PROJECT REPORT
T.W. BYRD DAIRY
ANIMAL WASTE MANAGEMENT SYSTEM
Revised August 6, 2003

A. GENERAL

This report covers the investigation, planning, and design of an animal waste management system for the T.W. Byrd Dairy located in Lafayette County, Florida.

The dairy barn and associated pastures are located on well to excessively well drained soils. The predominate soil types are the Blanton series.

The waste management system selected will accommodate 600 milk cows at an average weight of 1250 lbs. each (750 Equivalent Animal Unit (EAU) – milkers). The 600 milk cows will be confined for approximately 11.5 hours per day and pastured for the remaining 12.5 hours per day. The number of cows is limited by the number of acres available to utilize the nutrients being produced. The controlling nutrient is nitrogen. The dairy cows are operated as three herds on 6 herd lots (2 lots per herd).

Geologic investigations revealed that the clay content of the in-situ soil was not adequate to allow the construction of an earthen waste storage pond in accordance Agricultural Waste Management Field Handbook (AWMFH) Appendix 10D. A concrete liner with a bottom thickness of 5" and a side wall thickness of 4" will be constructed. The concrete-lined animal waste storage pond (WSP) was designed using a water and nutrient budget analysis. The pond is adequate in volume of storage to not overflow during occurrence of the 25-yr. 24 hr. rainfall event. Total fresh water usage for this facility is 36,000 gallons per day (gpd) for the months of May-October and 7,000 gpd for the winter months of November-April. The system includes cooling sprinklers of 29,000 gpd during the summer months. Wash down in the milk parlor will be accomplished by hose. The remaining heavy use area (HUA's) will be cleaned using hoses and flushing with recycled waste water.

B. NUTRIENT DISTRIBUTION

The nutrient content of waste for a 1000 lb. Cow is taken from Table FL 4-5 of the NRCS Agricultural Waste Management Field Handbook (AWMFH) and is as follows:

NUTRIENT	MILKING
Nitrogen	0.50 lbs./AU/day
Phosphorous (P_2O_5)	0.30 lbs./AU/day
Potassium (K_2O)	0.34 lbs./AU/day

The above nutrient values are adjusted based on the average weight of the cows in the milking herd.

The nutrient deposition for the waste management system selected is estimated as follows:

a. The milkers deposit their waste in the milking area and heavy use areas on concrete which is washed down by hose to a concrete solids separator which outlets into the waste storage pond. The waste water is then applied to the sprayfield using a hard hose traveler irrigation system. The sprayfield is designed to receive 48% of the waste generated by the milking cows. About 50% of the 48% will be retained in the solids separator. The solids upon removal will be spread over the sprayfields. Approximately 52% of the waste excreted by the milking cows will be deposited on the pastures.

b. Nutrients available for the crops are subject to various losses. There is a great loss of N within the system. For the irrigated and solids application fields, approximately 33% of the nitrogen is lost during storage (NRCS AWMFH, Table 11-5) and approximately 25% is lost through the application method (Table 11-6). The denitrification loss is 8% (Table 11-8). It is estimated that for the fresh manure deposited by animals in the pasture, there is a 50% application loss and 8% loss by denitrification.

c. The pastures will receive 100% of the manure deposited by the pastured cows. Nitrogen removal for the moderately irrigated pastures is based on management of bermuda grass and small grain for optimum growth. The milk herd will deposit 32,793 lbs. per year of available nitrogen in the manure on 98.1 acres of bermuda grass with a winter overseeding of rye or oats (field nos. 11, 12, 15, 16, 17, and 20). The sprayfield consists of 116.2 acres (field nos. 6, 9 and 27) of coastal bermuda with winter overseeding of rye that will receive the 15,160 lbs. per year of available nitrogen in the wastewater. The remaining 15,160 lbs. of N per year removed via solids from the solids separator will be spread over the same 116.2 acres.

Table 1: Estimated nutrient uptake based on AWMFH, Amend FL-6, April 1998

Management	Field #	Acres	Controlling Nutrient	Crop	Planned Crop Nutrient Removal		Planned Crop Production (tons/ac)
					N (lbs/ac)	P_2O_5 (lbs/ac)	
Moderate Irrigation Management	6, 9, 27	116.2	N	Bermuda/Oats	460	121	7.0/1.0
Moderate Irrigation Management	11, 12, 15-17, 20	98.1	N	Bermuda/Rye	335	91	6.2/1.0
Non – irrigated	25,26	40	N	Millet/Rye	205	66	6.0/1.0
Non - Irrigated	22,24	11.3	N	Bermuda/Rye	265	71	4.0/3.5
Non - Irrigated	1 – 5	50	N	Bermuda/Rye	265	71	4.0/3.5

Moderate management is defined as irrigation water is applied but does not meet the consumption use demand during peak consumptive use periods. The management for the hayfield and herd pastures is moderate.

Nutrient uptake for the fields irrigated with wastewater and fresh water is based on coastal bermuda with oats during the winter. For this combination, which is supplemented with irrigation water, the estimated N requirements are 460 lbs./acre-yr. for the coastal bermuda/oats. The actual estimated application of N from both the solids separator and the waste water on the 116.2 acres is 261 lbs./acre-yr. and P_2O_5 is 337 lbs/acre-yr. The excess P_2O_5 above the 121 lbs./acre-yr. that can be utilized is 216 lbs/acre-yr. The hay fields will need to be supplemented with commercial nitrogen to obtain the planned yields.

Nutrient uptake for the milk herd pastures is based on bermuda overseeded with winter rye. Herd pasture nutrient uptake for the bermuda/rye is 335 lbs. N/acre-yr. The actual estimated application of N on the 98.1 acres of bermuda/rye is 335 lbs./acre-yr. while P_2O_5 is 434 lbs./acre-yr. The excess P_2O_5 above the 92 lbs./acre-yr. recommended for the bermuda/rye herd pastures is 342 lbs./acre-yr.

The pastures for the dry cows and the heifers are 50 acres and 51.3 acres respectively that are not irrigated. The dry cow pasture will consist of bermuda grass with a winter over-seeding

of rye grass. The nutrient uptake for the dry cow pasture is 265 lbs. N/acre year. The actual estimated application of N or the 50 acres is 55 lbs. N/acre year while P_2O_5 is 74 lbs. acre/year. The P_2O_5 is excessive by 3 lbs./acre year.

The heifer pastures consist of 11.3 acres of bermuda/rye and 40 acres of millet/rye. The heifers (50 each) will be rotated among the fields resulting in approximately 3 hours per day on the millet for the months of June – September, hours per acre equally from December – March, and the 40 acres of millet unused April, May, October, and November. The unused months are to allow establishment of the crop.

The heifer pastures of 11.3 acres of bermuda/rye is expected to have the potential nutrient uptake of 265 lbs N/acre year and 71 lbs. P_2O_5 /acre year.

The heifers are estimated to provide 108 lbs. N/acre year and 68 lbs. P_2O_5 /acre year of which neither will be excessive.

The heifer pastures of 40 acres of millet/rye is expected to have the potential nutrient uptake of 205 lbs. N/acre year and 66 lbs. P_2O_5/acre year. The actual nutrients that the heifers are expected to provide are 19 lbs. N/acre year and 12 lbs. P_2O_5 /acre year of which neither are excessive.

Since the design nutrient is N, the amount of P applied per year is higher than the recommended rate. The waste management system design is based on excess P application being retained by the soil. At this time, it is not known how much P the soil can retain before excess application of P causes leaching. If it becomes necessary to apply waste according to P crop uptake, the total acreage required to utilize P is 323 acres of coastal bermuda/rye irrigated with wastewater and 466 acres for the milk herd pastures.

C. WASTE MANAGEMENT SYSTEM COMPONENTS

The waste management system selected consists of the following:

a. All waste collected on concrete surfaces of the milking barn and heavy use areas nos. 1 and 2 will be washed with a hose and routed to a WSP via a concrete solids separator. A floating chopper pump will prime a solids handling pump that will serve as a booster pump to pump to the waste distribution system. The accumulation of solids on the bottom of the WSP will be removed periodically, hauled and spread uniformly on the 116.2 acres of irrigated hayland (sprayfield). The solids from the solids separator will be uniformly spread over the 116.2 acre sprayfield.

b. HUA no. 3 and the cow walkway along HUA nos. 1 and 2 will be cleaned by means of flushing with the WSP floating pump. The flow for each flush will be about 2,350 gpm.

c. All waste water will be stored in the concrete lined WSP. The WSP will be capable of storing seven days accumulation of waste water generated by this facility plus the storm runoff from a 25-year 24-hour storm event. The WSP concrete liner is 5" thick on the bottom and 4" thick on the sides.

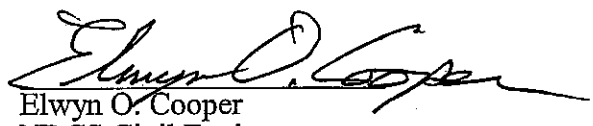
d. A hard hose traveler irrigation system will be used to spread the waste from the WSP on the designated waste application sites at a rate consistent with the crop's nitrogen uptake capacity. The irrigation system is served by three pumps; a chopper type pump (pump #1) capable of supplying 500 gpm of effluent from the WSP to a booster pump (pump # 2) supplying 500 gpm to the hard hose traveler irrigation system. Pump No. 3 will pump fresh water from a well to the traveler(s). Pump no. 3 will provide 500

gpm when only one traveler is operating and 860 gpm when two travelers are operating.

e. A traveling gun irrigation system will be used to provide supplemental irrigation to the 98.1 acres of herd pastures. Pump No. 4 will pump 500 gpm of fresh water from a well to the traveling gun irrigation system. An existing traveling gun will be used for this system.

f. Water troughs will provide water at different locations in each field to prevent the formation of high intensity areas. Each water trough will be provided with water supply valves to enable them to be alternately shut off as needed.

g. Six (6) herd pastures are planned for three herds. This will allow for rotation of the herds. The rotation will provide an opportunity for the grass to be undisturbed about 21 days allowing optimal growth prior to being grazed by the herd. Barb wire fences will be used to control animal placement and movement, which will in turn encourage a constant vegetative cover and an even distribution of wastes.



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