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Checklist For Using Lagoon Water Effectively

As part of our ongoing educational partnership with the RCD to assist dairies in improving air and water quality, I have included a checklist written by Marsha Campbell-Mathews, Farm Advisor, and Eric Swenson, Nutrient Management Program, University of California Cooperative Extension, on how to properly manage lagoon water as your primary crop fertilizer.

Will your system allow you to successfully use dairy lagoon water as the primary nutrient source for your crop? Use this checklist to see if you have all the necessary parts of the system in place. These are the things you will need:

1. **Sufficient crop acreage to utilize the nutrients in the lagoon water.** If application is through an irrigation system, the system must be designed in such a way that lagoon water can be applied to the entire acreage at appropriate rates.

2. **Sufficient storage capacity so that the pond water can be applied during or just prior to periods of crop uptake, and no applications made when crop nutrients are not needed.** Your soil type, climate, and irrigation practices will influence how far in advance of expected crop uptake you can safely apply lagoon water nitrogen. Extra capacity for storm water, higher than average rainfall years, storage of nutrients to cover peak use periods, additions of extra water to prevent the pond from becoming too concentrated, losses from evaporation, and minimum operating levels needed for flushing and floating pumps all need to be considered when sizing ponds.

3. **A source of fresh water for dilution.** In most cases, applying undiluted pond water to a field will result in over-application of nitrogen and phosphorus. The speed of the irrigation, concentration of nutrients in the pond, and desired application rate determine the dilution required. Required dilution rates vary greatly, but a dilution of 10% lagoon water in the mixed water is typical for an application rate of 50 lbs/A available N. Winter irrigations typically have lower dilution rates -- on the order of 25% - 35% lagoon water.

4. **Adequate mixing of fresh and pond water.** Pond water usually must be diluted prior to application. If flows of fresh and pond water come from opposite directions, they will probably not mix, and one side of the

irrigated area will receive more nutrients than the other side. This may occur even if both streams are put through the same valve. Lagoon water in a pipeline has a high electrical conductivity (EC) and an EC meter can be used to check mixing under your conditions.

5. **Correctly sized pumps and pipelines to allow application of 30 to 120 lbs of crop-available lagoon nitrogen in a single application without plugging.** The low rate will be needed to prevent salt injury on pre- and first irrigations, and the high rate will be used in mid-winter applications. Most mid-season summer applications will be around 50 lbs/A of available nitrogen. Very concentrated pond water and/or slow irrigation run times may make it difficult to apply appropriate rates of nutrients.

6. **A solids removal system** will be necessary in most cases to keep solids from building up at the head of fields, help keep pipelines clear, provide a more uniform product for nutrient application, help prevent solids from building up in the pond, make it easier to manage the organic nitrogen fraction of lagoon nutrients, and allow more nitrogen and phosphorus to be moved offsite if necessary.

7. **A means of preventing buildup of sludge in the pond is essential for long-term nutrient management.** All nutrients generated in a year should be applied in that same year to prevent having to apply the leftovers from many seasons in a single application. Agitation, movable floating pumps, freshwater flushing of ponds, excellent solids separation and multiple ponds are options to help minimize sludge buildup.

8. **Uniform distribution of irrigation water down the furrow or check**. Because nutrients are being applied with the water, more nutrients will be applied in parts of the field where more water infiltrates, for example the head or tail end. This will result in over-fertilization in some areas and under-fertilization in others. Applying lagoon water only during the last third of any given irrigation can yield a more uniform application of nutrients.

9. **A method of measuring how much lagoon water is being applied.** There are several methods for doing this. Measuring pond drop may seem the most straight-forward method, but can often be inaccurate due to inability to measure the correct drop, concurrent pond inflows or out flows, irregularly shaped dimensions or sides non-uniformly sloped sides, etc. Another method is to calculate the application based on pump output and the hours the pump ran. This is easy but can be inaccurate because pump output will vary according to the water level in the pond, the consistency of the material, debris on the impeller, etc. The best way to measure application is to install a flow meter on the pond outlet. This method, when coupled with a control valve, allows specific amounts of lagoon water to be applied and measures the total gallons applied to each field. In many cases, the cost of the flow meter can quickly be recovered in savings on commercial fertilizer.

10. **A method of measuring the concentration of crop nutrients in the lagoon water.** The amount and forms of nitrogen and the amount of phosphorus in the pond can vary throughout the season and sometimes even over the course of an irrigation. Laboratory analysis offers the most accurate and complete information on a sample, while in-field rapid testing procedures for nitrogen can allow the application to be rapidly adjusted in response to changing concentrations or unanticipated run times.

11. **A means of controlling the amount of lagoon water that is applied to the field by varying the proportion of lagoon water to fresh water.** A valve or variable frequency controller on the pump will allow the lagoon water flows to be regulated. Some valve designs are better at throttling flow than others, especially if it is sometimes necessary to apply very small amounts. A V-notch gate valve is preferred by most users for this purpose due to its relatively low cost, ease of operation, and low maintenance.

12. **A method of record keeping.** Choosing a good method of record keeping is as important as choosing a method of measuring and controlling the crop nutrients you are applying. You will

need to record volume and concentration of lagoon water applied to each field, as well as other information such as date, time, and source. Calculations will then be necessary to determine the amount of nutrients applied. A record keeping system that allows you to track the amount of crop nutrients as soon as they are applied to each field in each irrigation will enable you to make informed decisions about subsequent applications.

13. **An understanding of when crops need nutrients.** Most plants will have periods during the season when their need for nutrients is greater than at other times. Timing applications to coincide with crop uptake will ensure the highest yields. Applying crop nutrients at times when the crop doesn't need them can result in losses, especially of nutrients such as nitrogen that have the potential of leaching into groundwater.

14. **A soil and/or plant tissue testing program** to estimate how much plant available nitrogen or other crop nutrients are already present in the soil. This helps to plan nutrient applications so that enough nutrients are applied to meet crop needs while at the same time avoiding application to fields that may not need them. In some cases, it may be advantageous to monitor the nutrient content in the crop to avoid under- or over-application.

15. **A tail water return system** to prevent discharge of nutrients off the property is a necessity in many locations.

16. **Eliminate any unnecessary salt** (especially sodium and chloride) from the cow's diet and feed to minimize excessive phosphorus and nitrogen excretion.

17. **Apply dry manure at agronomic rates.** Since it is difficult to predict when the organic form nitrogen in dry manure will become available to plants, apply only small amounts to each field and use water-run commercial fertilizer or very low solids lagoon water to supply available nitrogen during periods of peak crop uptake.

Report Dairy Losses From Heat Wave to the Agricultural Commissioner

If you have not already done so, it is critical that dairy producers contact the county agricultural commissioner and report dairy losses. The Ag. Commissioners and several state agencies are working to make disaster relief available, but need an initial loss estimate to proceed. Reporting is voluntary and confidential. Contact information for the Commissioner's offices can be found below. You can file loss reports for animal death, abortions, and milk and crop production losses. If the claims are eligible for disaster relief, more paperwork will need to be filed with the Farm Services Agency. Be sure to keep records that allow you to verify losses. False claims are liable for penalty of perjury.

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Improving Air and Water Quality through Sustainable Agricultural Practices on Dairies

October 24, 2006
Kountry Kitchen - Orland
10:00 a.m. until 2:00 p.m.

10:00 Welcome
Barbara Reed, UCCE Dairy Advisor

10:10 Going Organic-What Does It Take, Is It For Me? Panel
Barbara Reed, UCCE Dairy Advisor-moderator
Greg Dabney/Mike Bandstra-Horizon Organic Dairies
Ward Burroughs, Organic Dairy Producer
CCOF rep or Oregon Tilth rep TBA

9:50 Implementing Nutrient Management Plans in the Sacramento Valley
Marsha Campbell-Mathews, UCCE Agronomy Advisor, Stanislaus County

11:20 Crop Nutrient Uptake and Timing Manure Water Applications - Data From Forage Trials in the San Joaquin Valley
Carol Frate, UCCE Agronomy Advisor, Tulare County

11:50 BREAK

12:00 Irrigation Management to Improve Water and Manure Nutrients Utilization
Larry Schwankl, UCCE Irrigation Specialist, Kearney Agricultural Center

12:30 An Update on Dairy Air Quality Regulations
Barbara Reed, UCCE Dairy Advisor

1:00 EQIP Programs For Dairies
Robert Vlach, Glenn County NRCS

1:30 Lunch

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