

American Samoa Interagency Piggery Management Council

Introduction

The American Samoa Interagency Piggery Management Council (ASIPMC) was formed to address the problems of improper piggery waste management and to improve the husbandry skills of pig farmers in the territory. The interagency approach allows member agencies to pool resources and effort towards a common goal and deliver a clear, concise, united message to the community.

The American Samoa Interagency Piggery Management Council aims to protect human health, the environment and to improve the quality of pig husbandry in American Samoa. This will be achieved by addressing the environmental impacts of piggery waste through a comprehensive program of applied research, community education, and the development and implementation of locally appropriate piggery waste management practices.

Member agencies include American Samoa Community College-Agriculture, Human and Natural Resources, USDA-Natural Resource Conservation Service, American Samoa Environmental Protection Agency, American Samoa Department of Commerce-Coastal Zone Management Program, American Samoa Power Authority, American Samoa Department of Agriculture, American Samoa Soil and Water Conservation District, American Samoa Resource Conservation and Development Board, American Samoa Department of Public Health (invited).

Background of problems encountered in American Samoa

The 1999 United States Department of Agriculture (USDA) Agricultural Census (USDA 1999) found that there are over 2,700 pig farms in American Samoa with a total swine population of over 35,000 head. Pig husbandry facilities in American Samoa typically contain 10 to 50 animals. A typical piggery consists of an open sided building on either a concrete or packed earth floor. Pig wastes are flushed from the floor with pressurized water. This waste slurry is often discharged directly to surface water or is contained in small, unlined cesspools. Although small-scale by some measures, the overall number and wide distribution of poorly managed piggeries are known to negatively impact human health and the environment (Fig 1, 2 & 3).

Pig manure like other animal wastes is high in nutrients including nitrogen and phosphorous. Pig manure also has a large biological oxygen demand (BOD) as well as being a source for human pathogens and parasites. These three components make pig manure a potential surface water, groundwater, and human health hazard if not properly managed. American Samoa pig farmers raise pigs almost entirely for cultural purposes. Because of the lack of an USDA-approved commercial slaughterhouse, the only means for legally selling pork is “on the hoof,” or as live animals to be used for cultural

purposes. Ironically, the prices obtained for live weaner pigs are over two dollars a pound, regardless of health status or meat composition. This exceeds the commercial prices for imported pork, resulting in little incentive for pig farmers to move towards commercial production. As a result, there is also little incentive for good husbandry practices, as high prices for pigs can be obtained without having to meet any health standards and without having to use intensive inputs.

There exists little formal data on husbandry practices, although anecdotal experience suggests that most farmers do not provide adequately balanced diets or adequate water supplies for their pigs to achieve maximum growth. Furthermore, few farmers are addressing the parasite problem that plagues the territory. In 1998, a team of animal scientists from the University of Hawaii conducted a pig health survey throughout the American Pacific. American Samoa was found to have the highest rate of parasite infestation of any of the areas surveyed. The consequences of such poor husbandry are not only inefficient growth, but also economic, money spent on commercial feed is in essence wasted on parasite-infested pigs. Furthermore, these parasites pose a risk to human health, though their impacts are currently unknown due to lack of tracking by the Public Health.

Surface water

Surface water formations in American Samoa are in the form of perennial and ephemeral streams. Many of the piggeries are located on stream banks and piggery waste is intentionally washed directly into the adjacent stream. These streams provide habitat for freshwater fish, plants and invertebrates. Surface waters are often used for recreational purposes and are a source of drinking water in some remote parts of the islands. All surface waters in the territory discharge directly into marine water bodies. Depending on the flow rate and water quality of the stream as well as the degree of mixing at the discharge, surface waters have the potential to impact the suitability of marine environments for wildlife and recreational purposes. In addition to the direct discharge of pig waste into surface waters, the drainage of fields during precipitation can contaminate surface waters if animal wastes have been applied improperly (Fig 4).

Ground water

Groundwater is the principle source of domestic and industrial water supply in the territory. This is due to its relative abundance in comparison to surface water as well as its high quality. Groundwater is frequently of high enough quality that it can simply be chlorinated and placed directly into the water distribution system without the expensive treatment systems that are required to make surface water suitable for domestic and industrial supply. The volcanic soil and bedrock, which make up the aquifers of the territory, are highly permeable and therefore do not provide a good filter to remove groundwater impurities. This lack of filtration capacity, combined with intense rainfall events, creates a situation where the groundwater supply is easily threatened by the poor management of potentially contaminants including piggery wastes.

When animal wastes are introduced into the aquifer, nutrients, BOD, and pathogens degrade the quality of the groundwater. Animal wastes may impact groundwater through infiltration from unlined lagoons or infiltration from animal wastes improperly applied to agricultural lands as fertilizer. In aquifers with the ability to filter out impurities pathogens and some BOD can often be attenuated. However, nutrients, which are dissolved in the water, are rarely removed and make the extracted groundwater unsuitable as a drinking water source. *E. coli* an indicator of the presence of pathogens, has been periodically detected at unsafe levels in the government water system by the American Samoa Environmental Protection Agency (ASEPA). This usually occurs after heavy rains or if chlorination at a wellhead fails. When *E. coli* is detected, warnings are issued to various villages alerting them to the need to boil their water due to the potential presence of pathogens. It has not been determined if the source of the contamination was the water supply or the distribution system however poor management of piggery wastes has the potential to affect both.

Current piggery operations also impact the environment through their high consumption of water. A piggery of less than 10 pigs is estimated to require 50 to 100 gallons of water per day using current manure management methods. Although piggeries use only a small fraction of the water used by the main water consumer on Tutuila Island, the tuna canneries, water supply projections by the American Samoa Power Authority (ASPA) indicate that conservation measures by all island consumers are needed.

Human Health

It is important that animal wastes be managed appropriately to prevent human illness. Poor management of animal waste can impact human health in several ways. Pathogens and parasites may affect people if fecal matter is ingested either directly from the hands or through the contamination of food. Preventing this type of human illness is principally a matter of proper hygiene and food preparation, however proper management of animal wastes will reduce the likelihood of contamination. When people come in contact with, or ingest contaminated surface water or groundwater they can contract skin infections or parasites. Animal wastes placed on food crops as fertilizer have the potential to spread pathogens that may subsequently be ingested by humans. This is a more significant concern for root crops and those foods that are eaten raw.

According to a 1996 ADAP health survey of swine in American Samoa, specific parasites include liver flukes, Coccidia, whipworm, stomach roundworm, kidney worm, lungworm, tapeworm, and mites, many of which can be passed on to humans. Several farms have tested positive for the presence of *Leptospira* bacteria, a bacterium that causes disease in humans similar to dengue fever and hepatitis, and can be fatal if untreated. It is not known if any deaths from leptospirosis have occurred in the territory, due to lack of adequate laboratory facilities and appropriate testing at the local hospital.

Cultural background

Pigs are the central food item at most family and social gatherings and are an essential part of the Samoan culture and diet. The island's piggeries predominantly produce pigs for consumption at these events. Pigs are either raised by family members as their contributions to the gathering or are raised for sale to families for an event. Currently, pig production does not contribute significantly to the day-to-day consumption of pork. This is principally because of two factors (1) Production levels are not capable of meeting the demand for both ceremonial pigs and daily consumption. It is suspected that this is at least in part due to the high cost of production (2) the absence of a USDA approved slaughterhouse on the island makes it illegal to sell locally raised pork in local supermarkets. Pigs must be sold live and slaughtered by the consuming family. Additionally, it is believed that current pig production techniques would make the meat unsuitable for human consumption under USDA standards.

Legal setting

American Samoa Code Section 25.16 defines the environmental health requirements for domestic animals. The regulations require that pigs be confined in a clean and sanitary condition, and that the confinement be at least fifty feet from a house, restaurant, food establishment or school. The regulations also prohibit the confining structure from being located directly over any body of fresh or salt water and goes on to state that, "Pigs or other domestic animals may not be confined in the area immediately adjacent to any body of fresh water in such a way that the waste discharges of the animal or the washings from the pen may contaminate or pollute a stream or other body of fresh water." Enforcement of these regulations is the responsibility of the Department of Health. Currently most piggeries are not in compliance with this regulation. Piggeries are often located adjacent to streams in order to easily discharge the large volumes of water generated using the current waste management practices.

Objectives

The objectives of the IPMC are:

- To increase public awareness about the importance of proper piggery waste management.
- To eliminate the discharge of piggery waste into surface waters and to minimize the impact of piggery operations on groundwater resources.
- To help local pig farmers improve their husbandry skills.
- To implement a long-term program with communities and piggery operators allowing them to properly manage their piggery waste and satisfy their production goals.

In order for changes in waste management to significantly reduce the effect of piggeries on human health and the environment, the changes must occur at a large number of piggeries. In order to implement a program that has the potential to impact a large number of piggeries the proposed management changes should require as little change as possible on the part of the piggery operator and be within the range of possibilities acceptable to the operator. Knowledge of the American Samoa situation suggests that two elements will be required of an appropriate pig waste management program. The program should include solids separation and should reduce the use of water as much as possible. The resources required to implement such a program should be within the identifiable resources of the implementing agency. This includes, but is not limited to, the costs for physical improvements to the piggery, if provided, educational programming, and long term monitoring. Implementation of a program will be more successful if the suggested changes can be limited to a concise message that is applicable to most of the intended recipients with as little site-specific tailoring as possible. Additionally this reduces the cost of implementing the program.

Approach

The IPMC seeks to obtain its objectives by initiating two research programs and an education program followed by an implementation phase. The Piggery Waste Management Techniques Development Program (PWMTDP) will seek to identify waste management techniques that are protective of human health and the environment as well as applicable and implementable in the American Samoa setting. Concurrent with this research program will be the Implications of Pig Production on Human Health and the Environment Research Program (IPPHERP). This research program is intended to answer outstanding questions on the effects of pig waste on the environment. Many of these questions have implications for the selection of appropriate management techniques. Although the programs will be run concurrently, limited research funds will be prioritized toward the development and evaluation of appropriate waste management techniques. Some research questions that could be investigated under this program may instead be incorporated into the evaluation procedures for various waste management techniques under the PWMTDP. This shift towards applied research is intended to speed the development and selection of appropriate waste management techniques.

In addition to the research programs a pig husbandry and water protection awareness program will be conducted to raise awareness of piggery waste management issues and proper pig husbandry. This program will be implemented by conducting presentations for various groups.

Following the completion of the PWMTDP one or more appropriate waste management techniques will be selected. These techniques will become the central part of the Implementation and Education (I&E) Program. Given the current uncertainty surrounding the waste management techniques to be selected development of the I&E Program will be delayed until technique selection has been made. This will allow the I&E Program to be properly developed in accordance with the technique.

Piggery Waste Management Technique Development Program

1. Existing small-scale piggery waste management techniques will be researched. The applicability of these techniques to the American Samoa setting will be reviewed and those that are potentially appropriate will be selected.
2. The IPMC will, based on knowledge of the local setting, develop any other management techniques that may be appropriate.
3. Both the selected existing techniques and those developed by the IPMC will be further evaluated and ranked based on their expected applicability, implement ability, and the degree of protection provided to human health and the environment. An evaluation procedure including site testing will be developed for the highest ranked techniques. The evaluation will determine the success of the technique at protecting human health and the environment as well as its applicability and implement ability in the American Samoa setting. The evaluation procedure will include a cost estimate.
4. Results of the evaluation procedures will be examined to determine if an appropriate technique was identified.
5. If one or more appropriate techniques are identified then the development of an implementation program should begin using those techniques. If no appropriate techniques were identified then the research cycle should be repeated but should include any modified techniques developed based on the results of the previous round of research.

Implications of Pig Production on Human Health and the Environment Research Program

1. A list of outstanding questions regarding the effects of pig production on human health and the environment will be developed. The list will be prioritized based on the importance of understanding the effect of pig production on human health and the environment and the development of an appropriate pig waste management technique.
2. From the prioritized list research questions will be incorporated, as applicable, into PWMTDP projects selected for that research cycle.
3. From the remaining list of questions, research programs, including cost estimates, will be developed for the top five questions.
4. Selection of questions from this list for implementation during the research cycle will be coordinated with PWMTDP projects based on the availability of funding and staff.

Pig Husbandry and Water Awareness Program

The Pig Husbandry and Water Awareness Program presentation was designed by staff members from the American Samoa Environmental Protection Agency and the American Samoa Community College, Division of Agriculture, Human and Natural Resources. The ASIPMC will continue to conduct presentations for various territorial government agencies and community groups including the Board of Higher Education, the American Samoa Department of Education, and village councils.

Implementation and Education Program

Development of the Implementation and Education program is pending results from the Piggery Waste Management Technique Development Program.

References

United States Department of Agriculture (USDA), 1999 Census of Agriculture.

Member Agencies and links

American Samoa Community College-Agriculture, Human and Natural Resources

www.amsamoacc.as

USDA-Natural Resource Conservation Service

www.nrcs.usda.gov

American Samoa Environmental Protection Agency

www.asg-gov.com/departments/epa.asg.htm

www.epa.gov

American Samoa Department of Commerce, Coastal Zone Management Program

www.amsamoa.com

American Samoa Power Authority

www.aspower.com

American Samoa Department of Agriculture

www.asg-gov.com/departments/doa.asg

American Samoa Soil and Water Conservation District

American Samoa Resource Conservation and Development Board

<http://gu.nrcs.usda.gov>

American Samoa Department of Public Health

www.asg-gov.com/departments/doh.asg



