

Animal Research Center Management Concepts

Philosophy and Design Assumptions - ARC

The overall philosophy of the design of the animal waste facilities of the Animal Research Center (ARC) is the utilization of the nutrients in the animal manures to meet crop nutrient removal rates of N, P, and K during harvesting and utilization of the biomass. Further, odor considerations were an important component of the system component selection. The reduction of odors from the animal research buildings, storage structures, and land application were an important design consideration due to the proximity of high profile landowners and the nearness of the Versailles community. This resulted in a system that applied composted solids topically on forage and pasture land, injection of liquids into row crop areas, and nutrient management in the riparian areas at maintenance levels using composted solids. The limiting nutrient on the ARC soils is P since the soils are found to be naturally high in native P. The long-term sustainable levels of P loading was to balance the waste P application rate with the biomass P removal rate. Grazed pastures must be open for disposal of composted solids so that there is sufficient land open to meet nutrient disposal at agronomic rates. These rates were estimated for the determination of the maximum animal population of the ARC. Approximate riparian boundaries have been set so that farm management and researchers can identify this management zone in an overall farm plan.

All pasture areas must be available for waste nutrient application unless critical issues are identified for specific short term research. Some research issues in the past have assumed that animal wastes were unsuitable for research pastures while favoring commercial fertilizer. These issues were: uniformity of nutrient application, inadequate nutrient application levels due to unknown nutrient content of waste, reduction in forage palatability, and animal reluctance to forage in areas where animal waste have been applied. Based on precision farming research, the assumption of the consistent uniformity of commercial application is not valid. Utilization of site specific strategies for solid nutrient sources can achieve adequate uniformity. Nutrient testing and mixing is an important management technique for the composted nutrient source. Supplementation for those nutrients with N or K will be needed in many field instances. Composting will eliminate the palatability issue as well as the cattle recognition of the applied waste material. The impact of N of the applied waste on a legume is not totally understood for legume/grass mixture pastures. This issue may need a research study. The objective would need to identify the strategies where a maximum amount of waste nutrients can be applied so that the beef production is economical. Beef farms will confront these issues if confinement facilities and pastures are components of the beef operation. This integration of nutrient utilization with land resource utilization is a direction that the industry will be moving in the future.

An important component of the ARC is the measurement of the impact of the agricultural activities on the surface and groundwater resources. A monitoring network of surface weirs and monitoring wells have been installed.

Each of these elements of the ARC has the potential to have ongoing long-term research projects. The full potential of research and extension activities requires encouragement and support of college administrators to encourage college interdisciplinary teams.

Management Strategy

The success of the animal waste nutrient utilization requires intensive management of the animal waste nutrients in a total farm cropping and pasture system by Management and Operations (M and O). Management systems for monitoring animal populations, nutrient production, crop production requirements, and soil nutrient needs must be installed. Personnel from M and O should be in charge of the handling, transport, storage, composting, and application and crop production.

To meet the above management goals, a management advisory structure should be set up to guide the activities of the ARC farm management. The advisory team should not have a large unwieldy number but have, at least, a member of the agronomy department (crop/soil fertility), Biosystems and Agricultural Engineering Department, Animal Science (a person selected by the animal research units), the ARC managers, and the director of M and O. The purpose of this committee is to advise the ARC on issues of cropping plan to meet the animal production needs, field operations, strategies of nutrient disposal from the solid and liquid storage facilities, and assisting research activities. The responsibility of M and O begins when solid manure is scrapped from feed floors or the liquid collection pits external to building structures. The animal science research facilities management responsibilities are the maintenance and operation of the facilities, repair leaking waterers, preventing of pipe clogging, and meeting the operational schemes that were assumed in the design of the facilities.

The Biosystems and Agricultural Engineering Department has in place a large and varied research effort that is either underway, in various stages of planning, or under consideration for future implementation. These areas include, surface water and groundwater water quality monitoring and modeling, riparian zone management for beef cattle, precision farming techniques for utilization of manure nutrients, reduction of odors in exhaust from swine facilities, and GIS implementation in the study of beef grazing using rotational grazing. Onsite scientific support for researchers and ARC managers will be necessary to implement both the research and nutrient management. This position has been defined by the BAE department.

The riparian zone should be set aside as a separate management area. The management goal is to utilize the area agriculturally while maintaining the integrity of the stream, banks and land cover. Goals should be set and the use should be reviewed by the above committee. Riparian management is a critical issue for KY.

ARC management should include an ARC assistant manager whose sole responsibility is the operation of waste management (collection, storage, and disposal) and nutrient management. This position must coordinate operations with the research needs and overall farm management.

The ARC should be set up as enterprise management units. These units would be the animal research/production units of swine, sheep, beef, and dairy (future); forage/grain production unit, feed mill unit; and the waste management/nutrient unit. Each animal enterprise unit would purchase feeds from the forage/grain enterprise and/or the feed mill, nutrients and nutrient application from the waste management/nutrient enterprise for pastures assigned to that production unit.