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THE USE OF SUBSURFACE DRIP IRRIGATION FOR THE DISPOSAL AND RE-USE OF SWINE EFFLUENT IN ALFALFA - A PRELIMINARY REPORT

by

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Summary:
There is concern about animal waste discharges affecting both surface and groundwater quality. Pathogens, nitrates and phosphates in the run-off cause serious problems in the surface waters. We logically anticipate that subsurface drip irrigation (SDI) disposal and reuse will eliminate all run-off problems, and minimize nitrate movement into the groundwater.
Reuse of the effluent and the nutrients in the effluent to grow alfalfa, which in turn could be consumed by the same animals which produced the effluent, is sustainable indefinitely. Furthermore we expect that we will find very little if any movement of nitrates below the root zone into the groundwater.

Keywords:
Irrigation, drip, subsurface, alfalfa, swine effluent, effluent disposal.

INTRODUCTION

The Environmental Engineering laboratory of California State University, Chico has been investigating solutions for the reduction of odor and disposal of wastewater generated from hog farms. This study has used a Nibbler treatment unit to produce effluent of sufficient quality to be used in a drip irrigation disposal system. A major factor in the environmental problems associated with animal effluent disposal arises from run-off caused by rain events and poorly managed irrigation. The other major environmental problem is movement of nitrates into the groundwater. The purpose of this research is to investigate the feasibility of growing alfalfa with the swine effluent using SDI, and to measure the nitrate movement below the root zone. In addition the performance of the SDI system and the quality of the alfalfa is being recorded. Because measuring the nitrate movement from the effluent is an essential part of this research it was decided that there would be no attempt to optimize the quality and yield of the alfalfa. Therefor any difference in nitrate movement below the root zone or yield or quality of the alfalfa would be as a result only of the difference between the effluent and the well water.
Alfalfa hay is bought and sold on the basis of the nutrient composition. The buyer is interested in the estimated net energy (EME), protein (either crude protein/CP or digestible protein/DP), acid detergent fiber (ADF), and neutral detergent fiber (NDF). Yield and quality from each plot will be measured at each cutting.

MATERIALS AND METHODS

In the Fall of 1996 sixteen plots each 1.5 by 4.5 meters were established. Two WASTEFLOW driplines each 4.5 meters long set 0.75 meters apart were buried at 0.6 meter depth in each plot. By random selection eight plots were connected to the swine effluent and eight plots were connected to well water. The pressure and flow rates are monitored and the difference in plugging rates can be compared. Provision for injection of chlorine and acids into the SDI systems has been provided.
Suction lysimeters were placed under four selected plots.
Alfalfa seed was sown on each plot in the Spring of 1997.
Potable irrigation water was applied to all the plots to raise the alfalfa. From June effluent was applied through the subsurface drip system to match the evapotranspiration. No additional fertilizers were applied to any of the plots. The water volume and quality from the treatment plant was maintained at 150 gallons per day maximum with BOD5 < 40 mg/l except for system upsets.

RESULTS AND DISCUSSION

The results of the Spring of 1997 growing period will be reported and the differences between effluent and well water compared. The data will include quality of influent, nitrate movement below the root zone, yield and quality of the alfalfa, and the mechanical performance of the equipment.

CONCLUSIONS