Recycling Manure Being Investigated For Cattle, Poultry

Livestock and poultry wastes, estimated at more than 1.5 billion tons a year, have become potential sources of pollution. But today's pollutants may become tomorrow's products. Such conversions are the goal of research at the Northern regional research laboratory, Peoria, Ill., supported by contract and cooperative research in Connecticut and Michigan.

Studies are underway on wastes from feedlots and poultry cages, with research emphasis on such diversified products as protein-rich feed for livestock, cellulose for fiber and pulp products, and enzymes to digest fiber. The Peoria research concludes a two-step fractionation process by chemists James H. Sloneker, Richard W. Jones, Harold L. Griffin, Kenneth Eskins, Bernard L. Bucher, and George E. Inglett.

Manure from corn-fed cattle was fractionated by screening and filtering. The chemists believe that if the undigested fiber can be separated from the protein or made more digestible, refeeding the fractions may be a way to reduce this source of pollution.

A feed fraction obtained in the study weighed 43 percent as much as the dry whole manure and compared with soybean meal in protein content and amino acid balance as determined by chemical analyses. The feed fraction is estimated at about $60 a ton based on a standard of $100 a ton for 49 percent protein soybean meal. Fractionation costs are estimated at only $40 a ton.

Amino acid analyses of the feed fraction indicated high levels of lysine and methionine and suggested that the protein was produced by micro-organisms in the digestive tracts of the cattle. Microscopic examination supported this suggestion.

Analyses also showed that only 2 percent of the feed fraction was cellulose, which would require further processing for conversion into feed of other products.

A residue fraction, 50 percent of the waste was made into board. The fraction contained cellulose and hemicelulose which the chemists coated with resin in making the board. This experimental board has neither the strength nor the water resistance of commercial hardboard. This residue fraction, however, might be useful for products like fiber planting pots that do not require permanent strength, or it might be blended with other fibers and additives for products like board that require strength and water resistance.

The residue fraction also served as a nutrient for a fungus that produces a fiber-digesting enzyme. The fungus, **Trichoderma viride**, feeds and grows on the fibrous fraction or on the fiber in whole manure, sparing the protein present. The fungal tissue itself is 47 percent protein. The enzyme, used to treat chicken feed, markedly improved digestibility of the feed. Baby chicks fed enzyme-treated feed ate less, produced less manure, but gained as much weight as did chicks fed two control feeds.

In another study, fiber digestion with enzymes and heat points the way to complete recycling of chicken manure. This study was conducted by Dr. Sloneker, chemist Ben F. Kelson and Michigan State University poultry scientist Cal J. Flegal. Studying compositional changes in recycled chicken manure, Dr. Sloneker, contrary to expectations, found that cellulose and hemicellulose did not build up in waste that was dried and refed as 25 percent of the chick's feed ration through 23 cycles.

Fiber has been considered indigestible by poultry. However, fermentation of the manure and chemical decomposition caused by drying break down the fiber and make it more digestible, Dr. Sloneker explained. These enzymatic and heat-accelerated changes can be improved to permit total recycling with minimum pollution.

In a contract study for ARS by Hamilton Standard of United Aircraft, Windson Locks, Conn., methane fuel gas and protein feed were produced by fermentation of cattle feedlot waste.

Contract reports to Northern laboratory microbiologist, Robert A. Rhodes, showed that cattle feeders with lot capacities ranging between 5,000 and 7,000 head could produce the feed at a cost less than the estimated value. On this scale, methane gas could provide all heat and electric power needed to operate the process.

Amino acid analyses of the feed compared favorably with those of soybean and cottonseed meal. The experimental system operates continuously and has capacity for about 8.5 gallons (10-percent solids) every 6 days. It has been operating about 2 years.

The contract has been extended to find ways to increase yields, improve feeding value of the solid product, and to conduct feeding tests with chicks.

In a study of micro-organisms in feedlot wastes, Dr. Rhodes and microbiologist George H. Hrubant obtained an isolate of **Salmonella**, commonly associated with mild to severe gastrointestinal illness. Although only one pathogen was present among 1,500 isolates, Dr. Rhodes cautions, "indiscriminate refeeding of understerilized feedlot waste could be hazardous."

Although it's too early to realize the full implications of these studies, ARS scientists can point the way to some process developments and farm practice changes. Developmental research, beyond laboratory results found so far, necessarily would include industrial trials. Further research would also include studies to bring the experimental product or process into conformance with applicable standards of efficiency, health, safety, and environmental protection.

Appliques

Disguise the holes in knees of children's slacks by using an applique. An applique is a bright pretty patch which is cut in a shape and then sewed on top of the hole. It can be any size or shape. You can trace a simple drawing from a child's color book, then cut it out of bright material. For an applique on knit slacks, you should use knit material so it will stretch. Sew it on using close-together stitches that hide the cut edge of the applique, recommends Mrs. Ruth Ann Wilson, Extension clothing specialist at The Pennsylvania State University.