Enhanced Climate Change Resilience of Food Production Systems for selected PICTs

Samoa Vulnerability Analysis Report

1. Introduction

This report details the Participatory Rural Appraisal (PRA) that was undertaken by LRD staff in Samoa on behalf of the USAID food security project component. The staff of LRD for this particular country assignment, in similar preparations with other country, prepared an itinerary and programme ahead of departure and were in liaison with counterparts in Samoa from the various ministries of Government that were invited to participate in the PRA. The pre-prepared materials included the PRA tools for use in the identified sites, additional field manuals, several copies of HIES (60+), and materials for the group sessions in the communities. From the plans made over email exchanges with counterparts in-country, there was an expected team of approximately a dozen awaiting the arrival of the 3 LRD officers (who were Mr Emil Adams, Mrs Valerie Tuia, and Mr Dean Solofa).

As a brief background, the 2 sites chosen for Samoa were selected by a group of stakeholders in climate change services and agriculture sector in an initial visit and consultation carried out by LRD officers in March. The sites are (i) Sapapali'i village in eastern coastal Savai'i; (ii) Savaia village in the southwest coast of Upolu island. Both these communities were agreed to have common exposures in extreme rainfall, drought risk, and particularly exposed to strong winds and tropical cyclones by recent experiences, sharing also a few food security risks in high monocropping practices combined with low diversity in root crops.

2. Community Vulnerability Analysis

2.1 Participatory Rural Assessment (PRA Team)

The community vulnerability assessment was conducted by the members of the Samoa project team that consisted of both SPC LRD staff and representatives from a number of government ministries (see annexed Duty Travel Report for list of national counterpart team members). The team make up was based on the needs of the PRA approach to use personnel experienced with the use of PRA tools, and whose respective offices have strong connections to the resulting work from the PRA and for the project in the long term. As such members included representatives from a local Community Service Organisation (Faasao i Savaii, a local NGO whose CEO is of the community of Sapapalii), the Ministry of Agriculture and Fisheries (MAF), the Ministry of Natural Resources and Environment (MNRE), the Ministry of Women and Community and Social Development (MWCSD), and the University of the South Pacific's (USP) Global Climate Change Alliance (GCCA). While the local counterpart team from these ministries were familiar with the concept and approach to be used (the community consultations by group and use of surveys) the specific PRA tools for use for the project needed some familiarisation. As a result, a half day PRA training session was held for the counterpart team and the final logistical plan for the PRA with the community arranged. For note, the PRA approach used in this project garnered positive feedback from the national counterparts (in particular MAF counterparts), including the assessment methods to derive quantified measures of assessing the community vulnerability.

Figure 1. The Samoa PRA team. From left; C. Amosa (Samoa Met Division), E. Ainuu (Crops Division), V. Tuia (SPC LRD), P(Community Division), Savaia community rep and matai, V.M. Jackson (FIS, NGO), T. Tuilemafua (USP GCCA), Savaia community rep and matai, J. Foltz (USAID), J. Sila (MAF), E. Adams (SPC LRD), D. Solofa (SPC LRD)

2.2 Methodology

The methodology used here in the Samoa PRA follows the same one used in the other project countries. From the reference PRA manual of the SPC\USAID developed by Dr. Siosiua Halavatau, the below describes and provides background on the methodology used.

Community-based Climate Change Vulnerability Assessment is based on the following theoretical basis, that *"Vulnerability is a function of character, magnitude and rate of **climate variation** to which a system is **exposed**, its resulting **sensitivity**, and its **adaptive capacity***".

This definition is articulated in the following equation for simplicity

$$V = E \times S/A$$

Where:

V = Vulnerability: The degree to which a system is susceptible to, or unable to cope with adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude and rate of climate variation to which a system is exposed, its sensitivity and its adaptive capacity. (IPCC, 2001)

E = Exposure: The nature and degree to which a system is exposed to significant climatic variations (TAR, IPCC). The climate variation includes average climate change and the extreme climate variabilities. Exposure, in this document, is the character, magnitude and rate of climate variation at local level

The more the local climate has changed or deviated from its historical condition or trend, the more the value of exposure (E) will be; the more the value of E means the more the system is exposed to new climate leading to high vulnerability. "E" is assessed through assessment of change in elements of climate over time – temperature, precipitation, etc and the hazards induced by such changes through community participation.

S = Sensitivity: Degree to which a system is affected, either adversely or beneficially, by climate-related stimuli. The effect may be direct e.g. a change in crop yield in response to a change in the mean, range or variability of temperature or indirect e.g. damages caused by an increase in the frequency of coastal flooding due to sea-level rise (IPCC, TAR) or floods, landslides, etc. Sensitivity in this document is the effect of local climate change and related hazards on local system – biophysical and socioeconomic.

Highly sensitive (S) systems will be more impacted compared to low sensitive systems even with a same level of climate change or hazards. Therefore the more the system is sensitive to climate change and related hazards, the more the system is vulnerable to climate change. Sensitivity of a system is assessed through assessment of effects or impacts or damages of the system from climate change and related hazards.

A = Adaptive Capacity: The ability of a system (in this case the "community") to adjust to climate change (including climate variability and extremes) to moderate potential damages, to take advantage of opportunities, or to cope with the consequences (TAR, IPCC).

Therefore climate change vulnerability assessment assesses E, S and A and their elements through community tools and methodologies.

The vulnerability assessment will follow the framework below showing the steps and tools to use at each step.

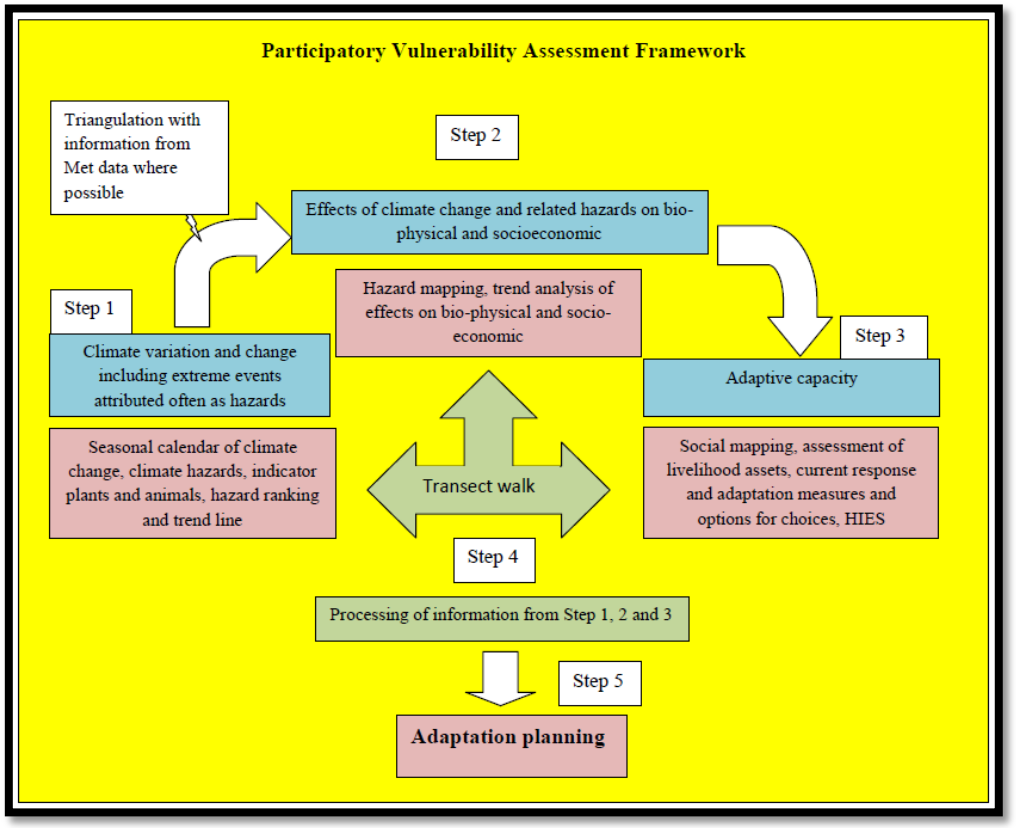

Figure 2. The PRA framework and process

2.3 Sapapalii community description

The Sapapalii community like most villages on Savaii, is a coastal village sharing a larger interior catchment basin with other neighbouring communities. Within its customary boundaries from inland to coast, the land slopes gently towards the coast and covers a secondary forest inland to extensive plantation land areas and finally to the village settlement areas on coast, spread along the main coastal road. Two, mostly seasonal, rivers wind their way through the Sapapalii lands from the interior valley, where at its innermost edges is sourced from a number of tributaries. At its coastal

nexus with the sea, the main road transforms into a slightly elevated ford at one crossing and a well built bridge at the other. The community population statistics from the most recent (2011) census gives Sapapalii's population as 952 people (509 males, 443 females) in approximately 200 households. No further detail on the demographics is given unfortunately.

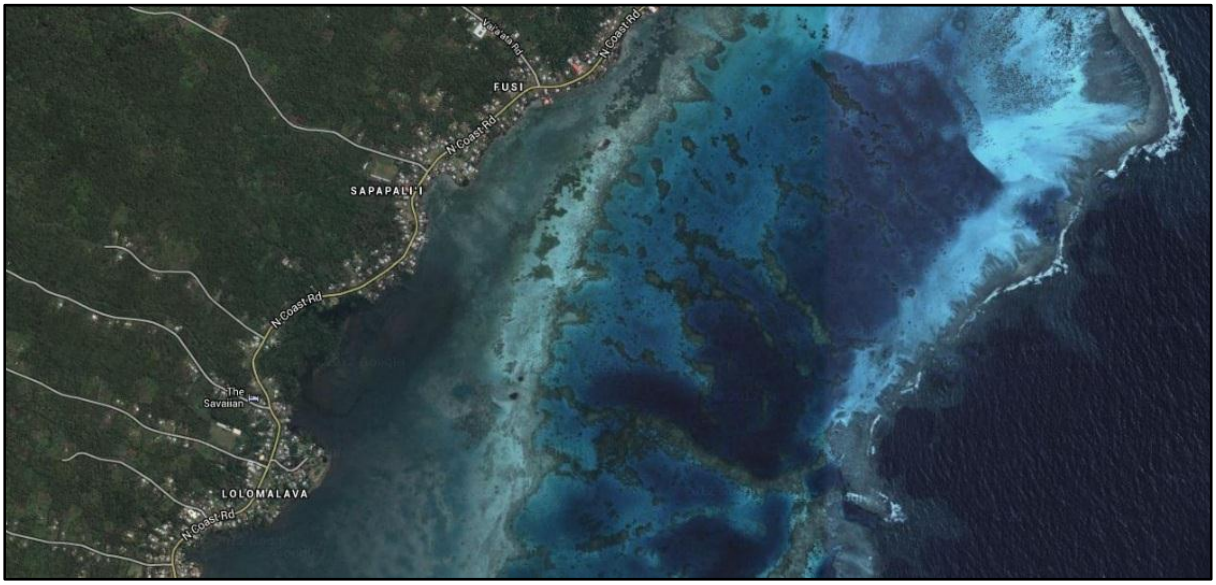

Figure 3. Google map of Sapapalii community and surrounds of inland forests and plantation and coastal inshore and reef

The geographic location of the community gives some automatic assumptions of the exposures faced here (and later verified by the community during the PRA). The area has an exposed northern face and also an exposed eastern coastal front. Damaging northerlies of tropical cyclones passing through the area exposes the community and its surrounding environment to some of the more damaging winds of a tropical cyclone as well as from associated storm surges. During regular seasons, the wet season should provide good rainfall in this area (verified by meteorological data), including good rainfall levels during dry seasons also as south-easterly trade winds dominate in this area during this time. The topography of the island with respect to the dry season trade winds finds for most of the rivers and streams to be concentrated from the southern districts of the island to the easterly coasts where Sapapalii is located. While providing for sources of water in these streams and rivers, these also are indications of possible flash floods in highly variable rainfall seasons.

2.4 Savaia community description

The Savaia community like Sapapalii, is a coastal village sharing a larger interior catchment basin with other neighbouring communities. Within its customary boundaries from inland to coast, the land gradient is sharper towards the coast and covers a secondary forest inland, plantation land areas predominantly of coconut and taro and finally to the village settlement on the coast, spread along the coastal front. Some households have relocated toward the interior closer to and along the main South Coast Upolu Road. A river to the north-west flows persistently and reflects the well watered windward catchment valley. A deep lagoon is protected from the south by a fringing to barrier reef system. The community population statistics from the most recent (2011) census gives Sapapalii's population as 399 people (221 males, 178 females) in approximately 70 households. No further detail on the demographics is given unfortunately.

Figure 4. Google map of the Savaia area from its south western facing coastal shore and inland areas of forests and plantations.

The geographic location of the Savaia community similarly reveals some exposures specific to its geography and topography (and later verified by the community during the PRA). The Savaia area is sheltered to some degree by a low western ridge of hills and to the north by the mid-island spine of volcanic mounts that lie north-west to south-east along the main island. Damaging northerlies of tropical cyclones passing north of the area can have little impact by way of infrastructural damage to the community buildings and housing. Similar to Sapapalii, the wet season provides good rainfall in this area (verified by meteorological data), including good rainfall levels during dry seasons also as south-easterly trade winds dominate in this area during this time (orographic rainfall here particularly due to the neighbouring high relief of the hills).

2.5 Descriptions of Soils at the Sites

The soils of the two sites (Sapapalii in Savaii, Savaia in Upolu) are referenced from the Soil Maps of Western Samoa by A.C.S. Wright of the Soils Bureau of DSIR, NZ, and Survey Department of Western Samoa, published 1962. The Savaia site soils are described as *Latosolic soils from Basalt*, and local specific as Lefaga clays, and stony and bouldery. It is bounded at the coast by more recent soils of calcareous sand, and locally described as Fusi sands. The Sapapalii site soils are described similarly as *Latosolic soils from Basalt*, and locally specific as a combination of A'ana clay loams and clays, stony and bouldery, and Tafatafa loams and clay loams, stony and bouldery. A river/stream to the south boundary of the community produces more recent basic alluvium of type Sauniatu sandy clay, and with the rivermouth containing typical marine marsh of type Loga sand clay and peaty sand.

A detailed soill analysis was ordered from and undertaken by the University of the South Pacific at both sites, with laboratory analysis results to be sent in due course to LRD.

3.0 PRA Results

3.1 Sapapalii Exposure results

Parameters	Indicators	Perceived changes/remarks	Score index/remarks
Temperature	• Numbers of hot days increased • Number of cold days decreased	High to Very High	**3.5**
Precipitation	• Rainfall has become increasingly unpredictable	High to Very High	**3.5**
Plant and animal indicators	• Breadfruit, mango, citrus, eggplant are similar in either being available all year round, produce being bigger in size, while some are reduced in season and smaller fruit • Some observed diseases increasing in chicken during dry season, more stillborn animals/reduced litter sizes	Medium	**1.8**
Climate induced disasters	• Landslides do not affect community • Drought often occurs and has many impacts • Fire is a lesser risk • Tropical cyclones are the main concern • Concern for human health is also very high	High to Very High	**3.5**
	Average Exposure index (1 Low – 4 Very High)		**3.085**

Table 1. The Sapapalii community Exposure summary

3.2 Savaia Exposure results

Parameters	Indicators	Perceived changes/remarks	Score index/remarks
Temperature	• Numbers of hot days increased • Number of cold days decreased	High to Very High	**3.6**
Precipitation	• Rainfall has become increasingly unpredictable	High to Very High	**3.0**
Plant and animal indicators	• Common fruits and root crops share some similarities in either being available all year round, produce being bigger in size, while some are reduced in season and smaller fruit • There is definite observation of more pests and diseases increasing in some vegetable and some root crops, however still edible	Medium	**3.7**
Climate induced disasters	• Landslides do not affect community directly though road access sometimes hampered by landslides • Drought seems to be more frequent • Fire risk is low • Tropical cyclones and human health risks are the main concern	High to Very High	**3.5**
	Average Exposure index (1 Low – 4 Very High)		**3.45**

Table 2. The Savaia community Exposure summary

3.3 Summary Exposure Discussion

Sapapalii: This community scores a 3.09 score for exposure. In light of this score and the additional details collected from the individual sheets of the PRA, the observations of the community of

weather and climate extremes seem to indicate an agreed pattern of variability and change that the accompanying climatologist in the team seemed to agree with based on expert knowledge of the local climate from historical and recent meteorological records. Climate and weather extremes are consistently ranked high across all groups and leads in the raising the exposure value. Proxy indicators in crops and livestock record close to medium values, indicating that crops are showing some resilience still, but with notes from all groups that incidence of pests and diseases are notable now. Climate induced disasters are ranked high to very high, with some of the weather and climate extremes showing resulting high impacts through tropical cyclones and drought, these in turn impacting on infrastructure and water resources. Animal health and reproduction proxies were variable.

Savaia: Savaia community records a 3.45 score for exposure. This community similarly records high values for observed weather and climate extremes, noting increasing variability in rainfall and temperatures. Proxy indicators are much higher in value by contrast, with detailed notes in changes in seasonality, availability, taste, sizes of fruits and crops. Pests and diseases in fruit trees and crops are also featured strongly as well. The community similarly rank recent weather and climate induced disasters as high, and raise connecting concerns to human health as previous results have raised this concern (the remoteness of the community to a health centre has some influence in this). Animal health and reproduction proxies were variable, with some expressing higher incidences of mortality from diseases and lower reproduction rates and numbers.

3.4 Sapapalii Sensitivity Results

Parameters	Hazards	Indicators	Perceived changes/ Remarks	Score index/ remarks
Agriculture and food security	Flash floods	Loss of productive lands due to soil erosion, destroyed crops, pests and disease outbreaks	High	3.5
	Drought	Loss of crop production	Very High	
	Outbreak of diseases	Crops particularly are suffering from increased pests and diseases despite now being available year round	Very High	
Forest and biodiversity	Floods	Loss of soils and trees near river during heavy rains	Very High	3.5
	Tropical cyclones	Loss of forest cover	High	
Infrastructure	Tropical cyclones	Housing damaged from winds, and road and bridges from flooding	High	3
Water resources and energy	Water supply	Cut off from water supply during flooding events, and unknown if water quality is met for safety	Medium	2.5
	Floods	Erosion of soil for farming, also polluting and blocking up springs	High	
Human health	Prevalence of diseases	Average of respondents say about 20% of population ill at any one time	High	3
Average Sensitivity Score (1 Low – 4 Very High)				3.1

Table 3. The Sapapalii community Sensitivity summary

3.5 Savaia Sensitivity Results

Parameters	Hazards	Indicators	Perceived changes/ Remarks	Score index/ remarks
Agriculture and food security	Flash floods	Loss of productive lands due to soil erosion, destroyed crops, pests and disease outbreaks	High	3.5
	Drought	Loss of crop production	Very High	
	Tropical cyclone	Extensive crop damages and long recovery times	Very High	
	Outbreak of diseases	A lot of significant crops are suffering from increased pests and diseases	Very High	
Forest and biodiversity	Floods	Loss of soils and trees during heavy rains	Very High	3.5
	Tropical cyclones	Loss of upland forest cover	High	
Infrastructure	Tropical cyclones	Housing damaged from winds, and road from flooding	High	3
Water resources and energy	Water supply	Cut off from water supply during flooding events, water quality safety is unknown	High	3
	Floods	Erosion of soil for farming, significant amount of freshwater from rain impacting inshore fishery	High	
Human health	Prevalence of diseases	High incidence of population ill at any one time recorded	High	3
Average Sensitivity Score (1 Low – 4 Very High)				**3.2**

Table 4. The Savaia community Sensitivity summary

3.6 Summary Sensitivity Discussion

The Sensitivity summaries for the two communities and their resulting scores indicate the degree of sensitivity of each community to climate change, ranked out of a score of 4.

Sapapalii Sensitivity: This community scores a Sensitivity value of 3.1 out of 4 (high). Extreme weather and climate events show a high impact with sensitivity values recorded as high across all groups. Disease outbreaks are noted here also as recording a very high value. The extent that natural resources of the community are also impacted is being witnessed as high also (comments about the linkage between water resources, river and inshore siltation, and reduced/damaged forest cover from extreme and other events are recorded from some groups). Recent tropical cyclone events are fresh in the minds of the community and infrastructure damage (road, bridge, water and electricity supply) directly from these are recorded also. Human health has strong focus also in this group, notably from the Women's Group, who say there is low support for community health programmes from the local Ministry, but note that the hospital fortunately is close by.

Savaia Sensitivity: This community scores a Sensitivity value of 3.2 out of 4 (high). Extreme weather and climate events similarly show a high impact with sensitivity values recorded as high across all groups. Disease outbreaks are noted here also as recording a very high value. The recent tropical cyclone Evan event recorded quite significant infrastructural damage (road, bridge, water and electricity supply) and while visually the recovery seemed quick, the community reports that a significant community effort was required to return the community to a near pre-Evan state. Human health has a similarly strong focus in this community as they are much more distant to the national hospital though a health centre is nearby in a neighbouring community.

3.7 Sapapalii Adaptive Capacity Results

Parameters	Indicators	Criteria	Perceived changes/ remarks	Score index/ remarks
Human assets	Demography	Old age and children	High	2
	Education	Secondary education and awareness of climate change	Very High	
	Skill labour	Trained workers	Medium	
Natural assets	Land	Land ownership and productivity	Very High	2.5
	Forest	Availability of product and services	Low	
	Water	Availability of drinking water	High	
Financial assets	Financial institutions	Banks, cooperatives,	Medium	2
	Household incomes	Sufficiency for household needs	Low	
Social assets	Social institutions	Community affiliations to formal and non-formal institutions	High	2.5
	Service providers	Engagements of NGOs and GOs with community	Medium	
Physical assets	Infrastructure for services	Access to school, house, bridge, road, electricity, health posts, vehicle availability	High	2
	Information and communication sources	Access to mobile phones, radio, TVs, papers, and internet	High	
Average Adaptive Capacity Score (1 Low – 4 Very High)				2.2

Table 5. Sapapalii Adaptive Capacity summary

Parameters	Indicators	Observations	Perceived changes/ remarks	Score index/ remarks
Human assets	Demography	Youth and children populations are high and outward migration is high also	High	2.0
	Education	Education is valued highly but older groups feel education standards are not good enough today	High	
	Skill labour	Trained workers, formal employment, knowledge workers, RSE opportunities	Medium	
Natural assets	Land	Land ownership and productivity	Very High	2.0
	Forest	Availability of product and services	Medium	
	Water	Availability of drinking water	High	
Financial assets	Financial institutions	Banks, cooperatives,	Low	1.5
	Household incomes	Sufficiency for household needs	Medium	
Social assets	Social institutions	Community affiliations to formal and non-formal institutions	High	2.7
	Service providers	Engagements of NGOs and GOs with community	Medium	
Physical assets	Infrastructure for services	Access to school, house, bridge, road, electricity, health posts, vehicle availability	Very High	2.0
	Information and communication sources	Access to mobile phones, radio, TVs, papers, and internet	Very High	
Average Adaptive Capacity Score (1 Low – 4 Very High)				**2.04**

Table 6. Savaia Adaptive Capacity summary

3.9 Summary Adaptive Capacity discussions

Sapapalii and Savaia Adaptive Capacity: The Sapapalii community scored a 2.2 out of 4 adaptive capacity while Savaia community scored 2.04. While many of the listed assets are present in the two communities have medium scores, in common with these parameters are the obvious state of these assets in current value and worth to the community perception. Infrastructure for example (access

to schools, roads, the local bridge) were considered to be of medium value due to problems faced by the community during weather and climate related extremes (the bridge in Sapapalii for example apparently did not hold up well during a recent flooding event, road was damaged from storm surges and floods, and the school damage took some time before repairs were made after a recent tropical cyclone). Likewise access to information on weather and climate was said to be poor (advisory services such as drought monitoring or rainfall forecasts). At the household level, household incomes were considered fairly low (from HIES data also) lending lower adaptive capacity to the household level within the Sapapalii community. This score is a medium however with the Savaia community (reflecting a smaller though more "well off" community whose farmers have a longer tradition with market access and supply of their crops). For both communities however, the adaptive capacity scores are medium reflecting the higher scores of Exposure and Sensitivity to make these scores of logical sense.

4.0 Transect walk

The transect walks of both communities were conducted and assisted by the community representatives. The transects revealed very close similarities in both communities in that there is extensive focus on root crops in plantations (taro is the main crop), few plots of vegetables, and few fruit trees. Forest areas form the traditional limits and boundaries of the village farmlands and the inner forests and catchment of the respective districts to which the communities belong.

Of most concern from the transects is the observation that the level of mono-cropping in both communities is very high i.e. taro of only 2 or 3 varieties are being grown extensively in most plantation lands. Added to the minimal effort to diversify the root crops (e.g. growing of cassava or sweet potatoes), the focus is also minimal on vegetables and other nutritional value crops. Fruit trees are older trees planted from long before, very few new fruit trees (aside from banana and papaya are being grown) are being consciously planted. Citrus are fairly common and seem to be doing well (observations from locals are that they are fruiting year-round), though there is a citrus disease affecting the plant said to be a risk. Other observers mentioned that the level of mono-cropping of taro is close to the levels of pre-taro leaf blight, and that the risks levels thus to a new disease would be considered high.

5.0 Final Vulnerability Indices for Sapapalii and Savaia Communities

Sapapalii	Savaia
Vulnerability (V) = EXS/A = (3.09 x 3.1) / 2.2 = 4.35	Vulnerability (V) = EXS/A = (3.45 x 3.2) / 2.04 = 5.4

5.0 HIES sample results

5.1 Households Income

The table below shows average income for households surveyed (in SAT currency). 80% of households surveyed indicated insufficient income for their household needs. Church obligations are the most frequent cause for financial impacts on families followed closely by food security. Both communities indicated very strong interest for the project to assist them from a livelihood perspective. The team leads made clear that the intervention purpose of the project is on food security and not livelihoods, but that this perspective provides thought about the future of the project in terms of the economic assessment of the crops brought in for the purposes of increasing the diversity of the crops and other food sources for the communities.

Village	Average Income Sources (Week) in SAT							Income Insufficiency		Expenses Impacting financial situation most
	Farming	Marine produce	Salary	Remittances	Other	Total	Income/ households	%	Methods for moderating expenses	
Sapapalii	80	30	550	100	50	810	200 – 1500	80	Extended Families overseas, neighbours	Church
Savaia	100	30	650	100	50	930	200 – 1500	80		Church

Table 7 Average Income sources sample

5.2 Housing

The table below shows a sampling of Sapapalii and Savaia household constructs and situation with regards to use of facilities.

Village	Living Quarters	Water sources		Toilet Facilities	Power & Light	Cooking
		Drinking	Washing			
Sapapalii	• Independent (100%) • Concrete (90%) • Timber(10%)	• Government water supply (100%)	• Government supply (80%) • Unprotected well, Spring, river lake (20%)	• Waterseal & Flush (90%) • Outdoor (10%)	• Govt Electricity (100%)	• Gas(60%) • Open Fire (100%) • Kerosene (50%)
Savaia	• Independent (100%) • Concrete (90%) • Timber(10%)	• Government water supply (100%)	• Government supply (70%) • Unprotected well, Spring, river lake (30%)	• Waterseal & Flush (90%) • Outdoor (10%)	• Govt Electricity (100%)	• Gas(90%) • Open Fire (100%) • Kerosene (30%)

Table 8 Housing details statistics

6.0 Nutrition and food balance

The table below shows a sampling of Sapapalii and Savaia household nutrition averages and estimates of the food balance in both communities.

Atoll	Quantity / person/ day	Taro	Sweet potato	Cassava	Banana	Total Local	Rice	Flour	Ramen Noodle	Total Import	Tot./ person /day	% Import
Sapapalii	g	500	100	neg	100	Apr 700	250	150	150	Apr 550	1250	44%
	kcal	708	91	neg	59	Apr 850	900	550	551	Apr 2000	2850	

Table 9 Carbohydrates availability

Atoll	Quantity / Person /day	Pig	Chicken	Tuna and deep sea	Reef fish	Total Local	Can fish	Can meat	Chicken	Tot import	Tot./ person/ day	% Import
Sapapalii	g	350	100	350	100.0	900	50	50	650	750	1650	
	kcal	1133	121	302	64	1620	92	117	792	1001	3621	30%
Savaia	g	200	100	150	100.0	550	150	50	450	750	1400	
	kcal	648	121	129	64	962	270	117	548	935	1897	49%

Table 10 Protein availability

The results indicated that on average, the energy intake per capita per day is doing better than the FAO/WHO minimum daily requirement for a person to be food secure. There is also an established tendency for reliance on imported food (rice, flour and noodles) for the community, similar to other PICs.

7. Final Discussions

7.1 Climate Change Vulnerability of Sapapalii and Savaia

The PRA exercise found for the high vulnerability of the Sapapalii and Savaia communities, based on their similar tendencies to have high exposure to weather and climate extremes, high sensitivities of the communities to these events when they occur, and finally a low adaptive capacity with current elements of collective assets of the community. The household surveys indicate from results that at the household level, the community vulnerability is sustained down to the individual household level.

From the exposure perspective, the climatology and surrounding geography of the two communities dictate the specific vulnerabilities (they both share high flood and drought exposures), while from the projections perspective, these elements may likely further exacerbate current sensitivities with projections indicating increased variability in rainfall and potential for more frequent drought.

The study also recorded that landslide is frequently occurring during high rainfall causing agricultural lands and communities to be impacted. Pest and disease incidences are increasing and also coincide with high rainfall. All the five sectors assessed on the impacts of climate change showed that the sectors are highly impacted by climate change and natural disasters.

The study also found that the adaptive capacity of the community to impacts of climate change is low. All sectors assessed were ranked medium to low. While housing in the main part of the village is modern (brick and concrete), an economic demographic separation is visible in those families in the outskirts of the village towards plantation lands inland. It is obvious that these houses are well maintained but that significant damage could be easily caused by a Category 3 tropical cyclone. The low adaptive capacity related to incomes of these families mean that significant damages will take some rebounding from.

For both communities, public transportation is available and the road infrastructure provided by government has been developed in recent years (the roads were observed to be very good, including plantation access roads which have most parts now sealed properly). However, other elements of public access resources such as medical centres and visitations, advisory services of agriculture and fisheries are commented as wanting by most groups.

There is an observed and noted difference in the two communities at the leadership level. Being a smaller community, the traditional and cultural extension of *matai* council rule seems to have a higher presence and reach throughout the Savaia community. It is also noted that many of this particular council are recognized leading businessmen and academics in Samoa, and that perhaps their combined service to their community through their considered deliberation provides for a stronger community as a result in the decisions the council makes for the community's benefit. Contrast this to the larger and more dispersed Sapapalii community with whom the PRA team had some initial difficulty in arranging for the PRA and other community based interactions.

7.2 Food Security situations for Sapapalii and Savaia communities

The four determinants of food security (food availability, food access, food utilization and food stability) were assessed to determine the communities' food security situation.

7.2.1 Food Availability

The food consumption analysis indicated that the energy supply per person per day is meeting the FAO/WHO minimum daily requirement for an individual to be food secure. Also, protein availability for the village population is sufficient but is sourced largely from store bought sources (30 – 45%). The main protein source for both communities is spread around enough between local bread sources of poultry, however there is a noted large source from imported chicken, which in Samoa is the cheaply imported American chicken which are high in fat and treated with many chemicals. Transportation wise, food availability is not hindered by transportation as most families have cars, and public transportation by bus is also available as well.

Food sources relied on from household gardens and plantations are generally the root crops and other carbohydrate crops such as breadfruit and bananas. In both communities, households still hold very strong agricultural traditions and all families surveyed by HIES have a garden or plantation of some sort of which crops are both consumed or sold. Subsistence agriculture in this case is still strong in these communities, and remains vital for supporting food security and supplementing livelihoods. The transects taken in both community have remarked on the similarities in these types of communities to tend towards mono-cropping successful market favoured varieties. The low diversity of the crops in plantations and gardens thus is the strongest risk here observed for food security. Livestock interventions would find stronger roles here in improving the production and availability of local protein sources.

7.2.2 Food Access

Food access is determined by the household's/individual's access to resources to either produces the food or enough income to purchase a sufficient and safe food. As mentioned above, most households in both communities have access to land to grow their own food. However, the quality and topography of the land directly related to the slope of the area, in particular when heavy rains occur. A soil test result is pending from the Alaufa campus of USP. Transportation and the means for transportation are relatively accessible by both communities so access to store bought foods is relatively easy. For plantations, access roads are available and regularly maintained by the community providing easy transport to and from farms. Sharing of food is as common here as part of traditional and cultural obligations and common remarks from groups are that those in need of food can easily be supported by others in the community.

7.2.3 Food Utilization

Food utilisation is still very much reliance on local food production. However, there is a need to strengthen food production for the village population to reverse the tendency for reliance on imported foods. Diversification of food production systems will ultimately help diversify the low diversity of diets observed in the village.

7.2.4 Food Stability

In terms of stability of food supply, it is clear from the exercise that food production is already impacted by climate change and non-climatic factors such as taste preferences and relative easier access to store bought foods. Behaviour of plants and animals are changing and this may be cause for influence in the uptake of some non-traditional food sources.

8.0 Income Generation

Income generating opportunities for the community is not by any means clear when looking at the support mechanisms that often drive some of the planting effort of certain crops, in particular *taro*. The current flooding of the markets with taro is said to have been partially spurred on by the success of the taro leaf blight resistant variants that have improved on size and taste, but also because of supply opportunities to overseas markets.

MAF officials described some organization and testing of potential markets in US, NZ, and Australia and that containers of taro are now being shipped off. While the market supply is good however, there is some work to be done to improve on the quality of the product, plus the preferences of the market overseas for a certain size to weight ratio. Overall, it seems that potential markets overseas can have some good direct connection to livelihoods of largely subsistence based farmers in communities such as Sapapalii and Savaia, however it would seem that there is still a cautionary approach to this on both the farmer side and the government. The potential however remains that livelihoods of these rural communities could be improved upon by having community farmers have a role in market supply of their crops if such opportunities could be consolidated. While this is not the focus of the project to enhance livelihoods, it pays to have some idea of the economic impact of the work of the project in the agricultural interventions it may seek to implement (e.g. introduction of varieties of other types of root crops such as sweet potatoes, yams and cassava).

9.0 Recommendations and adaptation strategies

Unsurprisingly, the PRA work (including the HIES surveys) show that food security in these two communities is at risk to climate change. Observations of past extreme weather and climate events show potential for future climate change related extremes to place stress on agricultural systems (in the face also of non-climatic pressures on land and population). The resilience of both communities is considered to be medium while the sensitivities it has to the climate related exposures remain high. As such interventions from the agricultural perspective are needed in order to shore up food security of these communities, and as such the potential interventions of this project would have merit via climate change adaptation framed activities.

As found in the Sabeto (Fiji) trial, the same overall headers of interventions would apply also to these two communities in Samoa, namely;

- Institutional and social strengthening
- Diversification of food production systems in order to ultimately diversify diet
- Introduction of hardy crop varieties
- Introduction of hardy livestock breeds
- Development of demonstration farms (both crop and livestock)
- Capacity Building in all areas of intervention including climate change and disaster risk reduction programs

10.0 Log frame

The log frame developed between the counterparts at the national level and LRD experts is attached.

Table 11. Workplan for the USAID CC Project at Sapapalii and Savaia for 2013

		Quarter			
Code	**Outputs and activities**	**1**	**2**	**3**	**4**
note these activities begin Q3 2013 and resume throughout 2014					
Component 1	**Increase adaptive capacity and reduce recurrent risks of climate variability at the community level**				
Result 1	**Improved productivity of food production systems**				
1.1	*Establish integrated cropping system*				
1.1.1	Establish community nurseries and project launch				
1.1.2	Identify appropriate cropping system and sourcing of planting material (fruit trees, root crops, vegetables, forestry trees)				
1.1.3	Nursery management training and potting of seedlings				
1.1.4	Field planting demonstration				
1.1.5	Field planting and crop management				
1.1.6	Crop management practices				
1.1.7	Pest management training				
1.2	*Establish mucuna plots*				
1.2.1	Obtain mucuna seeds				
1.2.2	Allocate piece of land and establish mucuna trials				
1.2.3	Harvest mucuna and measure soil nitrogen				
1.2.4	Extension field day on mucuna				
1.3	*Comparative research of drought tolerant sweet potato*				
1.3.1	Multiply planting materials in the nursery				
1.3.2	Set up trials as experiments at two sites				
1.3.3	Plant sweet potato at demo sites and involve farmer in data collection				
1.3.4	Harvest sweet potato and analyse data				
1.4	*Promote planting vegetables*				

1.4.1	Obtain seeds, seed trays, poly bags				
1.4.2	Plant vegetable seeds				
1.4.3	Distribute seedlings at nominal cost				
	Varietal screening for yield, pest and diseases				
	Bele varietal screening				
1.5	*Develop local chicken for supplementary protein*				
1.5.1	Decide with community on the model to take – community or household based				
1.6	*Develop pig production in the villages*				
1.6.1	Decide with community on the model to take – community or household based				
1.7	*Develop post-harvest technologies*				
1.7.1	Identify technologies such as chipping				
1.10	*Develop appropriate technologies to support adaptation strategies*				
1.10.1	Identify the problem and the potential solutions				
1.10.2	Establish on-farm and on-station experiment				
1.11	*Identify and record incremental benefits arising from the new technologies (CBA)*				
Result 2	**Improved food security**				
2.1	*Promote utilization of locally produced foods*				
2.1.1	Demonstrate via community workshop cooking methods of local produce				
2.2	*Conduct training on preparation of locally produced foods*				
	Organize and hold a community workshop				
Result 3	**Improved adaptive capacity of communities**				
3.1	*Support development of household incomes for communities*				
3.1.1	Identify farm and non-farm income generating opportunities				
3.2	*Conduct agribusiness skills training*				
3.2.1	Work with MAF and WIBD to plan and execute training workshop on agribusiness				
3.3	*Make available information on appropriate technologies in a form suitable for the community.*				
3.3.1	Review existing information products from MAF, LRD and other sources (WIBD, Red Cross) to identify appropriate information sources, and identify most suitable and appropriate forms of communicating and providing access for use of these at local communities				
Workplan for the USAID CC Project at Sapapalii and Savaia for 2014		Q1	Q2	Q3	Q4
Component 2	**Capacity building and knowledge management on managing climate change risks affecting food security**				
Result 1	**Increased awareness of communities on climate risks**				
1.1	*Establish and implement a training program on CC threats and adaptation measures related to food insecurity at community level (ensure gender focus in all trainings).*				
1.1.1	Develop the training materials on CC and DRM				
1.1.2	Conduct training in the communities and for other stakeholder staff				
1.2	*Identify sources of climate risk information at local; disseminate information and ensure that vulnerable households and schools have access to relevant information*				
Result 2	**Secured ownership of adaptation plans in targeted communities**				
2.1	*Design participatory methods for developing community adaptation plans*				
2.1.1	Develop training toolkit for the community				
2.1.2	Conduct training in the communities and for other stakeholder staff for developing adaptation and disaster management plans				

2.2	*Participatory development of adaptation plans*				
2.2.1	Village stakeholders develop their village adaptation plan				
Result 3	**Increased knowledge to manage climate change risk, including climate variability affecting food security**				
3.1	*Design and implement early warning systems to enable the dissemination of the main threats for the communities*				
3.2	*Training for all the necessary personnel to operate and maintain the EWS*				
3.3	Engage primary and secondary school authority in Sapapalii and Savaia districts to agree on climate change input into appropriate curriculum				
3.4	Develop and distribute awareness and education materials to Sapapalii and Savaia districts schools and communities				

END OF REPORT

11. ATTACHMENTS:

1. HIES AND PRA RESULTS DOCUMENTS
2. SUMMARY PRESENTATION OF RESULTS