



**Generation of Agricultural technologies to mitigate climate change imposed risks to food security
in smallholder farming communities in Western Pacific Countries**

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Ministry of Agriculture, Quarantine, Forestry and Fisheries of Vanuatu, and The University
of Natural Resources and Applied Life Sciences, Vienna, Austria*



WESTERN PACIFIC NARI EU – ARD CLIMATE CHANGE PROJECT

VANUATU SITE REPORT

Siviri, Malafau & Middle Bush



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1. BACKGROUND

In the course of the EU - ARD funded project “Generation and adaptation of improved agricultural technologies to mitigate climate change-imposed risks to food production within vulnerable smallholder farming communities in Western Pacific countries”. The project focuses on three components that includes, 1) Crop Improvement and Diversification; 2) Livestock Improvement and Management Practices; and 3) Soil and Water Management.

The overall objective of this project is to mitigate climate change associated risks to food security and livelihoods for vulnerable smallholder farming communities, with special focus on improving the food production capacity of smallholder farming areas vulnerable to suffer from climate change induced phenomena.

In Vanuatu, three sites were chosen earlier in this project to implement each component activities, the respective communities are Malafau and Siviri on Efate Island, and Middle Bush on Tanna Island. According to rapid assessments and focus group discussions that had been carried out, involving stakeholders from these communities, farmers experience the following problems there:

- Malafau: excess soil moisture (stress) and water logging on cropping plots
- Siviri: soil moisture deficit (stress), and other soil water constraints
- Middle Bush: seasonal excessive soil moisture and water logging (stress) as well as soil moisture deficit during the peak dry season.

2. PROJECT SITE DESCRIPTION

2.1. Geographical Location of Vanuatu

Vanuatu is a small island country located in the South West of the Pacific Ocean; it is composed of 83 small islands that stretch out over 1200 km primarily from north to south in an approximate Y- shape and covers a total land area of 12,190 km² of which 15.3% share is agricultural land with a humid tropical climate¹. The country has a population of 234,023 people (2009 census), mainly distributed in the rural areas where 75% depend entirely on Agriculture and rural development.

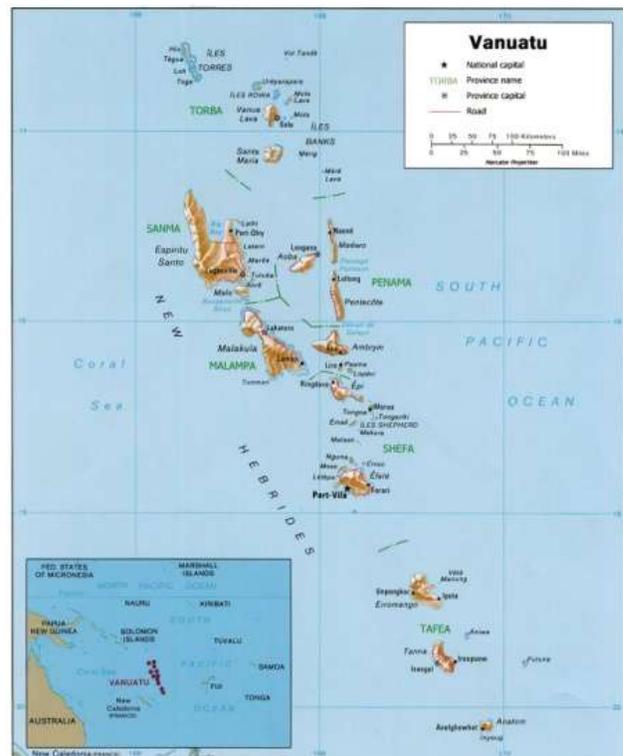


Figure 1: Bathymetric and topographic map of Vanuatu, Oceania (Gaba, 2009)

¹ <http://www.tradingeconomics.com/vanuatu/agricultural-land-sq-km-wb-data.html>

2.2. Sites Location

Of the three project sites two (Siviri and Malafau) are located on Efate island, which is a central island on which also the capital Port Vila is situated. The third site is located on central Tanna, an island about 200 km south of Efate (Schabschneider, 2014).

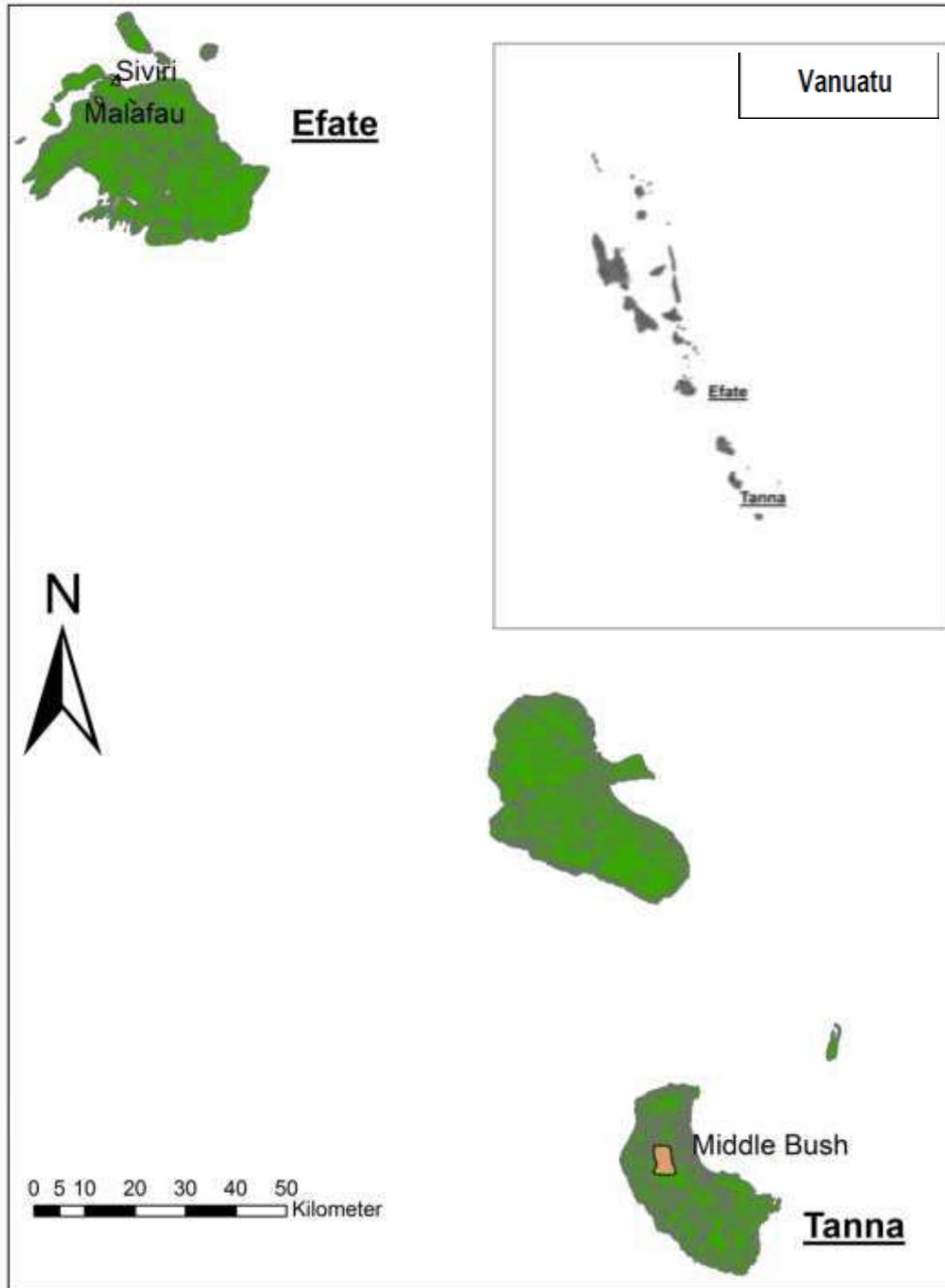


Figure 2: Location of the project sites within Vanuatu

2.2.1. Siviri

Siviri is a small village in the north of Efate, at Undine Bay (Picture 2). This site as it is defined in the project consists of four villages: Siviri, Paunagisu, Emau and Sama with a total of 193 households. The village Siviri itself is situated on the first limestone terrace of the island (around 5 m above sea level, at 17°31'S/168°19'E). This side of the island is always vulnerable to dry condition and gardening is done on mostly rocky (lime stone) areas with predominant vegetation of *Leucaena* and *Acacia*. The most important food sources are local root crops (i.e. cassava and yam), coconut milk, fresh fish, fruit trees, and imported food stuff like rice and corned beef.

Charcoal making from *Leucaena* and *Acacia* is the main income for households. The community also involves in tourism as it is home to the unique underwater cave. Kayaking is also a tourist activity in the community. The main denomination is the Presbyterian Church.

This Community like other communities outside Port Vila has access to tar- sealed road and telecommunications. The main land transport is trucks and buses. Essential services such as School and aid- posts are located within the community. The community has access to Agriculture extension services. There is good community cohesion (weekly work etc...) and Strong community social structure headed by the chiefs.

2.2.2. Malafau

Malafau is a small and new village in northern Efate (Picture 2); the area became populated around 2005 after an exodus of a part of the villagers of Siviri due to a church conflict. The project site itself comprises of four villages: Moso (on Moso Island), Malafau, Tanoliu and Meten that make up a total of 214 households. These communities are connected by quality tar sealed road about 35 minutes' drive from Port Vila.

The village Malafau itself is situated on the windward side of the island about 2 km below mountains therefore vulnerable to spillover effects. It can experience very wet conditions during the wet season from December to July. According to the project initial household assessments, 97% of farmers ranked flooding to be a common hazard in the community with high devastating levels whereby 5 % planted crops that are resilient to wet conditions. The main food sources are local root crops (i.e. yam and sweet potato), banana, fresh fish, coconut milk, fruit trees, vegetables and imported food stuff like rice and corned beef.

The main income is through selling of garden crops (mainly vegetables), fish and charcoal at the Port-Vila main market. The community has access to efficient land transport and Agriculture extension services. Essential services such as schools and aid post are located in the neighboring village of Tanoliu. The community has access to good portable water. The Main denomination is Assemblies of God (AOG). There is good community cohesion (community work is every Monday) and strong community social structure headed by the chiefs.

2.2.3. Middle Bush

Middle Bush is a rather densely populated region in the centre of the island of Tanna (Picture 2). Located more than 210 km south of the other two project sites, it is situated on a high plane at more than 300 m above sea level and comprises the following villages, located around 19°27'S/169°18'E: Lamak, Launapheuw, Loulipang, Launamilo, Loupikas, Lauaru, Lenemita, Lowehau,

Louwaula, Loujiaru, Euel, Lenaken, Lamak, Jupik (EpuK), Lounaukiam Apen, Loumiai, Laul, Lounauru, Launalou, Lounauru, Latuan, Lowiaru, Ilimanga, Lamnatu, Lamneau, Lounuwao Tuan, Kaunamelkin and Lanupu Pin Nipin with an estimate of 371 households (Schabschneider, 2014).

The area has its history of water logged conditions due to high rainfall coupled with high water table. These communities always experience prevailing overcast conditions. The maximum amount of rainfall recorded on a rain event is 150mm. It receives 3500mm rainfall annually. It has volcanic soil that is favorable of growing vegetables, root crops (i.e. sweet potato, cassava and taro), kava and coffee.

Sweet potato is the staple food sources and about 70 % of the vegetable production on Tanna is produced in these communities. The main commodity is coffee and a substantial number of farmers owned cattle farms. The main cash income for farmers is through selling of vegetables, dry coffee beans, taro and sweet potato.

Very good access to government services and public transport, located in the vicinity of the white grass airport and drive is about 20 minutes. There is good reception of both the Telecom Vanuatu Limited (TVL) and Digicel. The Agriculture field officer is stationed in this community and due to the agricultural activities carried out in this community extensions services has been regular and robust. Farmers still use horse as a main transport. There is good community cohesion.

3. SITES SELECTION & PRIORITIZATION

Approximately over 294 farmers were interviewed through a semi-structured questionnaire on the three vulnerable selected sites (Siviri, Malafau and Middle Bush) affected with drought (excessive soil moisture) and flooding (excess soil moisture), which was followed by a farmer's group discussion workshop in 2012 to capture the interested feedback of the sample population and appraisals were made respectively.

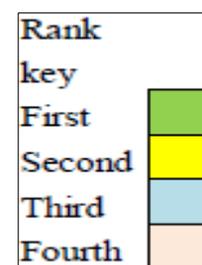
The top ranking for both the male and female members of the community were:

- Improving management and feeding of chickens and pigs to increase food (meat & egg) production and higher cash income.
- Introduction of other / new crops varieties (cassava, yam, sweet potato & rice) into the communities farming system.
- Protecting and managing water resources to have safe and secure access for household use.

Table 1 below summaries community feedback during the ranking / voting on the key findings and based on these to the assessment of potential remedial actions to address the prioritized list of key constraints.

Table 1: Priority Ranking of Identified Issues

Siviri				
Scores of the prioritization exercise by the community				
No.	Issues	Women	Men	Both
1	Improving management of soil water to reduce effect of drought	3	13	16
2	Improving production of meat and eggs for, chicken and ducks using garden crops for home consumption	1	3	4
3	Improving production of staples (banana, cassava Fiji taro)	3	13	16
4	Integrating livestock and crop production to improve yield from livestock and crop	2	8	10
5	Adding value to my staple crops through processing into food and feed	2	2	4
6	Keeping chicken, ducks and pig for higher cash income	4	22	26
7	Draining excess soil moisture from water logged plots for good crop production	1	0	1
8	Introduction of other / new crops or crop varieties into my farming system	2	13	15
	Total Votes	18	74	92
	No. of farmers	7	26	33
Malafau				
Scores of the prioritization exercise by the community				
No.	Issues	Women	Men	Both
1	Draining excess soil moisture from water logged plots for good crops production	5	1	6
2	Improving production of meat and eggs from chicken and ducks using garden crops for home consumption	2	3	5
3	Improving production of staples (banana, yam, cassava)	3	5	8
4	Integrating livestock and crop production to improve yield from livestock and crops	0	2	2
5	Improving soil fertility of my plots for sustainable and improved crop production	1	4	5
6	Adding value to my staple crops	1	2	3



	through processing into food and feed			
7	Keeping chicken, ducks and pigs for higher cash income	8	7	15
8	Improving management of soil water to reduce effects of drought	1	2	3
9	Introduction of other / new crops or crop varieties into my farming system	6	4	10
	Total Votes	27	30	57
	No. of farmer	9	10	19
Middle Bush				
Scores of the prioritization exercise by the community				
No.	Issues	Women	Men	Both
1	Protecting food gardens and soils from heavy rains and surface run off	0	0	0
2	Improving production of meat and eggs from chicken and ducks using garden crops for home consumption	10	8	18
3	Improving production of staples (Fiji taro, kumala)	2	3	5
4	Introduction of new technologies to protect food gardens during the dry season	3	0	3
5	Integrating livestock and crop production to improve yield from livestock and crops	3	14	17
6	Adding value to my staple crops through processing into food and feed	3	25	28
7	Keeping chicken, ducks and pigs for selling	9	6	15
8	Improving soil fertility of my plots for sustainable and improved crop production	5	1	6
9	Introduction of other / new crops or crop varieties into my farming system	7	0	7
10	Protecting water resources to have safe and secure access for household use	12	27	39
	Total votes	54	84	138
	No. of Farmers	18	28	46

Table 2: Summary of Selected Priorities & List of Outputs and Corresponding Activities Implemented per Site

Nº	Activity / Output	Output Indicator
Livestock Diversification – Siviri, Malafau & Middle Bush		
Output 1	Increased capacity of interested farmers in Siviri, Malafau & Middle Bush community for using improved/local chicken, pig feeding and management practices	<p>OI 1.1 # of farmers participating in learning workshops on type of technologies/practices and issued with certificate of attendance</p> <p>OI 1.2 number of model farmers trying out improved pig and chicken feeding and management practices</p> <p>OI 1.3. # of livestock units supplied to primary and secondary users (within or surrounding communities) against target</p> <p>OI 1.4 # and list of new livestock and type of improved chicken and pig management practices selected by >50% of participating farmers as appropriate for adoption into respective systems based on three priority criteria</p>
Milestone 1	Interested farmers & suitable villages identified for chicken and pig improvement interventions and baseline established	<ul style="list-style-type: none"> • No. of farmers interviewed & selected • Baseline information documented
Milestone 2	Selected model farmers trained on improved village chicken management, broiler feeding, pig husbandry and goat raising	<ul style="list-style-type: none"> • No. of farmers issued with certificates in attendance
Milestone 3	Basic materials acquired by participating farmers with assistance of the project & farm structures (shed, fencing, fodder) established	<ul style="list-style-type: none"> * Number & types of materials * No. of livestock units established with detail specifications
Milestone 4	Suitable breeding and production stock (village chicken, broilers, pigs, goats) acquired and maintained under improved management by the participating farmers for demonstration trials	<ul style="list-style-type: none"> • No. of stocks acquired by participating farmers & with assistance by the project • No. of stocks per species/breed (broiler, layer, goat) acquired & supplied to each farm unit
Milestone 5	On-farm participatory assessments of various demonstrations conducted and drawing up of next steps	<ul style="list-style-type: none"> • Assessment data • No. of farmers using the technologies • No. of stocks sold & income generated • Cost benefit analysis of interventions • Research reports of demonstration trials and participatory assessments
Crop Diversification – Siviri, Malafau & Middle Bush		
Output 2	Capacity for growing cassava, Yam and Sweet Potato (SP) using improved locally acceptable production practices and farmer - selected varieties increased in the Siviri, Malafau & Middle Bush Community.	OI 2.1 # of farmers participating in learning activities on the use of cassava, yam & SP production practices

		<p>OI 2.2 type of improved cassava, yam & SP production practices and # and names of cassava, yam & SP varieties selected by >50% of participating farmers as appropriate and useful for adoption in their own system by three priority criteria</p> <p>OI 2.3 # of planting material units (cassava, yam & SP) distributed to # of primary and secondary users (within or in surrounding communities)</p>
Milestone 1	Baseline data collected, interested farmers and suitable sites for cassava, yam & SP production demonstration identified	
Milestone 2	<p>Sufficient planting materials of cassava, yam (rotundata) & SP (drought tolerant varieties) assembled at VARTC & DARD for training and participatory research and demonstrations at the site - yam mini-setting, density, non-staking & staking / comparing drought tolerant SP & cassava varieties with local varieties & planting techniques established and maintain to harvest.</p> <ul style="list-style-type: none"> ▪ Monitoring visits by DARD officer - monthly ▪ Monitoring visits by Component leader- 3 months; 6 months after planting ▪ Monitoring visit by project field officers – weekly 	<ul style="list-style-type: none"> ▪ 100kg of yam to make more than 2000 mini-sets. ▪ Good planting material of cassava & SP available established.
	<ul style="list-style-type: none"> ▪ Monitoring visits conducted 	
Milestone 3	Participatory evaluation of cassava, yam & SP varieties and selection of best performing based on farmer assessment	<p>* no of male and female farmers participating in the field day and evaluation</p> <p>* list of varieties selected by male and female farmers</p>
Milestone 4	Bulking of selection of best performing cassava, yam & SP varieties based on farmer assessment on different treatments	<p>* no of male and female farmers participating in the field day and evaluation</p> <p>* list of varieties selected by male and female farmers</p>
Milestone 5	Distribution of best performing cassava, yam & SP varieties based on farmer assessment in the community to interested farmers (continue distribution to end of project).	<p>* no of male and female farmers participating in the field day and evaluation</p> <p>* list of varieties selected by male and female farmers</p>
Output 2b	Capacity for growing rice using locally appropriate production practices and varieties developed in Middle Bush Community	<p>OI 2b.1 # of farmers participating in learning activities on the use of rice production practices</p> <p>OI 2b.2 type of improved rice production practices and # and names of rice varieties selected by farmers as appropriate and useful for adoption in their own system by three priority criteria</p> <p>OI 2b.3 # of planting material units (rice) distributed to # of primary and secondary users (within or in surrounding communities)</p>
Milestone 1	Baseline data collected, interested farmers and suitable sites for rice production demonstration identified	

Milestone 2	Sufficient rice seeds assembled at DARD for participatory research and demonstrations at the site	Seeds bulked at MRC-Bubia
Milestone 3	Training of interested farmers on the upland / paddy field development and nursery practices conducted. Direct sowing of seeds completed.	* Upland field developed. * No. of male and female farmers trained on rice nursery practices.
Milestone 4	Demonstration trial plot comparing different varieties and cultivation practices successfully established	* Demonstration trail plots for upland and irrigated or paddy cultivation trail established.
	* Monitoring visits by DARD officer - monthly * Monitoring visits by Component leader- 3 months; 6 months after planting	* monitoring visits conducted
Milestone 5	Pest and disease control training and demonstrations conducted	* P&D control training conducted. * No. of male and female farmers attending training.
Milestone 6	Participatory evaluation of rice varieties and appropriate cultivation practices and selection of best performing varieties and practices based on farmer assessment.	* no of male and female farmers participating in the field day and evaluation * list of varieties selected by male and female farmers * list of lessons learnt for rice production practices and varieties
Milestone 7	Training and demonstration on harvesting, drying and processing practices successfully conducted.	* Post harvest and milling training conducted.
Milestone 8	Demonstration plots for the best selected cultivation practices and variety for the community successfully established	* Demonstration plots for best practice established.
Milestone 9	Monitoring and follow up technical advice to successful farmers by DARD officers carried out - 3 months; 6 monthly basis	* No. of farmers growing rice successfully in Middle Bush community.
Output 2c	Greater diversity of crops species and varieties maintain by selected farmers in Malafau & Middle Bush community – vegetables – tomatoes & cabbages	OI 2c. 1 # of selected vegetable farmers train on maintaining open pollination varieties of vegetable seeds. OI 2c.2 # of selected vegetable farmers train on seed storage practices, conservation measures, pest & disease control and distribution of seeds.
Output 3	Increased capacity of interested farmers in Middlebush community for processing sweet potato and cassava into other food products	OI 3.1 # of farmers participating in learning activities; OI 3.2 type of processing practices and products selected by >50% of participating farmers as appropriate and useful for adoption in their own system by three priority criteria
a)	Value addition to food	
Milestone 1	Traditional practices of processing sweet potato and cassava into food documented and baseline data established	<ul style="list-style-type: none"> ▪ No. of farmers interviewed & selected ▪ Baseline information documented
Milestone 2	Appropriate techniques for processing sweet potato and cassava into food (flour, starch, chips, pop, baked & fried products) identified	• No. and descriptions of the techniques identified

Milestone 3	Training of, and demonstration for, interested farmers in appropriate processing techniques conducted	<ul style="list-style-type: none"> • No. of farmers issued with certificates in attendance
Milestone 4	Selected farmers practice processing of staple crops and fruits into food	<ul style="list-style-type: none"> • No. of farmers practicing new techniques
Milestone 5	Participatory assessment of the introduced techniques conducted and drawing up next steps	<ul style="list-style-type: none"> • Assessment data • No. of farmers using the technologies • Research reports
b)	Value addition to feed	
Milestone 1	Local feed processing practices assessed and documented and baseline data established	<ul style="list-style-type: none"> • No. of farmers interviewed & selected • Baseline information documented
Milestone 2	Selected model farmers trained in value addition to sweet potato and cassava into feed	<ul style="list-style-type: none"> • No. of farmers issued with certificates in attendance
Milestone 3	Selected farmers practice processing of sweet potato and banana into feed of pigs.	<ul style="list-style-type: none"> • No. of farmers practicing new techniques
Milestone 4	Conduct participatory assessment and reflection on the introduced processing technique, and next steps drawn up	<ul style="list-style-type: none"> • Assessment data • No. of farmers using the technologies
Soil & Water – Siviri & Middlebush		
Output 4	Community has an increased and improved capacity to manage available water sources for domestic and agricultural uses.	<ul style="list-style-type: none"> OI 4.1 No. of people with access to better managed water for domestic and agricultural uses; OI 4.2 Increased awareness of community on hygiene and water. OI 4.3 #of community members participating in different type of learning activities on water management. OI 4.4 # of meetings of the Community water committee
Milestone 1	Suitable solution for integrated water supply system for domestic and agricultural use identified	<ul style="list-style-type: none"> * One integrated system identified using water for domestic and agricultural uses.
Milestone 2	Suitable integrated pilot water supply system for domestic and agricultural use installed and available to the model household	<ul style="list-style-type: none"> * Model pilot integrated water supply system installed, * Number of households with access to the source.
Milestone 3	Framers irrigation activities assessed and model farmers selected	<ul style="list-style-type: none"> * Assessment report on irrigation activities * Number of selected model farmers
Milestone 4	Appropriate irrigation technologies identified and farmers trained in soil and soil water conservation management practices.	<ul style="list-style-type: none"> * Number and type of technologies selected, * Number of farmers trained, * Demonstration & training on irrigation technologies conducted
Milestone 5	Pilot system for demonstration set-up and training of use of irrigation system conducted at Nasituan & NAPIL training center	<ul style="list-style-type: none"> *Number of farmers participating in training activities *Pilot system set-up and functional
Milestone 6	Technologies pilot tested by model farmers.	<ul style="list-style-type: none"> * Number of interested model farmers pilot testing technologies.

Milestone 7	Participatory assessment of demonstration plot.	* Workshop conducted; * No of male and female participants; document proceedings of the workshop. * Evaluation Report of the technologies pilot tested
Information Sharing and Networking – Siviri, Malafau & Middle Bush		
Output 5	Print Materials distributed to farmers & stakeholders.	OI 5.1 Type of adaptation themes and technologies selected; type of information collated and re-packaged OI 5.2 Type of methodology used in re-packaging/production and dissemination of adaptation information OI 5.3 Type and number of materials produced and frequency of dissemination OI 5.4 Number of stakeholders engaged
Milestone 1	Information materials (booklets, factsheets)	Number and type of materials print
Milestone 2	Awareness and communication materials (Posters, brochures, newsletters, Talemaot)	Number and type of materials print
Milestone 3	Communication Strategies for DARD & VARTC	Strategy document produced
Output 5b	Media outlet	OI 5b.1 Type of adaptation themes and technologies selected; type of information collated and re-packaged OI 5b.2 Type of methodology used in re-packaging/production and dissemination of adaptation information OI 5b.3 Type and number of materials produced and frequency of dissemination OI 5b.4 Number of media outlet utilized
Milestone 1	Newspapers (articles and inserts)	*Number and type of articles published *Number of media outlets fed
Milestone 2	Radio (talk-back show, pre-produced programs)	Number of shows
Milestone 3	Television (technology based programs)	Number of videos telecast
Milestone 4	Video (technology based videos)	Number and type of video clips produced; number of video shows
Output 5c	Stakeholder Engagement	OI 5c.1 type of adaptation themes selected; type of information collated and re-packaged OI 5c.2 type of methodology used in re-packaging/production and dissemination of adaptation information

		OI 5c.3 type and number of materials and frequency of dissemination OI 5c.4 number of participants engaged
Milestone 1	Field Days, shows, farm demonstrations, commemorations & Public events	Number and type of events
Output 5d	Strengthen Capacity Building	OI 5d.1 type of adaptation themes selected; type of information collated and re-packaged OI 5d.2 type of methodology used in re-packaging/production and dissemination of adaptation information OI 5d.3 type and number of materials and frequency of dissemination OI 5d.4 number of participants engaged
Milestone 1	Software applications	Number and type of software's
Milestone 2	Equipment (voice recorder, GPS, video camera, External Hard drive, internet router - Wifi)	Number and type of equipment
Milestone 3	Skills improvement (Mark attachment to NARI)	Number of communication areas learn
Socio Economic		
Output 6	Community meetings conducted for feedback on implemented activities (interest, active involvement in pilot activities, challenges faced in implementing project activities, adoption and impact etc...)	* > 50 % of a sample of 20 community members in the community feedback meetings expressing positive views on capacity building activities * no. of farmers expressing intent and confidence in continued use of improved water, crop, livestock technologies and practices

4. INTERVENTIONS IMPLEMENTED & SUMMARY OF ACHIEVEMENTS

Table 3 lists all output as indicated in table 2 including achievements in correspondence with respective output indicators. Number of trainings conducted and demonstration events are listed in the table including number of farmers trained and number of selected model farmers for respective activities and number of information materials distributed to key partners.

Table 3: Output & Achievements at Sites

Output	Description of Output / Intervention	Activity	Sites	No. of trainings	Farmers trained	Male farmers	Female farmers	Model farmers
O1	Increased capacity of interested farmers in Siviri, Malafau & Middle Bush community	Poultry improvement	Siviri	2	28	21	7	16
			Malafau	3	47	38	9	16
			Middle Bush	3	36	22	14	19
		Value Addition to	Siviri	1	34	28	6	18
			Malafau	1	3	2	1	3

	for using improved/local chicken, pig feeding and management practices	feed – Pig silage	Middle Bush	2	48	33	15	20
O2	Capacity for growing cassava, yam and Sweet Potato (SP) using improved locally acceptable production practices and farmer - selected varieties increased in the Siviri, Malafau & Middle Bush Community.	Cassava	Siviri	1	2	2		2
			Malafau	1	13	9	4	3
			Middle Bush	1	16	11	5	1
		Yam	Siviri	2	5	3	2	2
			Malafau	2	7	5	2	2
			Middle Bush	2	10	7	3	1
		Sweet Potato	Siviri	2	32	25	7	2
Malafau						1		
		Middle Bush	3	29	17	12	2	
O2b	Capacity for growing rice using locally appropriate production practices and varieties developed in Middle Bush Community.	Rice planting	Middle Bush	2	37	24	13	2
O2c	Greater diversity of crops species and varieties maintain by selected farmers in Malafau & Middle Bush community – vegetables – tomatoes & cabbages.	Vegetables	Malafau	1	18	6	12	3
			Middle Bush	2	37	13	24	4
O3	Increased capacity of interested farmers in Middlebush community for processing sweet potato and cassava into other food products.	Value addition to food – flour, starch, chips, pop, baked & fried products	Middle Bush	4	57	9	48	17

O4	Community has an increased and improved capacity to manage available water sources for domestic and agricultural uses.	Soil & Water Management	Siviri	1	11	7	4	1
			Middle Bush	2	23	15	8	2
Information Sharing & Networking								
	Description of output / Intervention	Activity	No. of materials distributed to farmers, schools, churches, NGO's, Projects etc...					
O5	Print Materials distributed to farmers & stakeholders.	Pig silage booklet (<i>bislama</i>)	500					
		Poultry booklet (<i>bislama</i>)	100					
		Food processing leaflet (<i>bislama</i>)	100					
		DVD's (<i>poultry, pig silage, SP & food processing</i>)	100					
O5b	Media outlet	Vanuatu daily post newspaper article	14					
		DARD Newsletter	10					
		Mobile Bluetooth sharing	17					
		National Radio Vanuatu News	7					
		Television blong Vanuatu (TBV)	11					
		Talkback show radio interview	4					
		Face Book (photo's & video)	7					
O5c	Stakeholder Engagement							
O5d	Strengthen Capacity Building							
O6	Community meetings conducted for feedback on implemented activities (interest, active involvement in pilot activities, challenges faced in implementing project activities,							

	adoption and impact etc...)		
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Table 4: Indicated Type of Farming Practices, Number of Field Days & Type of Materials Supply to Farmers

Output	Description of intervention	Tech./farming practice	Sites	Demons /field days	Stock / crops / feed used	Stocks / planting materials distributed to interested / model farmers / secondary user
O1	Increased capacity of interested farmers in Siviri, Malafau & Middle Bush community for using improved/local chicken, pig feeding and management practices	Improved local chicken management & feeding: 1. Supplementary feeding Chicken shed and fencing	Siviri	1	Lime, copra meal and meat meal	<ul style="list-style-type: none"> ▪ 37 local chicken distributed to model farmers ▪ 6 chicken wire (50m) distributed
			Malafau	2	Lime, copra meal and meat meal	<ul style="list-style-type: none"> ▪ 51 local chicken distributed to model farmers ▪ 8 chicken wire (50m) distributed
			Middle Bush	1	Lime, copra meal and meat meal	<ul style="list-style-type: none"> ▪ 72 local chicken distributed to model farmers ▪ 18 chicken wire(50m) distributed
		Improved pig management & feeding 1. Silage 2. Pig silage container & tapeline.	Siviri	1		<ul style="list-style-type: none"> ▪ 18 container (75L) distributed to farmers
			Malafau	1		<ul style="list-style-type: none"> ▪ 3 container (75L) distributed to interested farmers
			Middle Bush	2		<ul style="list-style-type: none"> ▪ 20 container (75L) distributed to interested farmers
O2	Capacity for growing cassava, yam and Sweet Potato (SP) using improved locally acceptable	Yam - High drought tolerant yam varieties.	Malafau	1	Yam varieties: wailu (African yam)	416 yam tubers distributed to interested farmers
			Middle Bush	1	Yam varieties: wailu (African yam)	632 yam tubers distributed to interested farmers

	production practices and farmer - selected varieties increased in the Siviri, Malafau & Middle Bush Community.	Sweet Potato – early maturing high yielding; high soil moisture tolerant & drought tolerant sweet potato varieties.	Siviri	1	Sweet potato varieties: Fanafo 1, Bankis, Local (control), PNG 8, Fanafo 2, Hybrid 52, HM 24, HM131, Lepule and Hybrid 27	1,751 SP vines / cuttings distributed to interested farmers.
			Middle Bush	1	Sweet potato varieties: Fanafo 1, Bankis, Local (kapalualua), PNG 8, Fanafo 2, Hybrid 52, HM 24, and Hybrid 27	2,845 SP vines /cuttings distributed to interested farmers.
O2b	Capacity for growing rice using locally appropriate production practices and varieties developed in Middle Bush Community.	New rice varieties tested	Middle Bush	2	Rice varieties: NR 1 & 15	150 kilos of rice seeds distributed to interested farmers. 1 mini rice machine for Middle Bush Rice Farmers Association
O2c	Greater diversity of crops species and varieties maintain by selected farmers in Malafau & Middle Bush community – vegetables – tomatoes & cabbages.	New vegetable varieties tested (open pollinated seeds)	Malafau	1	Vegetable varieties: tomato (<i>Solanum lycopersicum</i>) - 400 seeds each; paper (<i>Capsicum annuum</i>) – 7 lines; Leafy Brassica – 8 lines; Cucumber (<i>Cucumis sativus</i>); Shallot (<i>Allium cepa</i> var. <i>ascalonicum</i>)	
			Middle Bush	1	Vegetable varieties: tomato (<i>Solanum lycopersicum</i>) - 400 seeds each; paper (<i>Capsicum annuum</i>) – 7 lines; Leafy Brassica – 8 lines; Cucumber (<i>Cucumis sativus</i>); Shallot (<i>Allium cepa</i> var. <i>ascalonicum</i>)	
O3	Increased capacity of interested farmers in Middlebush community for processing sweet	New drying and cooking method of cassava flour, pawpaw jam, kumala pop and chips tasted.	Middle Bush	2		Food processing materials; 17 pillars, 17 grater, 17 cooking pots, 4 electronic scale, 50 meter black plastic,

	potato and cassava into other food products.					10 kilo nails, 1000 plastic bags (chips) & 1000 chips labels.
O4	Community has an increased and improved capacity to manage available water sources for domestic and agricultural uses.	Constrictions of rain water harvesting tanks including water management training.	Malafau	1		
			Middle Bush	1		
O5	Print Materials distributed to farmers.					
O5b	Media outlet	Face book & mobile blue tooth	Middle Bush & Siviri field day	4		
O5c	Stakeholder Engagement					
O5d	Strengthen Capacity Building					
O6	Community meetings conducted for feedback on implemented activities (interest, active involvement in pilot activities, challenges faced in implementing project activities, adoption and impact etc...)					

Output 1: Increased capacity of interested farmers in Siviri, Malafau & Middle Bush community for using improved/local chicken, pig feeding and management practices.

1. Poultry (village chickens)

A total of 51 poultry model farmers from all sites were involved in various interventions. Most of them have increased their level of understanding and skill of managing their chickens and were more interested in improved feed technology, selection of chicken for breeding purposes, keeping of chicken in fenced and farmers hatching their own eggs. The poultry management practices are now disseminated throughout the country by various projects, NGOs and the agriculture extension services.

2. Pig silage

Pig silage making is a new technology to majority of the farmers. Fourthly one (41) model farmers were selected from all sites as trainees and some of them have participated on special events such as the World Food Day, National Trade Show and the

Agriculture Shows purposely to demonstrate their skills of producing pig silage and as an important feed for domestic pigs. The Department of Agriculture & Rural Development (DARD) and the Livestock Department continues to promote pig silage technology throughout the country. Many interested farmers were able to adopt the new innovation of making pig silage using SP and cassava vines and leaves.

Output 2: Increased capacity for growing cassava, yam and Sweet Potato (SP) using improved locally acceptable production practices and farmer - selected varieties increased in Siviri, Malafau & Middle Bush Community.

1. Sweet Potato

Sweet potato is one of the staple foods in Siviri, Malafau and Middle Bush community. Traditionally sweet potatoes are cultivated using flat bed and raised mounds and are usually planted with 3-4 vine cuttings at an angle on the mounds. The EU-ARD project setup 2 demo plots of sweet potato, one in Siviri and another at Middle Bush. The project team has introduced 13 different sweet potato varieties and improved planting techniques using one vine per mound planted horizontally at each sites. The 13 different sweet potato varieties were planted on trial plots for evaluation and comparison against local sweet potato varieties. Farmers make their own evaluation during harvest (field day) based on priority criteria of high production yield, early maturing, cooking methods, taste and color. There were five (5) sweet potato model farmers that engaged with the project.

2. Yam

The African yam (wailu) varieties were introduced to the community and were planted on trial plots. Five (5) model farmers cultivated the introduced yam varieties comparing three (3) Treatments (T) introduced by the EU-ARD project that is: T₁ – staking vs non-staking; T₂ – small size mini – setting vs big size mini – setting; T₃ – high density spacing vs low density spacing. The results varies from each sites depending on the environmental factors, for example in Middle Bush where there is relative high humidity with excess soil moisture it proves that using these technologies yam can produced maximum yield. In Siviri and Malafau farmers prefers small size mini - setting and low density spacing for seeds production.

3. Cassava

Twenty (20) different varieties of cassava are collected around Tanna and were introduced at Middle Bush community planted on a trial plot using one cutting compared with 3-4 cuttings (traditional practices). The cassava varieties performed very well and unfortunately the demo plot was destruct by TC Pam. The cassava cuttings were then bulk and distributed to most farmers around Middle Bush area.

Output 2b: Capacity for growing rice using locally appropriate production practices and varieties developed in Middle Bush community.

Two (2) new rice varieties of NR 1 & 15 were introduced to the Middle Bush community and were planted on a trial plot of 25m x 17m area. The demo plot was setup purposely to evaluate the performance of the rice varieties, collect seeds and for training purposes. The outcome was successful as expected and seeds were distributed to most farmers in Middle Bush. The EU-ARD project has supported the community with a new mini rice machine as well as setting up of Middle Bush rice farmers association purposely to sustain and managed the rice planting program in the community. To date the DARD has distributed rice seeds to most farmers on Efate and Paama Island assisting them on planting rice. The DARD also works closely with a private individual

to import rice mini machine and seeds for the farmers. This has created high hope and demand of rice planting throughout the country, the Government fully supports the program with aid from its donor partners such as the Chinese Government.

Output 3: Increased capacity of interested farmers in Middlebush community for processing sweet potato and cassava into other food products

Food processing technology is a new activity for most farmers especially women's in Middle Bush community, whereby most of them were interest in improved technology for making food products such as flour, chips, jam, pop and biscuit. Seventeen (17) food processing model farmers were involved and trained other interested farmers in their community. Main activities included drying, preservation, packaging and marketing of their products. The program has increased farmers capacity to also add value to other crops such as roasted peanut and provide employment opportunities in the community. The DARD continues to support the model farmers through facilitation of trainings conducted by the model farmers in other islands of Vanuatu.

Output 4: Community has an increased and improved capacity to manage available water sources for domestic and agricultural uses

Access to reliable water sources for agricultural purposes at Malafau and Middle Bush is a priority to the community. The EU-ARD project has engaged ADRA in implementing activities more on agriculture orientated and focus on soil water management and conservation and soil fertility improvements. The ADRA has constructed 3 water tanks (10,000L), one in Malafau and two in Middle Bush communities. In Malafau, the program has revived the water committee to raise funds for purchasing water poly pipes for household consumption. The EU-ARD project has trained the communities to better manage their water for agricultural uses and to improved soil fertility.

Output 5: Print Materials distributed to farmers

Information sharing and networking is the key to success of the EU-ARD project in Vanuatu. The project team used media outlet such as the Vanuatu Daily Post, Radio Vanuatu news, Radio interviews, Television blong Vanuatu, Talemot Newsletter, Face Book and Mobile Bluetooth App to disseminate information on the technologies introduced by the project throughout all islands of Vanuatu. This activity has strengthen relationship between the DARD and key farmers in the islands, sharing of experience, improved capacity of agricultural field officers and bring in more interest of farmers to learn and increase their skill on livestock husbandry, crop production and food processing technology. Print materials such as booklets, leaflets, posters and DVD's were also distributed to farmers, NOG's, schools, churches, government line departments and projects officers at field days like the National Trade Show and World Food Day.

5. RESPONSES FROM COMMUNITIES DURING THE IMPLEMENTATION, ISSUES THAT AROSE AND HOW THEY WERE RESOLVED

The model farmers were identified by the project field technician with the help of the DARD extension officer through a baseline survey based on the farmers' interest and past experience. The model farmers agreed to work closely with the project team to take on new innovation using their land for crop trials and livestock husbandry demonstration trials. These are mostly interested and resourceful in their selected areas and other area as well. The success of the project depended on the pro-activeness of the

model farmers. In most cases the model farmers were also participating in other areas / activity based on his / her interest. For instance the model farmer for sweet potato was also the model farmer in poultry management and or other components.

Field demonstration trials, training demonstrations and field day were the main planned activities delivered under each of the technical components. Table 5 shows a summary of technologies introduced and farmer impressions during implementation particular for crop, livestock and food processing interventions.

Table 5: Technologies Dissemination & Farmer Impressions at Siviri, Malafau & Middle Bush Site

Output	Description of intervention	Technologies / innovation	Farmers impressions during implementation
O1	Increased capacity of interested farmers in Siviri, Malafau & Middle Bush community for using improved/local chicken, pig feeding and management practices	<ul style="list-style-type: none"> SP silage concentrate technology 	<ul style="list-style-type: none"> Fast growth rate and improved pig weight gains with the NARI introduced feed silage Silage feed reduces labour for pig feed preparation. Reduced social conflict
		<ul style="list-style-type: none"> Chicken feed technology 	<ul style="list-style-type: none"> Introduced feed technology using copra meal, meat meal and lime was very successful that increased production (egg) and fast growth, raise profit by 30% compare to traditional feeding.
O2	Increased capacity for growing cassava, yam and Sweet Potato (SP) using improved locally acceptable production practices and farmer - selected varieties increased in Siviri, Malafau & Middle Bush Community.	<ul style="list-style-type: none"> Yam husbandry practices adaptable to drought & excess rainfall. 	<ul style="list-style-type: none"> Farmers appreciated the techniques of planting yam comparing mini-setting seeds technology; staking vs non-staking; low and high density techniques. Increased production of yam seeds and conserve introduced varieties.
		<ul style="list-style-type: none"> SP varieties that is tolerant to drought & high soil moisture. 	<ul style="list-style-type: none"> Farmers appreciate the techniques introduced of planting one vine cutting on horizontal orientation per SP mound that produced higher yield compare to normal practice using 3-4 vines. The effect of El Nino and TC Pam in 2015 has caused the introduced SP not do better than the local varieties.
		<ul style="list-style-type: none"> Cassava varieties that are drought tolerant and tolerant to high soil moisture. 	<ul style="list-style-type: none"> 20 cassava varieties were introduced and trial out in Middle Bush performs very well but unfortunately damaged by TC Pam. Over 2000 cuttings of cassava were distributed after TC Pam
O2b	Capacity for growing rice using locally appropriate production practices and varieties developed in Middle Bush Community	<ul style="list-style-type: none"> Two new rice varieties of NR 1 & 15 introduced at Middle Bush 	<ul style="list-style-type: none"> Farmers were happy to accept new rice varieties. Address food security needs of the community and reduces household spending. Positive respond regarding the rice mini rice machine which motivate planting of rice.
O3	Increased capacity of interested farmers in	<ul style="list-style-type: none"> New technologies of food 	<ul style="list-style-type: none"> Farmers especially women's were

	Middlebush community for processing sweet potato and cassava into other food products.	processing introduced in the community.	happy to learn new technology of food processing that helps them generate high household income by selling their food products.
O4	Community has an increased and improved capacity to manage available water sources for domestic and agricultural uses.	<ul style="list-style-type: none"> ▪ Construction of 10,000L water tank for the community for agricultural uses ▪ Training of soil fertility improvement and construction of tunnel house. 	<ul style="list-style-type: none"> ▪ Community was happy to see that their main concern and priority was addressed. ▪ Community collaborated well and agreed to work closely with DARD and future projects.
O5	Print Materials distributed to farmers.	Booklets, leaflets, posters, & DVD's	<ul style="list-style-type: none"> ▪ The communities were happy that the print materials and DVD's are all in "bislama" translation that is easy for them to read and understand. ▪ Farmers are happy with their own photo used in the print materials which eventually motivate them to share their experiences to other interested community members.
O6	Community meetings conducted for feedback on implemented activities (interest, active involvement in pilot activities, challenges faced in implementing project activities, adoption and impact etc...)		

6. CHALLENGES AND LESSON LEARNT DURING PROJECT IMPLEMENTATION

The key challenges encountered at the implementation course of the project is the destruction of TC Pam and the prolong period of *Le Nino* induced drought in 2015. These has entirely affects the crop demonstration plot, livestock and food processing trials which makes most farmers lost interests for a while. Involvement of the community to the project activities is also determine by their cultural obligations in the village like attending marriages and funeral ceremony of death and national events such as the independence day celebration. Another important aspect is that training and demonstration of farming techniques often target male farmers for example in Middle Bush women's groups are thought to be only interested in food processing.

Frequent follow up and monitoring of the project activities by project field technicians and the agriculture officers often delays due to bad weather and commitment of officers to other programs and projects. It is important to carefully select model farmers that are motivated and innovative leader farmers. Field technicians always find it difficult to visit all farmers in a day since farmers' lives in areas located far away from the main community center. For some instance, the agriculture extension officer that owns a motorbike routinely visits those model farmers and report on the progress of each activity. Relocation of agricultural extension officers and changed of project country Sub - Coordinator also affects and delay implementation of the activities which requires clear explanation by the component leaders of the purpose and goals of the project that certainly lead to misunderstanding and miss interpretation of the planned activities. The soil and water component was delay until the final year of the project because of the changes on contract from World Vision to ADRA. Lack of technical expertise by the agriculture officer develops a stronger collaboration between DARD and the Vanuatu Agriculture Research Training Center (VARTC) to implement most of the project

activities. The involvement of the DARD and VARTC officers in short training at NARI PNG has eventually increased capacity of the technical human resources. Dissemination of project information to the public have better create stronger linkages between DARD, NGO's and projects to use the technology introduced by the EU-ARD Project. The key challenges were summaries in table 6 below in this regards.

Table 6: Key Challenges Faced During Implementation of the Project

Challenge	Type of approach taken to resolve the problem
Destruction of TC Pam and prolong period of <i>Le Nino</i> induced drought in 2015	Communicate with model farmers and find out the level of damage caused. Carry out damage assessments and identify farmers and developed rehabilitation work plan. Work with farmers that experience less damage on their livestock and crops.
Frequent monitoring and follow up of project activities	Field technicians and agriculture extension officer provide weekly reports on the day to day progress of the activities.
Delays of implemented activities	Appointment of agriculture officers as local team leader of each component to take lead in implementation of the activities.
Lack of expertise by agriculture officers	Draw up quarterly plans and request for NARI scientist to travel to Vanuatu and conduct trainings for farmers and agriculture officers.
Establish trust between project team and the community	Keep in touch with the farmers and agriculture extension officer and training days before travelling.
Training and demonstration of farming techniques often target male farmers.	Target both men and women for training as appropriate.

7. FINAL ASSESSMENTS AND COMMENTS

The final site assessment in Vanuatu took place in December 2015. The responses in technology performance and responses of representative farmers during focus group discussions were summaries as follows.

1. Siviri

Yam model farmers mentioned in the final site assessment meeting that the technologies of yam mini-set, yam density and staking is very useful mainly for seed production that certainly will increase production on a small piece of land. Farmers are not able to make comparison on the yield of both traditional and new technology due to the destructive TC Pam which destroyed the crop trial plot. However, it is anticipated that the yam technology introduced was disseminated to other nearby communities and plot size was also intend to increase in the future.

Sweet potato was experimental during off-season (December –April) period and the outcome shows high production yield compare to cultural practices. New sweet potato varieties were introduced into the community. The idea of inviting farmers to the field day has developed more interest whereby farmer are exposed to the innovations applied in the field and interact with extension and research officer. Farmers come to accept and understand contributing climatic factors that affects their crops demonstrated by the EU-ARD project team. Sweet potato is regard as a main food security crop to the community with potential to increase production in future using the technology respectively.

With the introduction of feeding and good management practices of keeping village chicken farmers are more interested to work with the project at initial implementation of the activity. However for some circumstances few model farmers lost interest to some extent especially when they committed to other cultural obligation.

2. Malafau

The crop model farmers (i.e. yam and cassava) were very happy with the technology introduced at their plot and are more interested to share their knowledge with the communities. A female model farmer stress that the technique of planting yam without staking could withstand drought and control pest attack, the idea of farmers taking a leading role in what they expect from the project in terms of their local priorities was a new approach that also was breaking traditional extension approaches and may have astounded many farmers, who expect EU-ARD project team to tell them what they should have and what not to have in their communities. Few successful chicken model farmers managed to hatch their own eggs. The steps of formulating chicken feed using copra meal, meat meal and lime is beneficial to the farmers, and some farmers are now using commercial feeds to raise their chicken for egg production. Farmers selling village chicken at a price of 1,500 VT and eggs for 30 VT to locals and 50 VT to restaurant owners. Young chicks reared after TC Pam was raised up to an acceptable weight and sold to restaurant owners at price of 1,000VT.

With the construction of the new water tank (10,000L) for the community to irrigate their crops it has generate interest of the leaders in the communities to establish a water committee that oversee the management of water used to irrigate crops and other purposes. The project has increased farmers capacity of keeping village chicken and crop management. There are high participations of men than women in the project.

3. Middle Bush

There was a lot of excitement in Middlebush for crop f (sweet potato, yam, cassava & rice) and livestock (chicken & pig). There is equal involvement of men and women which shows an effective dissemination of information share to the entirely population. Two field days were organized by the EU-ARD project on sweet potato and yam harvest. Planting materials of new crop varieties (sweet potato and yam) were eventually distributed to majority of the community members, farmers mentioned in the final site assessments meeting that they will continue to use the improved farming technology and expand their farm size.

Middle Bush community are not new to rice planting and with the introduction of the two (2) new rice varieties of NR 1 & 15 and the mini rice machine, it has encouraged high interest of farmers to plant rice and expand their farm size. These have set a new approach of agriculture extension officer to facilitate trainings of rice planting conducted by the farmers. The Middle Bush communities now setup a new rice farmers association that consists of 70 registered farmers that is responsible for the day to day schedule of rice planting. Interested farmers throughout the country and DARD are now sourcing rice seeds from the farmers' association. A lot of people use to get involved in growing and milling rice but milling became a problem to even when farmers stopped to grow rice.

Farmers were trained how to keep village chickens in fenced and were also introduced to new feeding techniques which really improved egg production and performance in terms of faster growth rate. The model farmers responded positively and mentioned that keeping village chickens in fenced is much better that the traditional or cultural practice of free ranching. In addition the technologies have supported the farmers to generate sufficient income to meet their basic needs such as school

fees and transport. It also address protein needs of the communities, for example parents normally boiled local eggs for their children to take with them to schools. There is high demand of village chickens at the market and farmers were able to increased supply.

Pig silage making technology capture interest of most farmers in Middle Bush. Model domestic pig farmers mentioned confidently that the technology is much better than the cultural practices because is save energy and time of feeding their pigs, the pigs perform faster growth rate and weight gains, and also solved other related problems of destroyed food gardens and polluted water sources through free roaming pigs.

The introduction of food processing technology was well received by the community members. This technology significantly benefits the community members by providing them with adequate income and employment opportunity. Female members mentioned the need of preserving their crops during disaster period for instance cyclone Pam.

The construction of two water tanks (10,000L) at Napil and Nasitua community have addressed the needs of post-harvest management of coffee and irrigated crops mainly vegetables. Male members mentioned also that the technology significantly benefits the community members by providing safe drinking water which simultaneously also reduce health risk associated with poor quality of water and waterborne disease.

8. REFERENCES

Schabschneider, H. (2014). "Evaluation of Agricultural Conditions of three ungauged Watersheds in Vanuatu". University of Natural Resources and Life Sciences, Vienna.