



---

## Farm Dairy Effluent: System Design and Management

|                       |  |
|-----------------------|--|
| <b>Controller:</b>    | <b>Fertilizer and Lime Research Centre (Massey University)</b>   |
| <b>Availability:</b>  | Extramural study plus a three day contact course offered to groups (approx. 20 persons) as demand dictates |
| <b>Location:</b>      | At Massey University, Turitea campus, Palmerston North or at other venues by arrangement.                  |
| <b>Delivery mode:</b> | Two extramural written assignments plus a three day contact course   |

Updated May 2016

---

|                             |  |
|-----------------------------|--|
| <b>Aim:</b>                 | To provide students with an advanced knowledge and understanding of 'best practice' for the design and management of land treatment systems for farm dairy effluent (FDE). Students should be able to design key components of a FDE system and develop a management package that will achieve sustainable land treatment outcomes for individual farms.   |
| <b>Entry requirements:</b>  | Participants should have significant practical or professional experience in dealing with land application systems for FDE. A Massey University Certificate of Completion in 'Sustainable Nutrient Management in New Zealand Agriculture' and/or the successful completion of tertiary level papers in Soil Science and Agricultural Engineering would also be advantageous.   |
| <b>Course requirement:</b>  | Completion of assignments to a satisfactory standard. Students must attend all sessions of the contact course and sit a 2 hour examination on the final day.   |
| <b>Course prescription:</b> | <p>The aim of this course is to provide students with the knowledge they require to design sustainable FDE management plans that maximise the recovery and productive use of nutrients on farm, whilst minimising the negative impacts of nutrient and microorganism losses on the wider environment. This will be achieved through the student gaining a comprehensive understanding of the key aspects of sustainable land treatment systems which include; environmental guidelines, farm-specific system design and effective daily management. The characteristics of dairy farms that affect management of FDE will be studied. These include consideration of soils and landscapes, climate, FDE generation, storage requirements and irrigator performance. Students will also learn about the range of decision support and fail-safe tools available to assist with daily management of FDE, including scheduling of FDE irrigations. Evaluation or auditing of land treatment systems will also be considered along with the construction and maintenance of storage ponds.</p> |

A study guide will provide explanation of the key aspects of FDE land treatment system design and management, and illustrate the use of decision support tools, including *Overseer*<sup>®</sup> *Nutrient Budgets* and the *Dairy Effluent Storage Calculator*. This information will assist the student to design FDE storage and land application systems customised to individual farms.

During the contact course, workshop discussions and field demonstrations will provide the student with the opportunity to learn practical aspects of FDE management and expose them to the latest research and tools. Research and case study information will be used to test and extend current FDE system design and decision support software.

**Learning outcomes:** On successfully completing this course, the student will be able to design key components of a sustainable FDE land treatment system and develop management plans that maximise the recovery and productive recycling of nutrients, whilst minimising the negative effects of nutrient and microorganism losses on the aquatic environment.

**Assessment:** An assignment that is to be completed before the commencement of the contact course (worth 10%), a two hour exam at the conclusion of the contact course (worth 60%) and an assignment to be completed after the contact course (worth 30%).

**Requirements to successfully complete the paper**

Complete all assignments to a satisfactory standard, attend all sessions of the day contact course and obtain a minimum of a C grade (>50%) aggregate of all forms of assessment.

**Learning Programme and Schedule:**

| Month | Activity                                   |
|-------|--|
| 1     | Read Study guide.<br>Complete assignment 1 |
| 2     | Attend contact course                      |
| 3     | Complete assignment 2                      |

**Timeline for assignment completion:**

The two assignments help a student to become skilled in designing key components of a land treatment system for FDE on New Zealand dairy farms. The three day contact course provides a workshop atmosphere for integrated learning from a range of University staff, guest researchers and engineers and student peers.

| Assignment No. | Form of Assessment  | % of Total mark |
|----------------|---|-----------------|
| 1              | Problem set   | 10              |
| 2              | Design project – design a land treatment systems and management package for a case study farm | 30              |

**Topics:**

Study notes are supplied on the following topics:

**1. Environmental and regulatory considerations**

- *Water quality*
- *Compliance*
- *Compare and contrast treatment options*

## **2. Soils, landscapes and climate considerations with land treatment of FDE.**

- *Soil and landscape features that influence management*
- *Climate influences on soil moisture*
- *Drainage systems*

## **3. FDE characteristics and effluent block allocation.**

- *Factors influencing FDE composition*
- *Using Overseer Nutrient Budgets to estimate nutrient loads and effluent block size*
- *Determining optimal effluent blocking location and layout*

## **4. Engineering design and irrigator performance**

- *Irrigator performance*
- *Understanding pumping and plumbing requirements*

## **5. FDE storage requirements**

- *Principles of storage requirements*
- *Use of Dairy Effluent Storage Calculator to optimise the system*

## **6. Management requirements and decision supports tools**

- *Soil water balance*
- *In situ measurement of soil moisture*
- *Monitoring and managing pond level*
- *Tracking irrigator reliability*

## **7. Evaluating land treatment systems**

- *Procedures for measuring application depths under irrigators*
- *Auditing other important components of land treatment systems*

## **8. Integrated management systems**

- *Objectives of management systems*
- *Putting a package together for a farm*
- *Commercial packages*

## **9. Pond design and construction**

- *Best management practice for pond construction*
- *Maintaining ponds*

# PROVISIONAL PROGRAMME

## Day One

| <b>Time</b>   | <b>Topic</b>  |
|---------------|---|
| 8.30 – 9.00   | Welcome, outline the course;<br>Industry and DairyNZ overview           |
| 9.00 – 10.00  | Regulatory and compliance considerations                                |
| 10.30 – 10.45 | An overview of dairy farm systems                                       |
| 10.45 – 12.00 | Soils, landscapes and climate considerations with land treatment of FDE |
| 1.00 – 2.15   | FDE characteristics and effluent block allocation                       |
| 2.15 – 3.30   | FDE storage requirements  |
| 4.00 – 5.00   | Management requirements and decision supports tools                     |

## Day Two

| <b>Time</b>   | <b>Topic</b>                         |
|---------------|--------------------------------------|
| 8.30 – 10.00  | Engineering design                   |
| 10.30 – 12.00 | Engineering design <i>continued</i>  |
| 1.00 – 1.45   | Evaluating land application systems  |
| 1.45 – 2.30   | Storage ponds – some key issues      |
| 2.30 – 3.00   | Equipment and decision support tools |
| 3.00 – 5.30   | Field trip to case study farms       |

## Day Three

| Time          | Topic   |
|---------------|---|
| 08.30 – 10.30 | System design – bringing it all together  |
| 11.00 – 12.00 | Course review, question time and free time  |
| 12.45 – 3.00  | <b>Assessment:</b><br><b>Two hour examination comprising short answer questions on topics covered in the study guide and addressed during the three-day contact course.</b> |