

# Sustainable agriculture: how do we get there in Samoa?

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## **Introduction**

Sustainable agriculture, food security and food safety in Samoa and the rest of the Pacific Islands are more urgent goals than ever as we enter the new millennium. In a developing country such as Samoa, the agriculture sector has multiple roles: to help ensure food security, anchor rural development, provide resources for the livelihood and adequate incomes of a majority of people, and to do this without destroying the ecological nature of the environment. There are thus two inextricably linked components, social and environmental, to agricultural sustainability.

## **Worldview**

In industrialized countries, the flaws of the industrial food production system are rapidly emerging. Over the past 2 years alone, the European public have confronted the health and environmental hazards of such a production system, both crops and animal husbandry. At the same time, increasing evidence of ecological and health dangers from genetic manipulation through modern biotechnologies is galvanizing deep public and scientific concern, starting in Europe, and spreading to Africa, Asia, Latin America and recently in North America which is the largest producer of genetically modified crops. Governments in a number of countries including Samoa have taken precautionary steps to halt or curb commercial production and imports, and in some cases, even banning certain types of technologies.

Meanwhile, the ecological, social, health and economic fall-out of chemical-based agriculture continues to unfold despite the acknowledgment in Agenda 21 by the World's political leaders that such production systems were proving to be environmentally unsustainable. Like other countries in the world, Samoa has taken several strategies in making sure its environment is ecologically, socially and economically sustainable.

Such strategies are geared to common challenges such as population growth, food security, conserving limited natural resources, limited arable farming land and the need for a sustainably healthy environment. This has raised the need for strategies for sustainable food security and the need to conserve natural resources as emphasized at the World Commission on Environment (Agenda 21, 1992).

## **Types of farming**

Types of agricultural farming in Samoa can be classified into three categories. These are subsistence farming, semi-commercial and commercial farming. The majority of farmers in Samoa fall into subsistence with surplus sold for cash. The Samoan culture and the land tenure system practiced influence these systems.

The farming technologies in these agricultural farming types however can also be classified as indigenous and introduced and are also the key factors to sustainable development such that they directly affect the sustainability of food security and conservation of natural resources.

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### **The need for sustainable agriculture in Samoa**

The need for sustainable development and the goals for sustainable agriculture in Samoa are fundamental factors in providing the basis for sustainable development programmes. However, one might ask if there is a need for sustainable agriculture in Samoa. This is a crucial question because it will all depend on a number of factors. Such factors include the need for food, household incomes and foreign exchange. Since Samoa is dependent on agriculture for its food and economy, it is significant that sustainable agriculture becomes an important technology in the farming systems.

At times the debate on poverty has become a controversial issue in Samoa. In the world condition, poverty is a day-to-day challenge for 800 million people struggling to meet their basic food requirements. Sixty percent are rural people who live in environmentally sensitive areas of low productivity. Of these, over 350 million are landless or near landless. The question is whether Samoa is in preparation for its future generation in terms of the required land for food security and conservation of natural resources? Does poverty exist in Samoa?

These and others are fundamental questions for Samoa in the new millennium. Many people argue that in most developing countries like Samoa, access to land remains the most viable opportunity for the poor rural households to become self-reliant. An example of this in Samoa is the Samoa Melanesian ethnic group who migrated from Papua New Guinea and the Solomon Islands many years ago. Not having access to land and do farming is one of their major problems living in Samoa.

However, the manner by which land is required is regulated. Rights are assigned and conflicts are resolved determines the incentives and opportunities for the rural poor to i) ensure their household food security; ii) conserve and restore their agro-ecosystems; iii) access to financial services; iv) earn income by producing marketable surpluses; v) accumulate capital and assets; vi) use their own labour and investments to sustain the natural resource base; vii) build reserves to cope with drought and cyclones and preserve their assets during periods of agricultural stress; and viii) invest in alternate livelihood options.

Sustainable agriculture and rural development are essentially about the way people in Samoa organize their social, economic and political systems to make the critical decisions on who has the rights to use which resources, in which ways, for how long and for which purposes. As we enter into the new millennium, the need for sustainable agriculture will intensify and become more important to the Samoan community and society. In the worldview, many organizations such as the Food and Agriculture Organization of the United Nations (FAO) and the Kellogg Foundation are focusing their efforts on sustainable agriculture and food systems. To help get the vision of sustainable agriculture and to understand the rationale, a brief philosophy of sustainable agriculture is given.

### **Philosophy of sustainable agriculture**

Agriculture and the food system are vitally important to the local community, district and Samoa as a whole. They are key contributors to the economic health and viability of the nation, districts and its local communities supplying its citizen with abundant, fresh, and nutritious supply of food.

Sustainable agriculture programmes in Samoa needs to ensure the long-term sustainability and viability of an agriculture and food system that will sustain the economic viability of farms as well as food processing, marketing, and distribution businesses. Such programmes should also enhance environmental quality and the natural resource base. It ensures that the

food and fibre needs of its citizens are met and strengthen communities; and enhance the quality of life of farm and rural people.

### **What is sustainable agriculture?**

There are many definitions but there are common elements in sustainable agriculture that we need to address under sustainable agriculture. For example, a good definition of sustainable agriculture is one like this: It is an integrated system of plant and animal production practices having site-specific application that will, over the long term: i) satisfy human food and fibre needs; ii) enhance environmental quality and the natural resource base upon which the agricultural economy depends; iii) make the most efficient use of non-renewable resources and on-farm resources and integrate, where appropriate, natural biological cycles and controls; iii) Sustain the economic viability of farm operations and enhance the quality of life for farmers and society as a whole.

### **Making the transition to sustainable agriculture in Samoa**

Sustainable agriculture is a management-intensive method of growing crops at a profit while concurrently minimizing negative impact on the environment, improving soil health, increasing biological diversity, and controlling pests. Sustainable agriculture is dependent on a whole-system approach as it focuses on the long-term health of the land. As such, it concentrates on long-term solutions to problems instead of short-term treatment of symptoms. One result of such strategy is that use of agricultural chemicals and similar inputs is reduced, though not necessarily eliminated. As a consequence, the land develops diversity and reliance that further reduce the need for agricultural chemicals.

It is widely agreed that a truly sustainable farm system must be sustainable economically, ecologically and socially. To be economically sustainable, our farms in Samoa should generate sufficient equitable returns to support farm families and to provide an economic base for the surrounding community. To be ecologically sustainable, farming methods used in the three farming systems must be modelled on nature to foster energy flow, effective water and mineral cycles, and viable community dynamics. Energy flow is enhanced through increased capture of solar energy and strategies to effectively utilize and store it. Off-season cover crops, perennial vegetation and relay planting are among the tools for capturing more sunlight; feeding livestock on-farm and carefully managing soil organic matter are means of conserving and storing it.

Strategies that conserve fossil-based fuels and/or substitute renewable energy sources also contribute positively to energy flow. Water cycling is improved through strategies and techniques that prevent erosion, increase the infiltration and water-holding capacity potential of soil, and reduce contamination of water resources by pesticides, fertilisers, and suspended matter. The cycling and recycling of wastes on-farm foster the mineral cycle. On-farm feeding of livestock is especially useful, as is the careful management of crop residues, the use of catch crops to reduce leaching losses, and practices that prevent wind and water erosion.

Effective community dynamics is encouraged through increased biodiversity. Crop rotation, companion planting, strip cropping, and the integration of livestock and crop enterprises are all means of increasing farm biodiversity. Community dynamics is also enhanced by the appropriate introduction of perennial crops and trees where possible. To be socially sustainable, agriculture should promote the physical, spiritual, cultural and economic health of farm families and communities.

### **Farming systems in Samoa**

Apart from indigenous systems such as shifting cultivation, a number of farming systems have been introduced to Samoa to provide alternative farming systems. The Ministry of Agriculture, The University of the South Pacific's School of Agriculture, FAO and other Non Government Organizations have played important roles in researching alternative farming systems that will provide sustainable agriculture. A research by Kama & Powell 2002 shows that farmers in Samoa have been using farming systems such as monocropping, mixed cropping, mixed farming, agroforestry and shifting cultivation. The study shows that 66% of farmers in Samoa use mixed cropping, 49% use mixed farming (crops & animals together), 13.6% use monocropping, 5.1% use shifting cultivation, while only 3.4% use agroforestry.

The study also shows that though farmers use introduced farming systems there are still a number of problems that they face. The most important problems are pests and diseases, lack of resources, theft, lack of markets, rocky soil and poor roads. This study shows that there is only a small portion (3.4%) of farmers who have adopted agroforestry. It shows that sustainable agriculture through the use of agroforestry is not easy to adopt and use. Other introduced technologies for sustainable agriculture include organic and hydroponics farming.

### **Some essential steps to a sustainable agriculture in Samoa**

How do we get started in sustainable agriculture? This is an important question for those who are seriously thinking of sustainable development. First, one has to understand the philosophy of sustainable agriculture and the definition and finally move to the various means of making agriculture sustainable. If this is the kind of agriculture we want in Samoa, how do we get there from here? I have formulated eight steps that will get us started. Note that these are not the only steps, there are more steps that are not mentioned here. Just how valuable these steps are will determine by how well they work for the Samoan farmers every day. They are guideposts for thinking about a farming operation, arrows that point the way to long-term viability of a farm.

#### *Conserve and create healthy soil*

In order to reach this step, one needs to stop soil erosion by mulching, cover cropping, terracing, strip cropping, and repairing gullies. The use of organic matter such as green manure, compost, manures, crop residues and organic fertilizer will conserve and create a healthy soil. Other management practices that would also help include crop rotation, intercropping and alley cropping, all these have been introduced in Samoa.

#### *Conserve water and protect its quality*

To conserve water and its quality, we need to address the following management practices: prevent soil erosion in field and pasture. Erosion can be controlled by cover cropping, mulching and improving organic matter content of the soil. We can also conserve water and protect its quality by reducing the use of chemical in farming. Samoa should take precaution in the use of pesticides, weedicides and other chemical such as fertilizers because of its porous soil. Chemical residues can easily leached down to underground water and caused contamination to drinking water. On the other hand, the idea of using biological control method is an alternative way of using chemicals. Another way of conserving water and its quality is to establish conservation buffer areas. One way to do this is to grow crops adapted to rainfall received. For this, a study of crops and their water requirements is important to the selection of crops. Water conservation and quality can also be maintained by the use of efficient irrigation methods. However, irrigation is not a common practice in Samoa. Most crops are rainfed.

### *Manage organic wastes and farm chemicals so they don't pollute*

To manage these one can do the following practices: i) Organic wastes is not really a threat in Samoa however, excess organic wastes will cause pollution to Samoa's environment if not controlled. Thus, it is important to carry out a soil test, apply manures and litters only when needed; ii) Manage compost, animal manures and litters. For example pig manure can be mixed with other ingredients to create a compost soil; iii) Store litter piles out of the rain and sun. This is to stop residue leaking out to recreational and residential areas. iv) Raise pastures and practice free-range poultry system for better ecological control system. v) Raise pigs in hoop or small houses or free-range system; vi) Look for alternatives to chemicals. Always look for other non chemical means to avoid the use of chemicals in farm production. vii) If a chemical is to be used, use the least amount necessary; viii) Buy the least toxic chemical; and ix) Dispose according to label instructions.

### *Manage pests with minimal environmental impact*

Pest management will include the following: i) Weed management. Weed management involves mechanical approaches. The approaches include mowing, burning, and flooding tillage, hand weeding and controlled burns. ii) Cultural Approaches. This includes hand weeding, crop rotation, smother crops, carry out cover crops, allelopathic plants and close spacing of plants. iii) Biological Approaches. This approach includes using multispecies grazing, and rotational grazing; iv) Insect and Disease Management. In this approach, we can introduce or enhance existing populations of natural predators, pathogens, sterile insects, and other biological control agents. Other practices include making traps, maintain wild areas or areas planted with species attractive to beneficial insects, selective insecticides to beneficial insects, botanical insecticides which are less toxic, trap crops, crop rotation, intercropping, strip cropping, maintain healthy soil and keep plants from becoming stressed.

### *Select plants and animals adapted to the environment*

Another essential step to sustainable agriculture is to select plants and animals adapted to the environment. These will include i) growing crops and crop varieties well-suited to Samoa; ii) matching crops to the soil type; iii) experiment with older, open pollinated varieties that do well without chemical inputs; iv) raise hardy breed of livestock adapted to local climate; and v) raise livestock that gain well on grass and native forages.

### *Encourage biodiversity*

Biodiversity is an important aspect of sustainable agriculture. It all means diversify both crops and animals. Preserve habitats for wildlife and maintain the health of stream and ponds. There should be wildlife corridors for wildlife to habitat and crop rotation is also a means of encouraging biodiversity.

### *Conserve energy resources*

Energy resource is conserved when: i) the number of tillage operations are reduced; ii) cut the use of chemicals and fertilizers; iii) develop production methods that reduce horsepower needs; iv) recycle used oil; iv) use solar-powered fences and machines; v) use renewable, farm-produced fuels: ethanol, methanol, fuel, oil from seed crops, methane from manure and crop wastes.

### *Increase profitability and reduced risk*

To achieve this, one can do the following practices: i) diversify crops and livestock; ii) Substitute management for off inputs; iii) Maximize the use of on-farm resources; iv) Work with, not against, natural cycles; v) Keep machinery, equipment and building costs down; vi)

Add value to crops and livestock, and vii) try to direct marketing for farmer's markets, and farm stores if necessary.

### **Standard for sustainable agricultural programmes**

The quality of sustainable agriculture also depends on a number of standards. These standards may include sustainable agricultural programmes and characteristics of technologies used in the farming systems. Standard for sustainable agriculture programmes surrounds the following areas: i) a programme that is based on science; ii) a programme which honours market principles; iii) a programme which increases profitability and reduce risk; iv) a programme which satisfies people's need for fibre and nutritious food; v) a programme which conserves energy resources; vi) a programme which creates and conserves healthy soil; vii) a programme which conserves and protects water resources; viii) a programme which recycles or manages waste products; ix) a programme which manages environmental impact; and xi) a programme which encourages strong rural communities.

### **Features (characteristics) of sustainable agricultural technology**

In addition to sustainable programmes, quality sustainable agriculture in Samoa will also depend on a number of agricultural technology characteristics. The characteristics include:

- i) *Relative advantage*: Technology for sustainable agriculture should be recognized as better than the idea or object it is intended to replace. Relative advantage is usually expressed in terms of economic gain, although smallholder farmers may consider the avoidance of risk more important.
- ii) *Compatibility*: Technology for sustainable agriculture should be consistent with a farmer's existing values, past experience, his management objectives, the level of technology, the stage of farm development and needs.
- iii) *Complexity*: Technology for sustainable agriculture should be perceived as relatively easy to understand and use. The simpler the technology the more rapidly it will be adopted.
- iv) *Trialability*: Technology for sustainable agriculture should be tried on a limited basis. Ideas or on an instalment plan will generally be adopted as part of a package. If a farmer can try an appropriate technology without committing too much money, he or she may adopt it more quickly.
- v) *Observability*: Results of technologies for sustainable agriculture should be visible to farmers. The easier it is for a farmer to see the advantages of sustainable technology the more likely he or she will adopt it.

### **Strategies for change**

Whatever the change is for sustainable agriculture, it will depend on the strategy used for change. Change surrounds farmer's knowledge, skills and attitudes towards sustainable agriculture. Strategies for change may include the reward strategy, giving order strategy, directive strategy and indirective strategy.

#### *Reward strategy*

This strategy is based on the principle that people will change their behaviour if you provide incentives for them to change. For example, the pasture planting competition by the Ministry of Agriculture, the provision of low interest loans or grants for farming activities through local development banks and the subsidy on fertilizers for farmers.

#### *Giving order strategy:*

This strategy consists of making rules, regulations and laws and telling people that they have to obey them. For example, in Samoa a number of years ago the government passed a Bunchy

Top Act in an attempt to control an outbreak of this disease in bananas. Farmers were required to take certain control measures against this disease. Inspectors from the Ministry of Agriculture could inspect plantations and order farmers who were not carrying out the controls to do so. If they refused, they could be taken to court.

*Directive strategy:*

This strategy is based on the assumption that new technology will come from research organizations and people are not important sources of knowledge. In this strategy, the organisation responsible for the programme decides what people need, or ought to know, or do, or how they should behave, and organises educational programmes and provides resources to encourage the target audience to behave in this way. Most programmes run by the Ministry of Agriculture in the region are of this type. For example, the Amelonado cocoa scheme in Samoa, the copra quality programme in Vanuatu, the banana export scheme in Tonga.

*Non-Directive Strategy:*

This strategy is based on the idea that people (like farmers) are important sources of knowledge about the activities they are involved in. It assumes that the farmers themselves know their problems, and the solutions that work.

## **Conclusion**

In summary, sustainable agriculture, food security and food safety are important goals in Samoa as we enter the new millennium. The major roles for agriculture sector are to achieve these goals through the provision of technical services to ensure food security is established and maintained, anchor rural development, provide resources for the livelihood and adequate income for a majority of people. While these are the major goals, it must emphasize the need to maintain the ecological base of the environment. Generally speaking, there is a need for sustainable agriculture in Samoa. This is indicated in Samoa's dependence on agriculture for its food and economy and therefore it is important that agriculture is sustained in the long run.

Agricultural programmes in Samoa must be designed to ensure the long-term sustainability and viability of an agriculture and food system that will sustain the economic viability of farms as well as food processing, marketing, and distribution businesses. Sustainable agriculture is an integrated system of plant and animal production practices having site-specific application that will, over the long term satisfy human food and fibre needs, enhance environmental quality and the natural base upon which agricultural economy depends, make the most efficient use of non-renewable resources and on-farm resources and integrate, where appropriate natural biological cycles and controls, sustain the economic viability of farm operation and enhance the quality of life for farmers and society as whole.

The essential steps to sustainable agriculture in Samoa are as follows; conserve and create healthy soil, conserve water and protect its quality, manage organic waste, manage pests with minimal environment impact, select plants and animal adapted to the environment, encourage biodiversity, conserve energy resources and increase profitability and reduce risk. Success in sustainable agriculture depends on a number of standards. These standards incorporate well into the programmes, characteristics of technologies and strategies for change. The existence of appropriate government policy on sustainable development is very important to govern sustainable development. In addition, commitments from Non Government Organizations and other related bodies will also enhance sustainable development. Finally, sustainable

agriculture can be strengthened by establishing markets where economic transactions succeed to take into account social or environment costs and strengthen policy where government encourage and promote environmental issues.

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