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American Samoa, Factor 6: Sustainable Agriculture

Animal Waste Handling on American Samoa

American Samoa is an unincorporated territory of the United States and is also the southernmost US Territory. It's part of the Samoan Island Chain located in the South Pacific Ocean, half way between Hawaii and New Zealand. There are five main islands and two coral atolls bringing it to a total of 76.83 square miles, with a population of 54,343 people; 95% of these people live on the largest island of Tutuila. The capitol of Pago Pago has a population of 3,656.

The islands that make up American Samoa are both volcanic and coral atolls. There is currently an active submerged volcano just 28 miles east of American Samoa. Topography of the island includes rugged peaks and small coastal plains. The highest point is Lata Mountain which rises to 314 feet above sea level. Soils on American Samoa are mostly volcanic, porous and rocky. American Samoa has a tropical climate with an average of 119 inches of precipitation. During the months between November and April, the people of American Samoa are on the look out for tropical cyclones. There are two seasons in American Samoa, wet and dry. The wet season extends from December to March; leaving April through September for the dry season. The temperature in American Samoa is the same year-round, averaging 82-83 degrees.

The average household in American Samoa is seven people. There are usually three generations in one household with one or more nuclear families and some relatives. The head of the family in American Samoa is called the *matai*; the *matai* is usually a male and he is in charge of the household, settling disputes and representing the family. Work within the family is divided by age; elders are respected and cared for by younger family members. In turn, grandmothers usually fill the role of babysitter for infants in the household. Diet in American Samoa mostly consists of fruit. They include taro, breadfruit, banana, coconut, papayas, mangoes, some chicken, pork, canned corn beef and tuna. Meals are prepared twice a day in the home and traditionally are eaten cold.

The education programs on American Samoa are somewhat like the programs in the rest of the United States. Education begins with a preschool program, next they move up to universal public school and then to high school. There is a 97% literacy rate in American Samoa. Although the main language is Samoan, most residents are bilingual and school is taught in English. There is a community college on the main island of Tutuila which offers two year degrees. Some Samoans also go to the mainland for further education, approximately 7% of the people on American Samoa have bachelor degrees or higher. Access to healthcare is adequate. A hospital on the island of Tutuila offers most medical services. There are several small clinics available for medical attention in addition to medical flights to larger hospitals in the region.

While most of the population on American Samoa works in government or at the local cannery, many also have small agricultural operations at home. A survey for data collection conducted on the island in 2003 described a farm as "any place that raised or produced any agriculture product for sale or home consumption" (USDA-NRCS 2005). According to this data, 75% of households fit this description with the average farm being 2.8 acres. There are approximately 7,094 farms in total on American Samoa; these farms raise animals and grow crops that are usually kept for the home consumption but can also be sold. Some of the major crops grown are taro, yams, bananas, breadfruit, and coconuts. Many raise pigs for home and cultural purposes, there are also a small number of cattle raised as well and chickens for meat and eggs. Most producers raise 10-50 pigs on small acreages (USDA-NRCS, 2005). Crops are also

raised on small family plots of land. Very few actually raise crops or animals for commercial use. In fact, due to the absence of a federally inspected meat packing facility, animals must be sold live and then butchered by the purchaser.

Families on American Samoa are limited in terms of agricultural productivity, employment and nutrition. The climate on the Island along with soil type and limits to farm size make it hard to increase production. There are also fewer options for agricultural loans and information about management programs. There are few crops and species of animals that can thrive in a tropical climate. Culturally, pigs are the most in demand and also the most suited for the climate. Many grain and vegetable crops are not viable due to moisture and soil type. Most also Samoans work away from the farm, leaving less time to dedicate to farm practices. While there is good access to fruits, pork and some chicken, other meat sources and vegetables are hard to find and expensive as they must be imported from other areas.

One of the largest components of agriculture on American Samoa are piggeries. According to the United States Department of Agriculture (USDA) Agricultural Census there are over 2,700 pig farms on American Samoa with a total swine population of 35,000 head. The viability and sustainability of these piggeries and the quality of the protein they provide is a concern. According to a report by the American Samoa Interagency Piggery Management Council (ASIPMC), these piggeries are typically open sided buildings with either a concrete or packed dirt floor. They are cleaned by using high pressured water to wash the waste out of the area. Usually the waste is discharged to surface water or into unlined cesspools. The lack of waste and carcass management is affecting water quality as well as food quality. Many of the pigs raised on American Samoa have parasite problems which are only compounded by living conditions.

Pigs play a very important role both economically and culturally on American Samoa. Pigs are used for a main source of protein and also for religious and social celebrations. Pigs are sold live and at a cost per pound without regard to health or meat composition. Therefore, there is little to no incentive for producers to improve management practices. Prices are also higher when selling to private parties so there is little interest in producing commercially. These factors have resulted in a lower quality product and the highest rate of parasite infestation in the area (ASIPMC). A typical family on American Samoa is consuming a poor quality, parasite infested animal. The producer is not seeing the highest returns for his investment due to poor management and barriers to production.

Presently, many organizations have come together to address the issue of waste management on American Samoa. While much research is being done, there are still major concerns regarding this issue in terms of public health, water quality and animal husbandry. A Piggery Management Council has been formed to look into the issues and to help get practices on the ground. Results are slow and effects of poor management are being seen in both surface and groundwater sources. Improving waste management practices on American Samoa would benefit water sources, agricultural sustainability, human health and animal health. Piggeries are not allowed to be within 200 feet of surface water on American Samoa, however, many are within this setback. Local government lacks the labor force to inspect and regulate this rule. After heavy rains, many villages must boil their water due to the presence of E. coli. Poor waste management is partly to blame for these problems. In addition to drinking water concerns, poor water quality also affects recreation and aquatic life for both surface and ground water. American Samoa is susceptible to heavy rains, hurricanes and tsunamis. The possibility that changes in climate could affect agricultural sustainability is very real. The soils on American Samoa are mostly volcanic rock which is very porous, making it a poor filter in terms of water quality. High amounts of rain essentially wash raw manure in to the surface and groundwater sources. Poor management of livestock also leads to higher water consumption. Currently, there is water conservation measures put in place by the local government. Fresh water sources on American Samoa are limited and if there were a shortage, piggeries would be affected.

In order to effectively address waste and carcass management in American Samoa, centralized composting facilities should be put in place on the Island. The facilities would be used by multiple families. Composting facilities are a safe and effective way to turn animal waste and plant waste into a nutrient rich, pathogen and bacteria free compost. The facilities would be built on a concrete slab with covering and adequate drainage to keep rainwater from coming onto the slab. Each slab would be constructed using USDA-NRCS guidelines.

Animal waste management facilities are already used in many areas of the world. The idea and construction behind them is fairly simple, but effective. Each facility would need three bays, one for the waste directly from the farm and the others for the compost as it aged. The first bay would be layers of animal waste and plant matter. The correct layer depth is important to generate heat and also to contain gases as it breaks down (USDA-NRCS, 2006). Many composting facilities use sawdust, wood chips and garden waste to layer with the animal waste. Depending on temperature and amount of material, the initial step in the first bay should be completed in 2-3 months. It would then be moved to the second bay where it will be stirred and continue to breakdown. The final bay would be usual compost, which could be applied to fields or even bagged and sold for garden use.

Animal health and human health are very closely related on American Samoa. With the majority of commercial and small-scale pig producers dumping waste directly into streams and other water ways, the surface water becomes polluted. Pigs produce four times more waste than human beings, if not managed properly, soon humans are affected. Poor handling also contributes to the increased amount of parasites in the pigs. These parasites directly affect the quality of protein in the meat. The people of American Samoa are consuming this meat and, if not cooked properly, they will become sick. Air quality is another issue when pigs are raised in a concentrated area and waste is not handled properly. People have reported many adverse physical and mental health effects from ammonia, hydrogen sulfide, and nuisance odors originating from pig farms. Eye, nose, and throat irritation, headache, nausea, diarrhea, cough, chest tightness, palpitations, shortness of breath, stress, and drowsiness are some of the most frequently reported problems (Shiffman 2000).

While commonly referred to as “animal waste” facilities, it is important to note that composting of carcasses can also be safely done in these systems. Death loss of up to 5 % is average for farrow to finish operations (Vansickle, 2006). Those averages are taken across the United States; however, it can be substantially higher in areas of high parasite presence, like American Samoa. Assuming a 5% death loss, and knowing there are 35,000 pigs on American Samoa, the average number of pigs lost in a year is 1,750. With limited space, porous soil and high precipitation, burying those carcasses is not a safe way to dispose of them. The same process used for composting manure is used with carcasses, with special attention given to the depth of layers (USDA-NRCS, 2006).

The implications of having a safe way to compost carcasses are far reaching. Public health, animal health, water quality and aesthetic value are all increased by properly disposing of carcasses. As population continues to grow, the need for facilities in which to compost animal waste will become more and more important. Each facility could handle waste from up to ten producers. The facilities would be placed in areas central to that group of farmers. Each farmer would be responsible for getting their own waste to the facility. Therefore, it is important to have these facilities close to the farmer. Wheelbarrows could easily transport waste to the facility on a regular basis. Quick transportation to the facility is very important. The issues of water quality, air quality and animal health are best addressed by getting the waste to the facility. The facility will be constructed to handle water run off and managed to control odor. Getting the waste out of the production areas will also help improve animal health. Clean, dry pens are a safer and more sanitary than manure laden areas. Controlling parasites within the piggery will also be easier when areas are clean and dry.

Already, there are some small scale compost facilities being implemented on American Samoa (Saumweber, 2013). While this has been positive and successful, not all producers have the space or labor pool to have their own facility. With a shared facility, many more could benefit from the same facility and also pool labor resources. The facility would require some input. The United States Department of Agriculture's Natural Resource Conservation Service (USDA-NRCS) has cost share programs funded by the Farm Bill Conservation Program. The Environmental Quality Incentive Program (EQIP) could help fund construction. EQIP funds could be used for the planning as well as materials and labor. According to the Program guidelines, approximately 75% of the costs would be covered. Other funding could come from private sources as well as local grants and partners.

A tractor would also be needed intermittently to stir the compost as it aged. This could be an opportunity for local government to be involved; they could provide a tractor and operator for short amounts of time as needed. The State Department of Agriculture, Environmental Protection Agency and even the local community college could also be involved. The local community college offers classes in agriculture and they could extend these classes to include producers. Not only in set up and initial learning, but also in extended monitoring and training. Ground and surface water would be positively impacted as would public health which could include the Department of Public Health as well as the local Soil and Water Conservation District.

While involvement from local governments to the federal government is needed, just as important is the involvement of local families. Families would have a large part in the success of the facility. Not only would they provide labor, they would also help train others and manage the system. An individual family would need to get the waste to the facility, straw or wood chips could be provided at each farm to help capture waste and make transport easier. Individual families would be part of the solution to a larger problem. The sense of community could be used to educate producers on animal husbandry and management skills. Aside from having a place to take their animal waste, another benefit is the compost itself after it has been through the process. The end result is compost that is nutrient rich and could help to increase soil health and production. The volcanic rock and porous soil types on the Island could be amended and turned into a much more effective plant base.

By implementing a centralized animal waste compost facility, agriculture in American Samoa will become more sustainable. In addition, water quality, public health, and farm income could improve. Water quality could be improved simply by having less manure and waste running into water sources. Increased awareness about animal health could lead to better animal husbandry practices. A 1996 survey by Agricultural Development in the American Pacific (ADAP) Project found eight different types of parasites present on pigs in American Samoa. Public healthcare could be improved by treating parasites and by having cleaner farms and pens. Farm income could be raised by the application or sale of compost and increase prices for high quality meat.

A sustainable agricultural operation is one that is rewarding to the owner as well as to the environment. Piggeries on American Samoa are not sustainable, the damage to water sources, tourist income, public health and animal welfare are too great. With implementation of centralized composting facilities, producers will have a way to turn the animal waste into a usual, safe and beneficial product. Pigs are an important part of the Samoan culture. They have been successfully raised on the island for centuries. Making sure that producers have the tools, facilities and training needed to operate a successful, sustainable piggery will take time. Bringing these producers together with a common goal could be a path to even more ideas for sustainable practices.

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