

Land Application of Livestock Manure in Hawaii and the American Pacific

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Situation

Management of livestock waste is a serious concern for livestock producers in Hawaii and the American-affiliated Pacific Islands. This project has been conducted from 2001 to 2005 to study land application of livestock waste and to promote improved nutrient management planning in the islands. Integrated activities to address these issues are supported by the CSREES National Water Quality Program.



The project is designed to determine:

- (1) maximum application rates of livestock waste (manure and effluent),
- (2) interactions of nutrients in tropical soils to which manures are applied, and
- (3) development and adoption of Comprehensive Nutrient Management Plans (CNMPs) on livestock farms in the region.

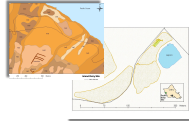
Improved Manure Management

A workshop was co-sponsored by the University of Hawaii and the Natural Resources Conservation Service in August 2003 to review and integrate animal waste management issues into nutrient management recommendations. Nutrient management services at the Hawaii Agriculture Diagnostic Service Center were updated and revised based on this information. The proceedings were published in April 2004.

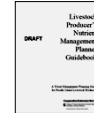


Nutrient Management planning aids developed:

- **Phosphorus Runoff Risk Evaluator (PRE) Software** (Local version of *P Index*) developed with NRCS. Free download at www.nrcs.usda.gov/technical/PREE.html
- **GIS mapping of Farms and Research Sites**



A Nutrient Management Planning Guide was developed and piloted with livestock producers in Hawaii and has been distributed in workshops throughout the Pacific Islands.



Practices for Small Farms

An example of a practice being promoted is a portable dry-litter system which eliminates discharges into waterways and integrates composting. A pen is constructed of 8-foot lengths of fence material, filled with about 6 inches of bedding material and holds up to 4 weaned pigs for 4 to 6 months. New bedding is added weekly.



Portable Dry Litter Pen in American Samoa



Mr. Gilbert Macaranas converted from flushing to dry litter composting in Tinian, CNMI

Composting and dry litter systems are being introduced throughout the islands. Farmers like their simplicity, lower water use and the nutrient-rich fertilizer produced. Dry litter composting is similar to the Portable Pens (above), except that the structures are not moved. The systems are being adapted to include sloping floors and locally available carbon materials, such as coconut husks.

Land Application Studies

Project research results have been presented previously and will be summarized here:

- Composition of manures and effluents in Hawaii were similar to the mainland US, except for higher Cu and Zn contents due to feed supplements and disease treatments.
- A highly weathered tropical soil (Oxisol) retained much more P against runoff than did a less weathered soil (Mollisol). P release varied with P source; fastest from inorganic P (TSP) and slowest from swine manure, with chicken manure intermediate.
- 4 to 5 times as much manure-P application was required to reach the same extractable P level on an Andisol (volcanic ash soil) as on a Mollisol or Oxisol.
- Tropical forage grasses were selected for effluent application studies, including **Suerte Paspalum** (*P. atratum*) and **Bana Grass** (*Pennisetum sp.*). These grasses have high nutrient removal rates (over 1000 kg N/ha/yr, 175 kg P/ha/yr and 2000 kg K/ha/yr).
- High soil retention rates for P and high nutrient removal rates for forages indicate that high effluent and manure application rates can be environmentally acceptable in tropical areas.



Lagoon and farmland at dairy effluent irrigation site (Mollisol) on Oahu

Increased Farm Adoption

Water quality education and outreach throughout the region reaches community members in universities, government agencies, youth groups, on farms and in homes to promote improved practices. A series of 8 livestock producer workshops on improved waste management were held from 2002 – 2004 on the Islands of Oahu, Maui, and Hawaii, attended by over 100 producers. A final statewide workshop was held at the 2004 Hawaii Agriculture Conference with over 70 farm and community leaders attending.



Hilo, Hawaii -- 4 Dec. 2002

Livestock operations in Hawaii were surveyed in 2001, showing high water utilization, common use of earthen lagoons, and limited land application of manures. Only 3 farms had waste management plans. A follow-up survey was conducted in 2005. Significant findings included: 12 producers had approved CNMPs; improved management practices were composting, manure sales, effluent irrigation, and reduced water use; however, about 40% of previously interviewed producers had closed due to high costs and increased regulation.



Community workshop in Rota, CNMI

A series of four workshops were also held in Guam and CNMI (Saipan, Tinian, and Rota) in summer 2004, with over 115 attending. An invited working session was held at the EPA Pacific Islands Conference in June 2005 on Guam. Composting and dry litter systems are now being implemented throughout the American Pacific.

What's Next?

- American Samoa EPA invited project personnel as consultants in November 2005, promoting piggery waste management systems to reduce a serious outbreak of *Leptospirosis*. This disease is common in the Pacific Islands and is often transmitted to humans from pigs. Ongoing activities are planned in American Samoa in 2006.
- Hawaii is hosting the Water Quality Coordinator from Nevada on sabbatical in 2005-2006 to develop improved methods for environmental detection of *Leptospirosis*.
- Education and demonstration of composting and dry litter systems continues in the American Pacific Islands. Current 2006 activities are focused on Palau, Pohnpei, CNMI, and Guam.
- A large scale planting of tropical grasses with effluent irrigation is planned for 2006 at a major Oahu dairy.
- Project publications are being drafted, including journal articles for submission to *Journal of Environmental Quality* and *Agronomy Journal* on the project land application research.
- Three extension articles have been authorized and are being developed for the LPES Small Farms Fact Sheet series, using project results.



This material is based upon work supported by the Cooperative State Research, Education, and Extension Service, U.S. Department of Agriculture, under Agreement No. 2001-51130-11413. Any opinions, findings, conclusions, or recommendations expressed in this publication are the authors and do not necessarily reflect the view of the U.S. Department of Agriculture.