

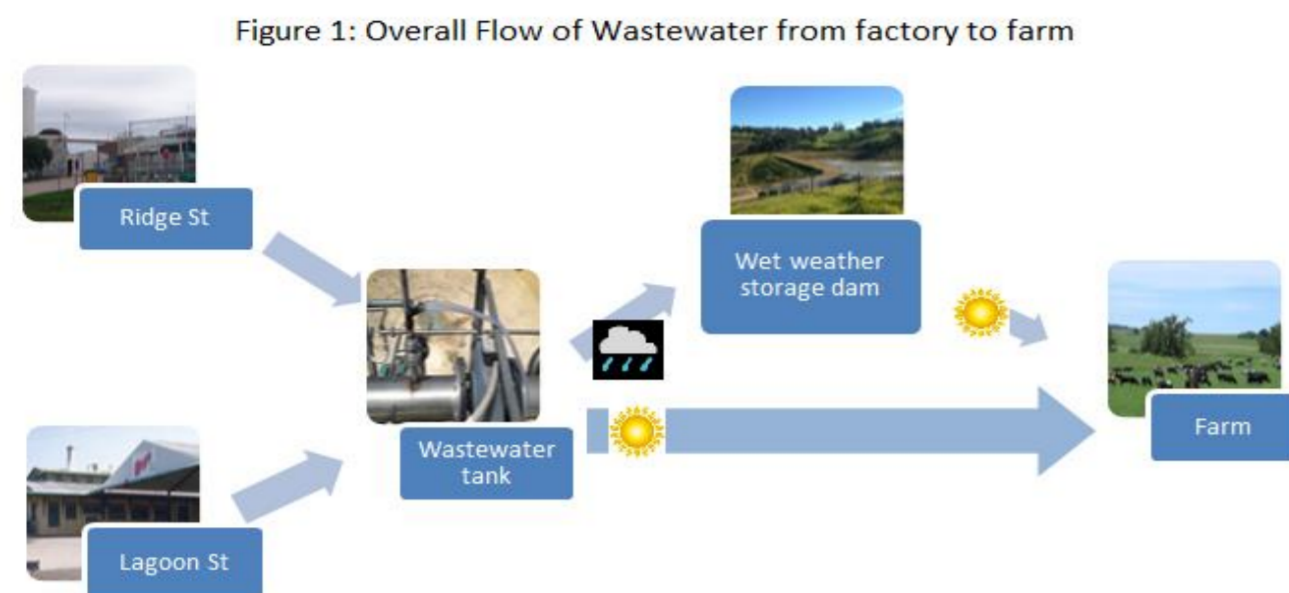
Wastewater Modeling for the existing Factory and proposed D90 plant

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To create a dynamic model that predicts amounts of key parameters present in the wastewater tanks and calculate safe volumes which can be distributed to the farms.

Context of project

Bega Cheese has been irrigating factory wastewater from its 250m³ tank onto surrounding farmland. Due to the DPI restrictions, in times of heavy rain, the irrigate is pumped into a wet weather storage dam located offsite until the weather and farmland permit irrigation again.



The Issue

Several studies commissioned by Bega Cheese have highlighted issues with the mineral levels in the wastewater. Bega Cheese is in the process of upgrading their D40 whey plant to a D90 whey plant where it is expected to generate a higher mineral waste. In order to reduce environmental impacts, the current wastewater coming from both factories (Ridge St and Lagoon St) need to be modelled and the effect of the D90 plant can be analysed.

The Solution

Using Excel and Visual Basic Application, the team would need to make a dynamic model that could predict the key parameters within the waste water that is irrigated to the individual farms. The chosen parameters were Non-Protein Nitrogen, Sodium, Potassium, Phosphorus, Magnesium, Calcium, Chloride, Fats and pH.

Process of development

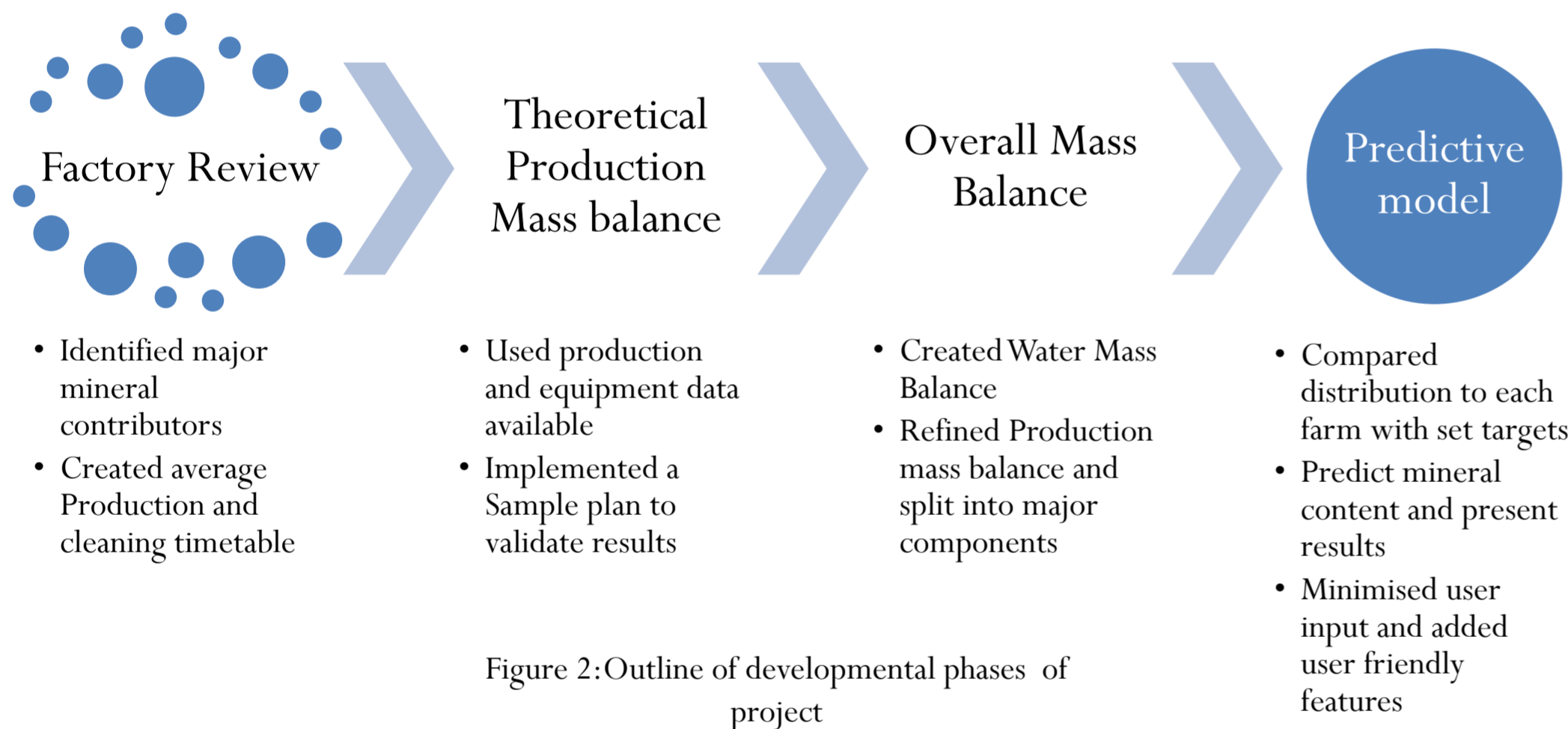


Figure 2: Outline of developmental phases of project

Recommendation from project

Improve accuracy of the model

- Automated pH logger installed at effluent tank
- Frequent sample

To improve factory processes and practices

- Consistent date and time format for log-sheets
- Calibration and maintenance of flow meters
- Consultation between different factories

Results from the dynamic model

Figure 3: Summary of results of current (incl. D40) vs proposed D90 plant

Component	DPI Target kg/ha	D40			D90		
		Total Mass For Year kg	Farm Load kg/ha	Required Land ha	Total Mass For Year kg	Farm Load kg/ha	Required Land ha
Non-protein Nitrogen, NPN	300	21,930	52	421	30,248	24	1,246
Phosphorus, PO4	89	33,748	80	421	60,504	49	1,246
Calcium, Ca	N/A	20,181	48	421	79,474	64	421
Potassium, K	120	149,500	355	1,246	277,743	223	2,315
Sodium, Na	600	233,825	555	421	356,811	286	1,246
Magnesium, Mg	N/A	5,446	13	421	16,194	13	421
Chloride, Cl	400	395,782	940	989	675,038	542	1,688
Recommended Land				1,246			2,315

About Bega Cheese Ltd

Bega Cheese Ltd. is an exporting Australian owned and operated dairy company producing a range of dairy products as well as packaging cheese products. They have several sites across the country with the base of operations located at their original site, Bega Valley NSW. The original factory is located on Lagoon st and is known as the Dairy Processing Unit (Lagoon st DPU) and their second factory is the Processing Packaging Unit which is at Ridge St (Ridge st PPU).

Challenges

- Lack of accurate measuring equipment in the factory
- Isolation of components
- Assuming significance of ambiguous components
- Collating actual raw data from the right people
- Being critical and evaluating information given to the team
- External lab results were not useable
- Time

How the dynamic model works

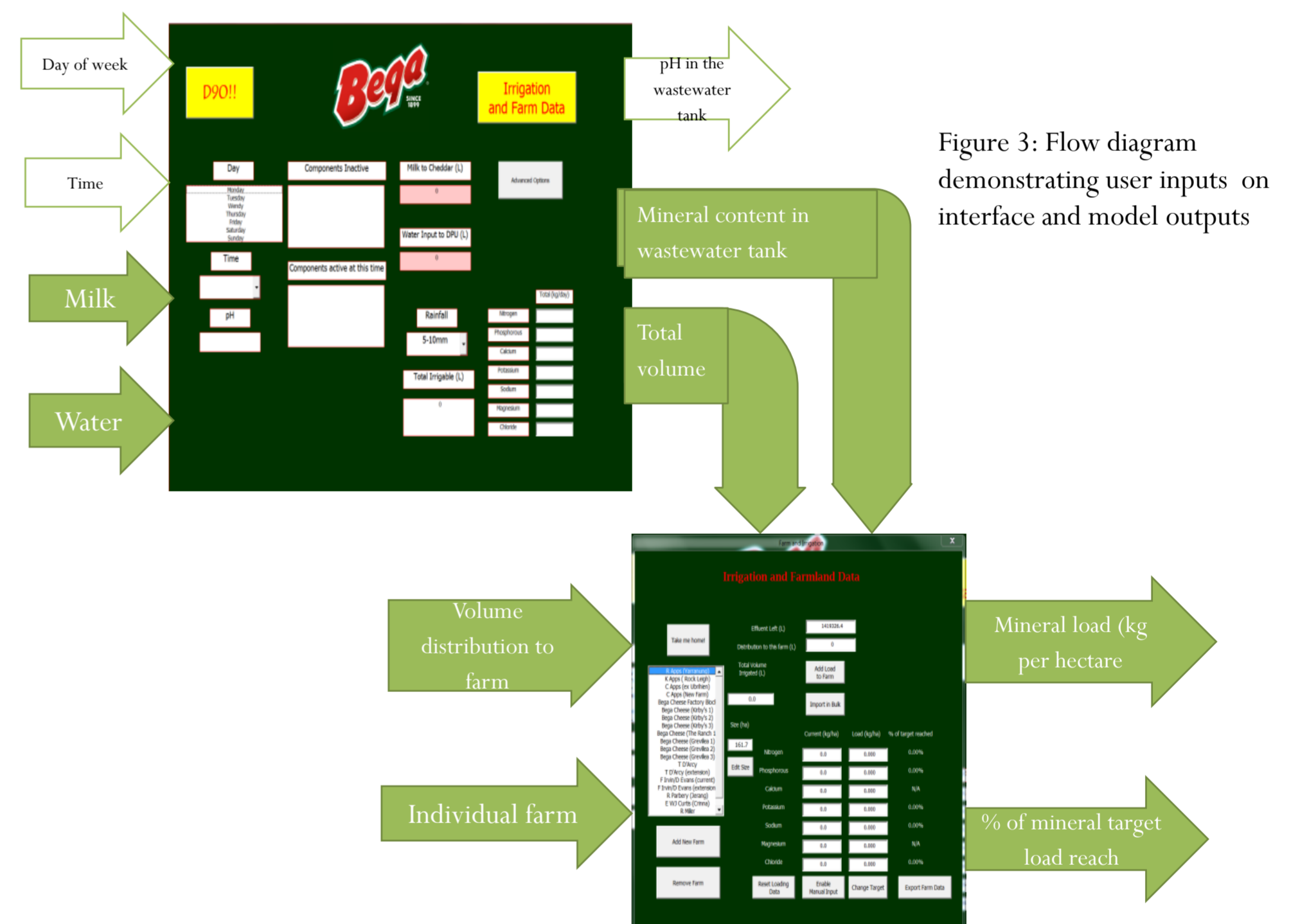


Figure 3: Flow diagram demonstrating user inputs on interface and model outputs

Experience at Bega Cheese



The team received great hospitality from Bega Cheese. They invited the team on many social events such as Christmas celebrations, fishing trips, bush-walking and trivia night.

- The supervisors provided great insight into the dairy and food industry as well as free recruitment and career advice for the team.



The change in project and casual office environment were pleasant surprises

- Learning all about the two factories, the people and how different departments interlink was very interesting.
- Linking tertiary studies with actual data and being able to deliver results was very gratifying for the team.
- The team found that learning how to work and live with each other was an exciting challenge and each individual member gained valuable feedback from colleagues.

Acknowledgements

The team would like to thank the Bega Cheese supervisors and personnel who supported us throughout the duration of the project. We would like to thank Monash University for giving us this opportunity and positive experience.



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