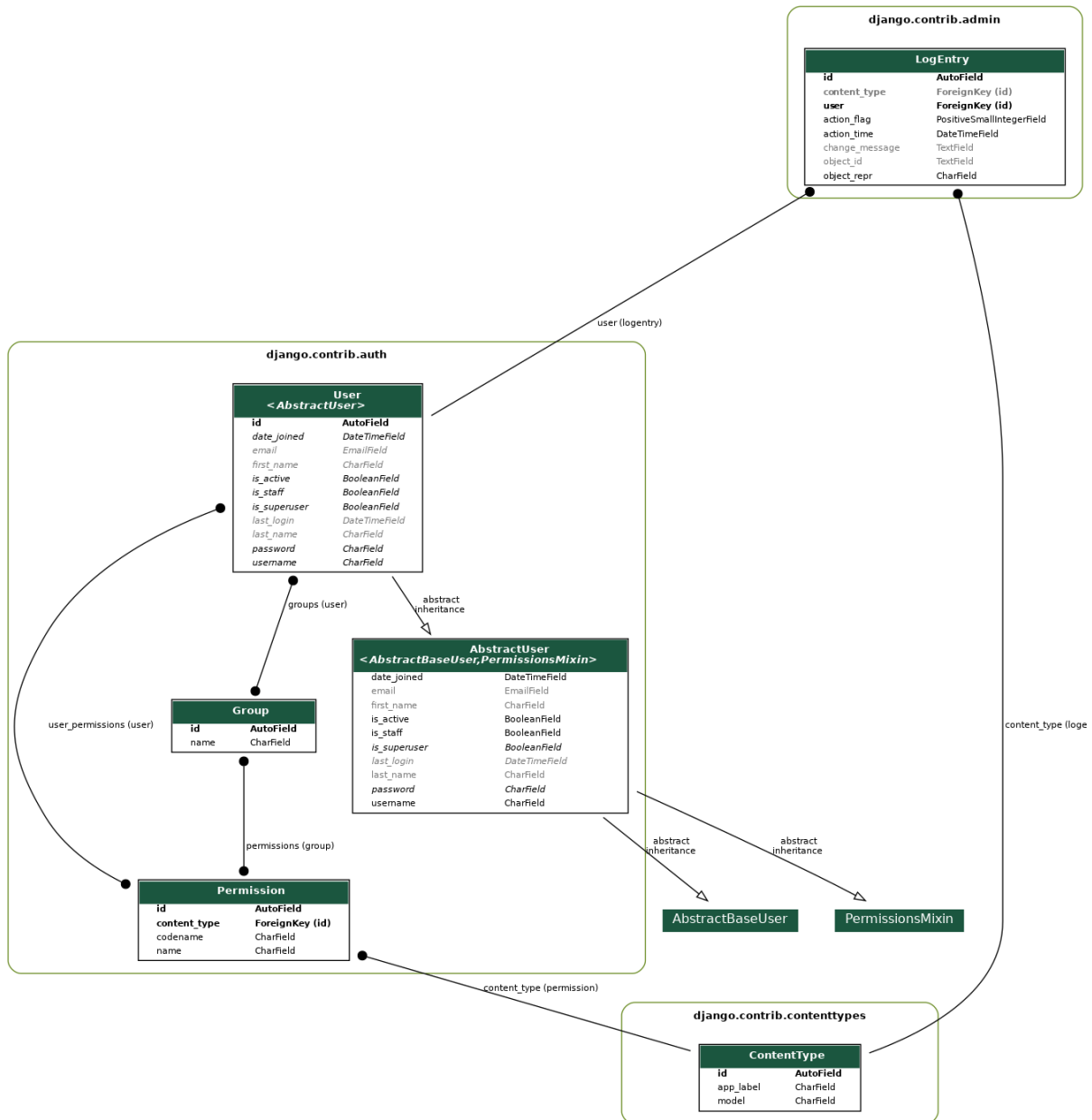


Figure 7: System Architecture

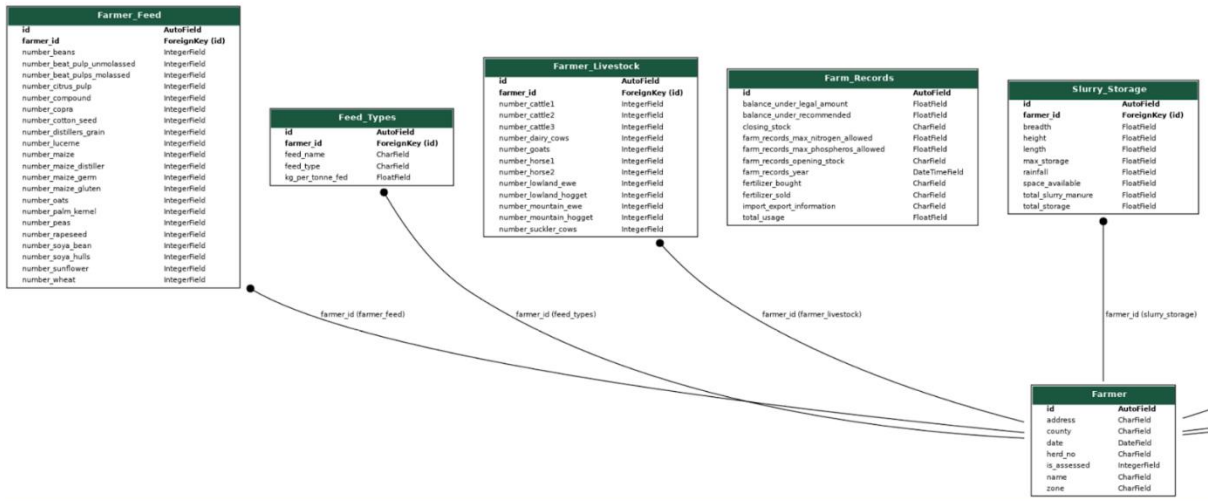


Figure 8: System Architecture

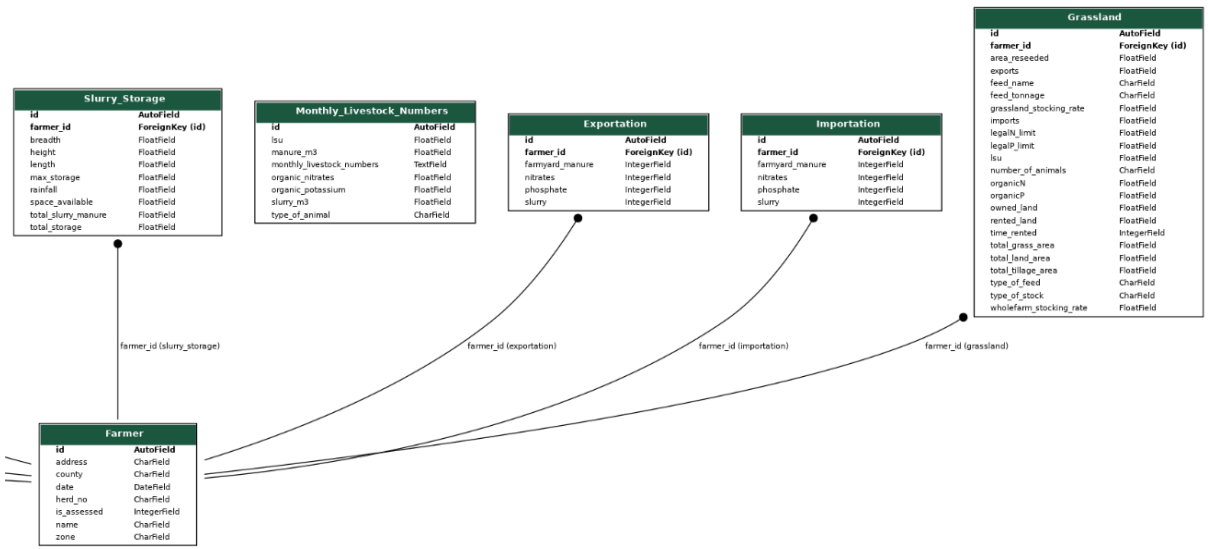


Figure 9: System Architecture

7.0 FURPS+

Robert Grady at Hewlett Packard devised a model for a classification system that is used to identify requirements not immediately defined in use cases. FURPS+ stands for Usability, Reliability, Performance, Supportability, focusing on functional requirements, the '+' was added to outline any additional non-functional requirements. FURPS is used widely in Software Development as it can be used to quickly outline requirements.

7.1 Functionality

Functionality refers to the main application features and its associated functionality. With this application the main functionality is calculations, displaying reports and recording personal information which must be stored securely

- The system will require an Advisor to log in
- The Application will allow Advisors to perform nitrate assessments on farmers
- Each assessment adheres to legal limits
- The Application should deliver a clean report at the end of each feature
- Each calculation must be accurate 100% of the time regardless as major penalties incur otherwise.
- The application must keep up to date with new Derogation plans

7.2 Useability

Useability refers to the user experience of the application. The UX aesthetics, design, accessibility, consistency, responsiveness are all major factors to keep in mind when providing an application that engages a user.

- An Advisor should be able to log in to the application within 10 seconds 99% of the time
- An Advisor should be capable of logging out within 5 seconds
- Each page should be structured to be easily read and understood
- Navigation between features/pages should be within 20 seconds
- Each feature is designed to be completed within 5 minutes
- After conducting a successful assessment reports should be displayed within 20 seconds
- An Advisor, of any level should be able to use this application with little to no explanation

7.3 Reliability

Reliability refers to the stability and availability of the system, how it reacts to failures and the time taken to recover from failures.

- This project is destined to exist within Teagasc offices, a government body which requires reliability
- This application should be accessible 99% of the time during a 5-day week (8-6)
- The application should always maintain and save Teagasc data
- Forms should submit 98% of the time. Very little errors or failures can be accepted, Farmers require swift evaluations as everything works in seasons, everything needs to be completed on time
- Any errors/failures should be easy to recover from 96% of the time
- The application should load without issues 95% of the time

7.4 Performance

Performance refers to how efficiently the system operates, its response time, retrieval speed, transmission. Performance also refers to how the system handles multiple users simultaneously and how the system scales with new users

- The application should be capable of handling large amounts of users at any given time
- The application should be capable of storing large amounts of data in a safe secure, CRUD manner
- The application should retrieve stored data within 20 seconds
- The performance will vary depending on internet connection, as this will be deployed within the Teagasc Offices this should not cause issues

7.5 Supportability

Supportability refers to the flexibility, sustainability, and maintainability of the system. Supportability also includes requirements such as testability and compatibility with other platforms

- This application will be deployed on one platform but will still be supported on all platforms
- The look and feel of the application should be equal across all platforms
- Testing should be easily accessed
- The application should be flexible enough to incorporate additional features in the future
- The application should be flexible to incorporate new calculations depending on new farm plans / schemes

7.6 + (Security)

The MySQL database and access to the application should be secured as to prevent unauthorised access.

- The application will record sensitive information from farmers which must be secured safely.
- All code within the application must comply with current standards for each language respectively.
- Access to the application must only be through the login screen
- The data stored should only be accessible through the applications features

8.0 Metrics

Metrics in this context will describe the success of this project overall. The below criteria specify how the success of the project will be measured :

- Application should run on Teagasc Platform
- Advisors should be allowed log in securely with correct credentials
- Calculations must be accurate
- The application should handle multiple users
- Reports must be clear and precise and understood by farmers
- Application results will be compared with current software to assess accuracy
- Application will be deployed and used by Advisors from the Teagasc offices

9.0 Testing

Testing of the application will be done through deployment of the application and accessed by the Teagasc Offices in Gorey and Enniscorthy. The results from this will be emailed and attached to verify success. Due to how the application will be deployed it's possible to have many issues present themselves as the application will be released into a closed beta group immediately upon deployment.

Test calculations were received from the Teagasc offices to be compared with the application, this was a list of test farmers with specified input figures and results. The application was accurate with every feature.

10.0 Conclusion

After deploying the project, both Gorey and Enniscorthy offices have used the application with very positive feedback. Robert has requested extra functionality and further development with the goal of being demoed for the Department of Agriculture. Simple user interface with minimised input allowed for easier use by the advisors. Some requests were made for more clarification of the units of measurement in some calculations, this was reviewed and fixed. Overall, the application was met with a lot of success and will continue to be developed and improved.

11.0 Plagiarism Declaration

I hereby declare that this research project titled "Teagasc Advisors Application" has been written by me under the supervision of Dr. Christophe Meudec.

The work has not been presented in any previous research for the award of bachelor's degree to the best of my knowledge.

The work is entirely mine and I accept the sole responsibility for any errors that might be found in the work, while the references to published materials have been duly acknowledged.

I have provided a complete table of reference of all works and sources used in the preparation of this document.

I understand that failure to conform with the Institute's regulations governing plagiarism constitutes a serious offence.

Signature: *Damien Doran*

Date: 29/04/2021

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