Effluent as a Fert$mart Fertiliser

- Reuse of effluent as a fertiliser can be easy if you have an efficient and simple system – try to avoid high maintenance systems with breakdowns which can be costly. Look at good systems on other farms or seek design advice if needed.
- **READY TO GO, KEEP IT LOW** is a good motto for effluent. Keep the effluent pond as empty as possible, especially coming into winter, so nutrients out on the paddock growing grass and there is maximum storage capacity for winter storage and in event of breakdowns.
- Allow sufficient land area to apply effluent at an **agronomically** sensible rate to meet the crop or pasture nutrient requirements. Aim to spread effluent as far as possible across the farm. A minimum of 10% farm area or 1 ha/20 cows milked.
- A lighter rate over a larger area is preferable to overloading a small area
- Dairy effluent typically contains relatively large amounts of readily plant available nutrients, particularly nitrogen (N) and potassium (K). The nutrient that requires the largest reuse area is normally potassium and this sets the application rate. A nutrient analysis of your effluent taken at the paddock end of the system is useful for calculating application rates.
- Depending on the farm, the effluent can also be quite saline. Effluent can be shandied with irrigation water to reduce the salinity levels. Effluent should not be applied to young seedlings or to irrigate a crop up due to the risk of burning. Run effluent in a separate line through your pivot or flush with fresh water at the end of the season to prevent corrosion of irrigation equipment.
- Total potassium per application should be no more than **60 kg K/ha**, and no more than **120 kg K/ha** per year. This applies for both liquid effluent and sludge. Soil K levels in paddocks that have been repeatedly used for effluent disposal often have very high K levels and will not require application of potassium fertiliser (subject to a soil test). Effluent paddocks can be cut for hay or silage to remove excess potassium and prevent overloading.
- Avoid applying effluent to paddocks used to calve down the herd as the excess potassium can lead to grass tetany with cows going down due to induced magnesium deficiency.
- For liquid effluent, the total nitrogen application should be no more than **50 kg N/ha**.

How to work out how much nutrient you are applying in irrigated effluent:

1. Collect an effluent sample for analysis. *This must be as applied to the paddock via the irrigator.* It is pointless to take a sample from top of the pond. A good way is to put out buckets while irrigator is going. Measure the amount that irrigator is applying (mm), remembering that 100 mm/ha is equivalent to 1 ML per ha.
2. Keep effluent sample cold and get to lab for analysis asap.
3. Look at the analysis for nutrients in ppm and convert to kg nutrient per ML. For example:
   ammonium 8.58 ppm = 8.58 kg in 1ML
   phosphorus 18.71 ppm = 18.71 kg in 1 ML
   potassium 58.43ppm = 58.43 kg in 1ML
4. Convert kg per ML to total annual application based on total effluent irrigation for the year

For example:
Effluent irrigator applies 4 mm/ha each application, with 30 applications per year to same paddock. 4 mm x 30 = 120 mm/ha/year = 1.2 ML/ha per year.
Effluent analysis shows potassium (K) at 58.43 ppm = 58.43 kg in 1 ML, which is 70.11 kg in 1.2 ML.

Therefore effluent paddock is receiving 70.11 kg K/ha per year.

- Rotate effluent applications around at least three or four different areas if possible to avoid excessive build-up of nutrients in the soil.
- Conduct regular soil testing of the areas where effluent is being applied to monitor nutrient levels and soil health.
- Where possible effluent applications should be synchronised with paddock rotations to allow sufficient time between application and grazing. In summer, 2 weeks is the recommended minimum before grazing. In winter, 3 weeks is the recommended minimum.
- Best plant growth responses are obtained when effluent is applied to actively growing crops or pastures in the warmer months of the year. This is due largely to responses to the N content and to a lesser extent the water content. This also decreases the risk of losses to the environment when soils are wet.
- Forage crops, such as turnips or rape, have been found to give excellent responses to effluent.
- Empty storage ponds prior to winter to ensure ponds have adequate holding capacity for effluent generated when soils are too wet to irrigate.
- In Tasmania, ideal times for applying effluent are the end of spring (December) and then soon after the autumn break. Quite often, a single irrigation onto a fodder crop at this time of the year will significantly improve yields.

Sludge

- Dairy sludge extracted from the bottom of treatment ponds is physically and chemically quite different to the liquid effluent. Its high solids content, typically 6-8% dry matter as spread, requires specialist handling equipment which influences when and how it can be used.
- Applied sludge acts as a long-acting, slow-release fertiliser as the majority of the nutrients are in organic forms that need to be mineralised to convert them to plant available forms.
- Sludge can be applied directly to established pasture or to cultivated ground and incorporated into the soil prior to sowing of a crop.
- The time between application and grazing may be up to 6 – 8 weeks due to the solids content.
- Apply sludge in the drier months, to enable the water content to drain and evaporate off leaving the nutrient rich solids on the soil surface. Direct applications at wetter times of the year run the risk of rainfall washing these solids off the pasture and into nearby streams.
- Application rates are usually limited by trafficability over the spread area and typically are not more than 5 – 10 mm (50,000 – 100,000 L/Ha).
- Speak to your spreading contractor about getting a sample analyzed so you know the nutrient analysis of what is being spread. Your agronomist should be able to help calculate kg/ha of N, P, K, S and other nutrients being applied in effluent.
- Laboratory processing may take a couple of weeks, so it is smart to make arrangements for a fast turnaround on nutrient analysis. Even if you do not have the results back from the laboratory before spreading is finished, they will be a good basis for planning the next de-sludging event. You are better off using your own old data than book 'averages' or your neighbour's test results.
- The bulk of effluent nutrients settle to the bottom of the first pond so that is why the pond needs to be stirred at the time of pumping. The only representative nutrient sample worth getting analysed is of the effluent that is being spread by the slurry tanker. Taking a sample off the top of the pond prior to the contractor coming is a waste of money – that is not representative of the nutrient mix that the contractor will be spreading after stirring and pumping.

Strategies to reduce problems

Any effluent or sludge applied to land should not leave the farm boundary or pollute any surface waterway or ground water. In addition, steps should be taken to reduce the risk of odours. Strategies to minimise these risks include:

- Where possible, effluent should be applied to land during the drier months. Applications in the wetter months increase the risk of runoff to streams or leaching to ground water when soils are saturated. Nitrous oxide greenhouse gas emissions are also higher under anaerobic conditions.
- Apply effluent or sludge on areas well away from watercourses or drainage lines.
- Apply effluent at such a rate that the liquid does not remain ponded for more than one hour after application.
- For all spray applications, use sprinkler nozzles that produce large droplets rather than a fine spray. Note, the lower the nozzle height, the lower the odour potential.
- Consider the wind direction and velocity on days when applying effluent or spreading sludge or manure. Adjust application times to suit.

Use Dairy Effluent Safely

Effluent ponds are dangerous

- Please ensure your pond is safe for yourself and contractors working on your farm.
- Ponds must be fenced from people and stock: - be especially careful that small children can't access effluent ponds.
- Must have signage stating:
    - Dangerous areas
    - Location of flotation devices at the pond in case someone falls in.
    - Procedures for "What if" something goes wrong: e.g. person fell in, tractor fell in.

Safe pumping from ponds

Typically, contractors will come with a tractor and slurry tanker and they will request the farmer to set up a second tractor on the edge of the pond with a PTO driven stirrer.

- Ensure there is safe and easy access to the pond for all large machinery
- Ensure all earthworks around the pond are stable under heavy loads.
- All tractors have PTOs guarded, and are in good condition

Please keep in mind:

- It may be difficult to identify the pond surface area if ponds are heavily overgrown.
- The water line should be carefully marked before backing any machinery up to the pond.
- Floating debris may cause blockages or be flung into the stirrer.
- External batter slopes on ponds are steep when accessing machinery.
- Ideally, there should be bump stops for tractors – even a heavy timber chock is better than nothing.
- People driving tractors in the vicinity of effluent ponds need to be very experienced. People have died when tractors and stirrers have fallen into deep ponds.
- There needs to be a clear line of sight between all people working around an effluent pond.
- Wear Personal Protective Equipment (PPE) and be highly visible.
- Establish clear procedures for immediate communication.

Contractor management - You need to:

- Check contractor registration includes current public liability insurances and "professional indemnity" insurance.
- Undertake contractor induction for your farm (map, with routes to be used and hazards in the area / en-route).
- Ensure contractor's tractor / equipment are safe to operate e.g. PTO guards are in place.
- Check equipment is in good operating order (may need to sight their maintenance records)
- Sight their safe operating procedures for performing this task.

Animal health considerations when using dairy effluent or sludge as fertiliser

Bacteria that cause diseases can be found in manure, urine and milk. These include

- Johne's disease
- Salmonellosis
- Leptospirosis
- Mastitis
- Enzootic bovine leucosis,

Worm eggs, coccidial eggs, clostridium organisms and tetanus spores are also passed in manure.

In most cases, the period of time before application to pasture and the dilution effect of the washdown water tend to reduce the risk to stock that graze paddocks that have been treated with waste water.

To further reduce the risk to animal health, the following precautions should be taken:

- Do not allow young stock (less than 12 months old) to graze or have access to treated areas.
- Do not allow drains from treated areas to flow into areas where young stock are being kept. (This will help to reduce the risk of infection with Johne's disease.)
- During summer, do not graze areas to which effluent has been applied for at least 2 weeks. If you can safely apply effluent in the winter, do not graze treated areas for at least 3 weeks.
- Do graze areas just prior to effluent application to allow increased sunlight penetration to kill organisms and to extend the period before the area is ready to be regrazed.
- Do spread effluent during the warmer, drier months to reduce survival chances of disease organisms.
- High K levels can cause grass tetany (blood magnesium (Mg) levels fall below a critical level). It is important to regularly soil test areas that are being loaded with effluent.. Grass tetany information is on Dairy Australia website http://www.dairyaustralia.com.au/Animal-management/Animal-health/Animal-health-fast-facts/Downer-cows/Grass-tetany.aspx
- Contact your veterinarian if you have concerns about any specific animal health problems associated with applying dairy shed wastes to pastures or crops.