

**<sup>1</sup>Equitable Payments for Watershed Services (EPWS) Programme: A Practical Experience in Delivering Conservation and Poverty Reduction in the Ulugurus, Morogoro, Tanzania**

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**Morogoro,  
20<sup>th</sup> October 2010**

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## 1. Introduction

This paper presents the effectiveness of CARE International in Tanzania and WWF Tanzania Country Office program in managing natural resources in the country by piloting **Payment for Environmental Services (PES)** scheme in Tanzania. Payments for Environmental Services (PES) mechanisms, such as Payments for Watershed Services, are market-based instruments that arose as a response to remedy market failures associated with environmental services. The basic principle of PES is that those who provide environmental services should be rewarded for doing so (Wunder, 2005). This means mechanisms are put in place that transfer rewards from those who benefit from the environmental services to those who manage it. PES schemes have the potential to contribute to this long-term effort by motivating and supporting landowners to adopt best land use practices (Branca, Et al, 2009). Branca, Et al, 2009 also stipulate that PES schemes pools funds from public and private sources to help cover implementation costs and may also provide continuous payments to compensate opportunity costs, if best land use practices don't offset these by increasing productivity. This is possible due to the fact that PES can provide technical support during the adoption phase and help farmers overcome gaps in information and technical capacity.

Payments for ecosystem services (PES) are not designed to reduce poverty, but rather offer economic incentives to foster more efficient and sustainable use of ecosystem services (Branca, et al, 2009). Thusly, PES provides a financing mechanism for implementation of interventions that can benefit the poor through the newly created and previously unavailable markets. These potential benefits can include increased cash income, expanded experience with external business activities, increased knowledge of sustainable resource use practices, improved resilience of local ecosystems and high productivity on their land. PES strives to give monetary value to ecosystem services by reimbursing providers (like upstream farmers) for their direct or indirect product manifested in their maintenance of ecological services. These payments causes benefit to occur where it would not have otherwise, and allow the farmers to reap the benefits of the mechanism and the buyers to reap the benefit of the farmers' maintenance (Branca, et al, 2009).

PES in the context of watershed protection considers in many cases the services provided by natural resources are not restricted and the benefits they provide accrue beyond the people who manage them. For example, upstream watershed protection services typically benefit downstream stakeholders, including domestic users, drinking water, bottling and hydro-electric companies as to mention the few (Branca, et al, 2009). In most cases, however, these beneficiaries have not compensated upstream land managers for the provision of these services, and the result is that beneficiaries have been "free-riding" - deriving benefits at someone else's expense. Thus, PES for watershed protection intends to motivate and support land managers who are mostly rural poor communities to adopt best land use practices such as terraces, agroforestry and riparian restoration for their production objectives.

## 2. Tanzania EPWS programme's Overview

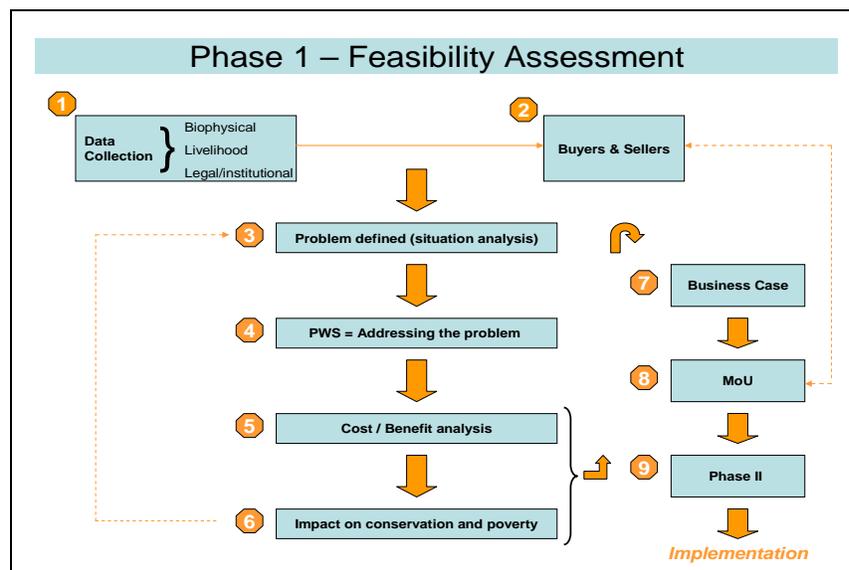
### 2.1. Background of EPWS

PES was originally conceived as an innovative market-based solution to environmental problems (CARE/WWF, 2007b). More recently environmental and development agencies in the Developing World have started to look at the social impacts of PES – primarily the potential to support poverty reduction, but also the need to avoid negative social impacts that may occur where there are changes in land use (WWF/CARE, 2005 and also 2007). This has made CARE International in Tanzania and WWF Tanzania Country Office to jointly establish and implement the “Equitable Payment for Water Services (EPWS)” program in the country as part of the broader PES concept. Thus, EPWS program in Tanzania stands to ensure a sustainable flow of watershed services to beneficiaries to these services into the future via a mechanism that promotes articulation of conservation practices while directly affecting poverty alleviation.

EPWS implementation was designed to roll-out over a 5 year period, divided into two distinct phases (See the following figure). The first phase (2006-2007) consisted of feasibility studies, to build a business case for investment through justification of certain “business criteria” and gathering knowledge to structure the new market appropriate to local conditions and equitable outcomes. Thus, a number of studies were conducted between July 2006 and September 2007 as follows:

- Hydrological Assessment
- Preliminary Buyer's Profiling
- Seller Livelihood Analysis and capacity assessment
- Cost-Benefit Analysis
- Legal Analysis

From early 2008, phase II started supporting implementation with guidance from the findings of the feasibility assessment/studies. In principle the second phase draws from the feasibility studies to establish a trial market for watershed services so as to ascertain the viability of PWS as an effective natural resource management tool and its ability under the EPWS framework to deliver sell-side equitable outcomes.



It is also anticipated that there will be Phase III to be financed by the buyers. This phase III will actually extend the scheme beyond a large pilot to the full scale needed to secure the improvement in water quantity and quality that the buyers are looking for. The phase will also involve replication of the mechanism in other watersheds of the country to bring more impact in managing water resources to ensure water availability for many uses and users.

## **2.2. Goal of the EPWS project**

The overall goal of EPWS project is to deliver sustainable natural resource management (modifying land use to conserve and improve “watersheds” for reliable flow and quality of water) and improved livelihoods of the rural poor with social justice and equity.

## **2.3. Objectives of the EPWS project in Tanzania:**

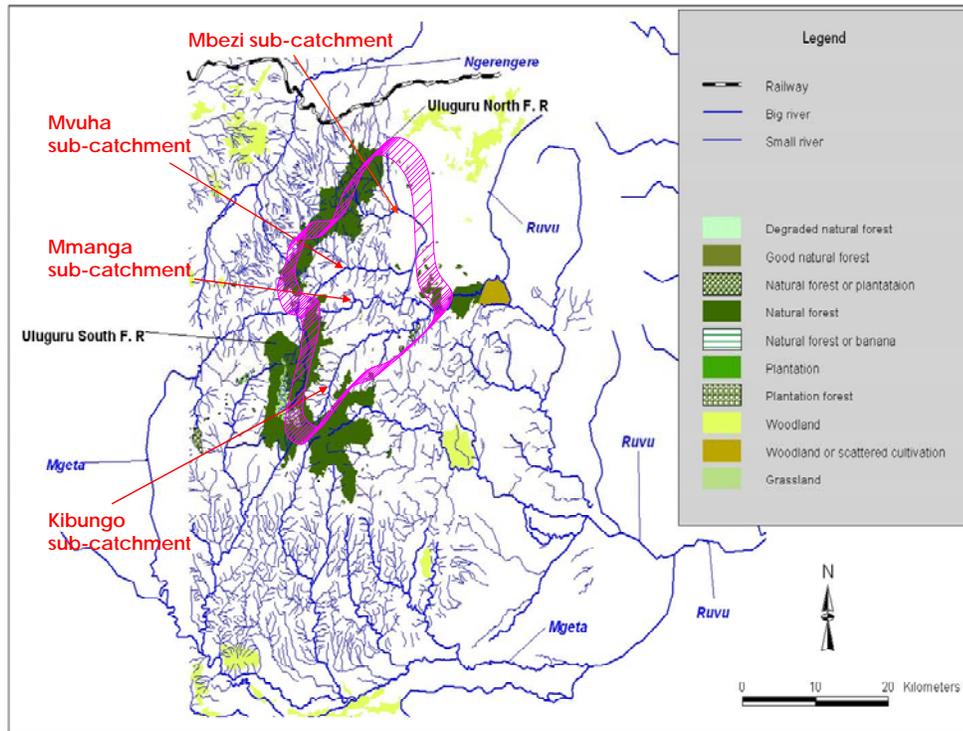
- To establish long term financial investment (FI) in modifying land use to conserve and improve “watersheds” for reliable flow and quality of water.
- To establish compensation mechanism that recognizes the needs and priorities of the marginalized and poor people to improve their quality of life hence contributing to poverty reduction

### **2.3.1. The project also aims to:**

- Work with the upstream and downstream stakeholders to create a win-win scenario where both the upland communities who are the stewards of the catchment areas and downstream water user benefits.
- Ensure that resources are applied to the priorities and needs of the poor and that local values, knowledge and practices are incorporated into natural resources management practices, as well as ensure that women and marginalized groups directly participate in, and benefit, from the payment for watershed services mechanism.
- Engage a wide range of national partners in implementation, including local NGOs, private sector and government agencies and institutions.

## **3. Geographical Location**

The programme site is in the Uluguru Mountains which are part of the Eastern Arc Mountain Forests Eco-region and located in Morogoro Region about 200km west of Dar es Salaam the capital city of Tanzania (URT, 2005). They are also part of the ten most important tropical forest sites for conservation in Africa. They are key elements of the Eastern Arc Range, whose natural forests are recognized as part of the 25 richest and most threatened reservoirs of plant and animal life on Earth (URT, 2005). Vegetation cover in the mountains consists of submontane, montane and upper montane, lowland moist and woodlands forests. Whilst, the Uluguru Mountains’ altitude ranges from 300 to 2,638 m.a.s.l (CARE/WWF, 2007a). Within the Uluguru Mountains the programme is being implemented at the Kibungo sub-catchment within Kibungo Juu Ward which is located about 85km South-East of Morogoro town –the district administrative centre (See the map below). In the Kibungo Juu ward, the programme is being implemented Lukenge, Kibungo, Lanzi, Dimilo and Nyingwa villages.



#### 4. Why do the Ulugurus need/are an appropriate place to implement this program?

##### 4.1. Importance of the Ulugurus

The Uluguru Mountains with their Watershed and Forest Reserves are of global importance for their biological value and are nationally significant in their provision of water to millions of Tanzanians and development (Mittermeier et al. 2004, URT, 2005). A very rural area, however, the Ulugurus have been plagued by the economic realities of develop that translate into limited management of resources due to inadequate human and financial resources. High population density also causes issues and leads to intensive agriculture and land fragmentation that are a causation of the pollution of water and degradation of forest reserves (Schösler and Riddington, 2006). For example, among the 2,245.69 hectares of land available in Kibungo-Juu ward, 86% of the plots own by individual farmers do not exceed 2 hectares, thereby, creating the problems of land scarcity and food shortage (CARE/WWF, 2007c). Ergo, were 90% of the farmers able to form a collective and implement the suggested agricultural conservation techniques, not only would their food yields be higher, the integrity of the water quality could be maintain and improved. When plots are this small, 90% of the land area involves a considerable number of individuals to form the general collective and, with the help of EPWS, means that more individual's lives will be directly impacted by the program's deliverables.

##### 4.2. Watershed problems

The Uluguru Mountains receive an average rainfall ranging from 1300mm to 3000mm /year which is high enough to feed the many small rivers and streams which consequently joins together to form the main Ruvu River which flows eastward

into the Indian Ocean (see the map below). The amount of rainfalls differs between west and east of the mountains due to geographical characteristics. The western side receives less amount ranging from 1000 to 1500mm/year as it is located at leeward side while in the eastern side receive rainfall above 2000mm/year. However, even though there are high rainfalls in Ulugurus as indicated previously there is declining of quantity and quality of water in the Ruvu River which causes rationing of water supply and increase of treatment costs. This is contrary to the fact that the Uluguru Watershed, in particular, is a not only identifiable, but also heavily relied on area for water allocation. Responsible for servicing an estimate 2.8 million in the city centre and roughly 4 million in the surrounding area, the cleanliness of the Uluguru Watershed is of tantamount importance to both health and function of many people and development activities.

### **4.3. Unsustainable land use management**

The hydrological assessment by CARE/WWF (2007a) exposed a key problem of increasing water turbidity in the Ruvu River, increasing at an average of 5 Nephelometric Turbidity Units (NTUs) per year, reflecting a dramatic increase in sediment loading into the river. This is attributed to land-use change causing greater surface run-off and an associated increase in topsoil erosion leading to this increased siltation. Also, the trends analysis on annual volume flows of the Ruvu indicates considerable variance in flows as influenced by the contributions from its sub-catchments and the seasonality of rains. This problem is largely attributed to reduced storage capacity and increased runoff in the catchment as a result of unsustainable land use resulting in significant decrease in land/vegetation cover. Since the 1970s, forested areas in the Ulugurus have decreased in size by approximately 25%. Since as recently as 1995, land under cultivation in the Ulugurus has doubled. In the Kibungo sub-catchment, the extent of cultivated land has increased by 300% since 1995. This calls for innovative approach to make people change their unsustainable land use practices to revert the situation which with climate change influences make things extremely worse. For example, agriculture production depends heavily on availability of rainfall which is no reliable as there is a lot of rainfall variability (CARE/WWF, 2007a).

### **4.4. Impoverishments of dwellers in Ulugurus**

Lastly but not least, Uluguru is a prime site due to the wealth gradient and distribution. The poverty analysis done recently showed that around 31% of the population of the Ulugurus live below bellow 1 USD (URT, 2005b). The study conducted by CARE/WWF (2007c) on livelihood status of people in project villages revealed that most of the households in the surveyed areas of Uluguru ranked annual crop farming as an activity that provides most of their livelihoods including cash income followed by off farm Income, tree/forest resources, livestock keeping and remittances. Generally, the farming system is subsistence farming with slash and burn in shifting practices due to loss of soil fertility after cultivating in the area.

In so far as PES concept is concerned, the prime conditions for PWS programs arise when the wealthier stakeholders are the buyers live downstream of the sellers. This system manifests itself perfectly in the Ulugurus with the mountain dwellers living in

extremely impoverished conditions in comparison to Dar-es-Salaam stakeholders. This makes conglomerating a much more attractive and economically meaningful incentive for the farmers to comply with EPWS objectives and make changes to their land and water management systems to provide, ultimately, for the sustainability of the ecosystem.

## **5. Programme implementation initiatives**

### **5.1. Main land use practices to solve the problems**

As stated at the outset, the EPWS programme is implemented for improving water flow status (quality&quantity) and livelihoods of communities living in the watershed. It is thought that this could be achieved through successfully implementation of land use interventions that will ensure control of run-off and soil erosion hence hydrological status and also improve land productivity in Kibungo Juu hence improving livelihoods.

Poor agricultural producers in Kibungo Juu rural areas are the stewards of watershed services from the Ulugurus. The farmers are engaged in improving the land use practices to improve water quality downstream hence facilitating reduction in cost of treatments of water users. The main land use interventions as key solutions and/or measures to the water problems are agro-forestry, reforestation, bench terraces, fanya Juu/chini, grass stripping and contour planting of crops to restore watershed services in Ulugurus. When growing crops, farmers are using cover crops and mulching on their field to improve soil moisture for improving production. Moreover, riparian zone management are emphasized in order for local farmers to reduce run-off and soil erosion. These measures are believed that they will contribute in conserving the watershed and support improvements of livelihoods of the stewards in terms of high farm yields to ensure food security and cash incomes.

### **5.2. Identification and engagement of farmers in the EPWS implementations**

The project has been implemented in phased approaches. While in phase 1 was used to identify water quality problem, Kibungo Juu hotspot, land use change interventions/solutions and communities to solve or implement the solutions, phase two is for actual implementations. In the community level the farmers to implement the land use change interventions have been identified and engaged in participatory processes as follows:

- Sensitisation and mobilisation meetings were conducted in 2008 to convince farmers to engage in the project implementations
- Few farmers volunteered and registered to engage in the implementation
- The few farmers registered formed groups farmers' in each project village who received various trainings on techniques to apply
- Through groups of farmers demonstrations of techniques performance were done to influence more farmers to engage
- New farmers were encouraged to register and join the implementation of the project initiatives. This went together with formation of new farmers' groups in the villages whereby trainings were organised and conducted to them

### 5.3. Capacity building and Training programmes

Ensuring realisation of the expected achievements depended mainly on successful implementation of all the sustainable land use practices. This required clear understanding of the need to intervene and readiness to change. So the project conducted series of workshops at local and national level to create awareness and buy in of the key players (i.e. communities as sellers and private companies as buyers). Also, specific to land use interventions, it required also practical skills on how to apply the proposed methods/measures. The programme therefore conducts relevant trainings to build capacities and practical skills of local farmers on application of the appropriate Soil and Water Conservation (SWC) and agronomic practices. The farmers have been trained and obtained practical skills on:

- Excavation and uses of “fanya Juu” and bench terraces technologies.
- Tree nursery establishment and management
- Tree planting methods and field management
- Grass strip farming techniques
- Agronomic practices to improve soil moisture and production
- Animal husbandry for income generation, manure production and applications

**Table1. Farmers received training to improve land use practices between July 2009 and June 2010**

<b>Technology</b>	<b>Male</b>	<b>Female</b>	<b>Total</b>
Grass strip, fanya juu and bench terraces with respective agronomic practices	184	81	265
Tree nursery establishment and management	20	15	35
Tree planting methods and field management	242	148	390
<b>Total</b>	<b>446</b>	<b>244</b>	<b>690</b>

*Source: Field data July 2010*

Capacity building also included:

- Use of established demonstration plots in every project operating village whereby “Fanya Juu/chini” and Bench terraces were excavated by farmers themselves.
- Other extension supports to farmers including necessary equipments, tools and materials for accomplishing farm activities. These include: - hand hoes, *sururu*, pangas, and spirit levels, calculators, grinding stones (*tupa*), axe animal manure and high value crops seeds.



country including Lushoto and Mufindi districts for terraces and tree management respectively.

## **6. Achievements to date**

The project implementation is still in progress with various achievements are being noticed. The farmers have committed themselves to implement the soil and water conservation methods as being facilitated by the project. This is due to the fact that they have realised the necessity of implementing the methods. They know about unsustainable land use practices have resulted to loss of forests, increase of soil erosion and sediment load in water systems. The farmers have also listened to the cry of downstream water users about decline of amount and quality of water which are attributed by their unsustainable land use practices/management. Todate various achievements are noted as follows:

### **6.1. Awareness creation and involvement of stakeholders**

The project used significant time to create awareness of various stakeholders including farmers, private sectors, government institutions, experts and CSOs. This has been done through various methods including consultations, workshops, seminars, publications, exchange visits, sharing project documents, media and exhibitions during events like Farmers Festival or known as Nane-Nane Exhibition period. These have ensured participation of stakeholders in the project initiatives and thus making high level of implementations. Crucially:

- There is an apparent increased awareness at the local level on why to conserve water sources and about 60% of the villagers have accepted the project and become joined to the project's initiatives implementation (Mid term review report, 2010).
- There is a reasonable number are women involved in the project initiatives which are about 38% of farmers' group members are women.
- The impression of government towards the project, especially those sectors keenly involved such as Water, agriculture, forestry and Local Government, is a positive one and government is also well represented in the Intermediary Group.

### **6.2. Tree seedlings planting and nursery establishment**

- Over 170,000 tree seedlings were planted between April 2009 and June 2010 and the survival rate is 85%. The trees planted include Mango, Oranges, and Avocado for fruits and food security. Passion fruit plant has also been planted by farmers in the project villages. The most trees planted include Grevillea Robusta and Khaya anthotheca for fire, building poles and timber production. Some species are planted to ensure nitrogen fixation like Gravellia Robusta,
- From September 2010, the farmers are raising over 131,000 tree seedlings including Khaya anthotheca, Grevillea



Robusta and Faidherbia albida in five nurseries. The villagers are involved fully to manage the nurseries and distribution of seedlings.

### **6.3. Physical structure**

To date over 265 farmers, 184 males and 81 females have applied fanya juu, bench terrace and grass strip farming techniques. These techniques are used for growing and producing seasonal and high value crops including maize, beans, tomato and cabbage for food security and earning incomes. These crops are growing very well in the terraces as their management is very simple and efficient. For example, it is easier to add animal manure and irrigate on the terraces as the cultivated areas are well levelled to support water and manure to stay and improve soil productivity.

### **6.4. Agronomic practices**

All farmers engaged in the programme implementation are supported to apply appropriate agronomic practices to ensure high crop yields including:

- Proper farmland ploughing and/or digging
- Intercropping especially, Maize with cover crops including beans and groundnuts
- Agro-forestry (banana and trees)
- Selection and application of Improved seeds
- Application of animal manure
- Specialise to high value crops for markets which are beans, banana, tomato and cabbage.



### **6.5. Livelihood improvement**

Productivity has increased quite significantly for participating farmers for the first year of intervention. The production has been estimated to be three times the traditional one. The farmers as per recent interviews said that crop yields obtained from excavated were higher than before leading to improved lives of people in near future. They have shown that this is tangible benefit to them and has motivated them to continue changing their land use practices to improve their production. This is actually the issue to take into consideration that increase in crop yields is the critical benefit for farmer to engage effectively to the sustainable land management. Furthermore, the crop produced such as tomatoes and cabbages are being sold to the market to gain cash income. These achievements have assurance of remaining in the area with no causing harm to the environment or ecosystem while improving people's livelihoods.

## **7. Payments realisations to rewarding farmers**

### **7.1. Payments arrangements and modalities**

Although [participating farmers are proud of the capacity built to them so far; channelling payments/compensation/incentives to these communities in return for the provision of these services could motivate more local farmers to engage effectively in improved land use practices. The payments are provided to individual

farmer as basically the payment has to be paid to farm owner. The farmers are paid based on land size and technology applied he or she applies. As indicated previously that farmers are applying bench terraces, fanya juu/chini, agroforestry, reforestation, grass stripping and riparian restoration. The prices for these technologies are determined by labour inputs and opportunity costs (for loss of production).

For successful payments and ensuring fairness, all converted farms with improved measures are measured and mapped using GPS and GIS applications to verify the land sizes and method/s applied. Farmers are involved during GPS measurement and sign the data collection tool. Table 2 presents labour and opportunity costs used to determine the compensation amount that one deserves.

**Table 2: Labour and opportunity Costs of implementing respective improved land use practices in the Kibungo sub-catchment**

Method	Land Removed from Productive Use in the First Year	First year opportunity cost (TSH/ha)	Labour days/ha	First year labour cost (TSH/ha)	Total cost (TSH/ha)	Total cost (TSH/acre)
Bench terraces	100%	160,000	140.0	210,000	370,000	149,798
Fanya Juu	20%	32,000	103.7	155,610	187,610	75,955
Reforestation	100%	160,000	50.0	75,000	235,000	95,142
Agroforestry	17%	27,200	9.0	13,500	40,700	16,478
Grass stripping	17%	27,200	9.0	13,500	40,700	16,478
Riparian restoration	100%	160,000	8.0	12,000	172,000	69,636
Pineapple contour farming	14%	22,400	12.0	18,000	40,400	16,356

Source: CARE/WWF, 2008

For successful provisioning of the payments to farmers, CARE and WWF are used to facilitate the linkages and transfer of money. Intrinsically, CARE&WWF are acting as the mediator and bridge between the buyers and the sellers. The organisations are helping the farmers enter into agreement through Memorandum of Understanding (MoU) by providing the education through community awareness. The organisations are also helping farmers form collectives to make their impacts more economically viable, and educate farmers on soil and water conservation technologies such as agronomic, vegetative, and structural management measures that prevent and control land degradation and enhance productivity in their field and allow them to reach the objectives of their contracts. Indeed, CARE-WWF has ascertained the correct trajectories to begin provisioning of payments from The Dar es Salaam Water Supply and Sewerage Corporation (DAWASCO) and Coca Cola Kwanza Ltd as the buyers for the time being.

## 7.2. Payments provisioning to rewarding farmers

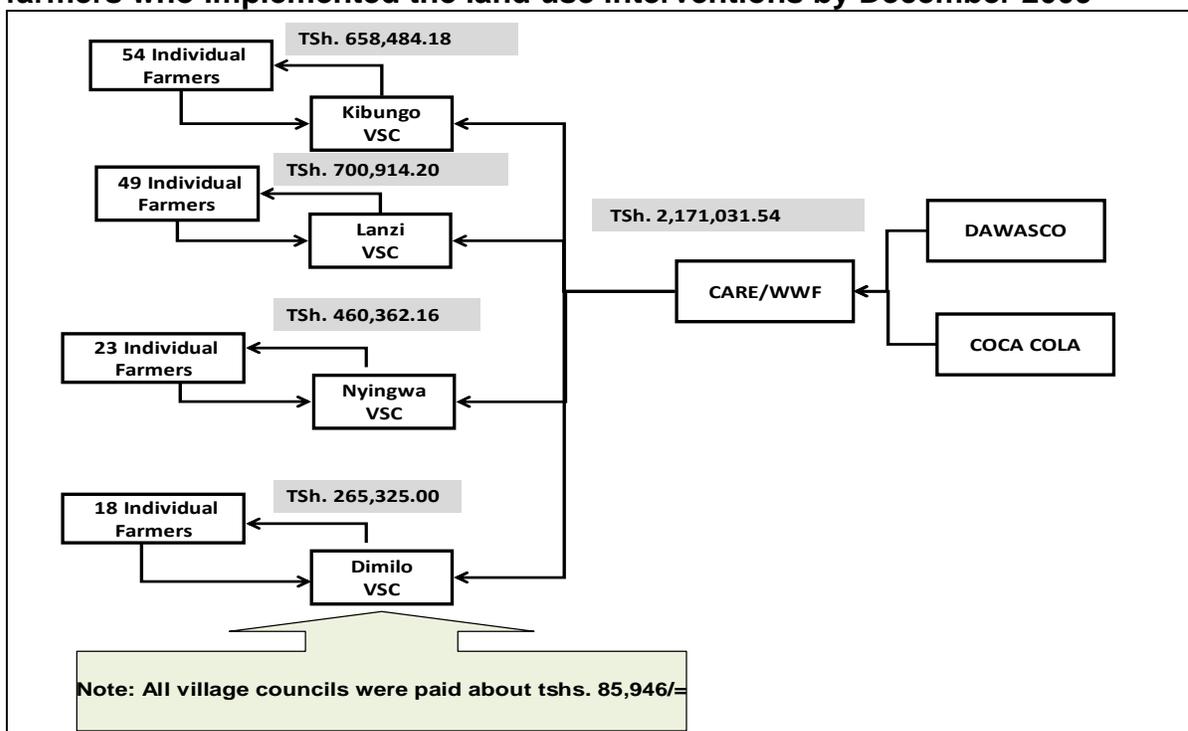
Currently, there are farmers who already received payments from buyers at Kibungo Juu, Uluguru Mountains, Tanzania. The money was transferred from DAWASCO (USD \$5,060) to the Village Council as autonomy local authority consists of village chairperson, village executive officer and village council members totalling to 25 leaders and distributed to the farmers accordingly. The payments are made as per land size and technology applied. As the village councils engage in the whole process of project implementation as supervisors, they are also paid a certain amount of money as per amount of land converted with the improved land use practices/interventions in the respective village/s. The following table 3 and figure 1 present 134 farmers and 3 institutions received and the flow of payments from DAWASCO to them.

**Table 3: Number of farmers received payments from DAWASCO for implementing land use practices by December 2009**

Village	Male	Female	Institution	Total
Kibungo	30	20	1	51
Dimilo	11	7	-	18
Nyingwa	15	6	1	22
Lanzi	25	20	1	46
<b>Total</b>	<b>84</b>	<b>53</b>	<b>3</b>	<b>137</b>

Source: CARE/WWF data base, May 2010

**Figure 1: Payment flow and vehicle from DAWASCO a Buyer to individual farmers who implemented the land use interventions by December 2009**



Source: Drawn in May 2010

## 8. Hydrological monitoring

One of the project objectives is to manage watersheds for improving hydrological status of the Ruvu river. Thus, one of the project performance indicators is the monitoring of hydrological parameters of the catchment in order to gauge the effect the interventions are being implemented on the catchment processes in terms of water quantity and quality (CARE/WWF, 2010). At the moment the project:

- Has fixed of hydro-meteorological equipments in the catchment within Mfizigo river
- Is collecting data collection for rainfalls, temperature, water level, flow volume
- Is currently doing initial data analysis for water quantity and quality



## 9. Project Sustainability and Replication

In implementing this programme, many actors and stakeholders are involved in various ways. These key actors involved in the programme include the communities in programme villages in the Kibungo Juu Ward, the major users of water in Dar es Salaam notably DAWASCO and Coca Cola Kwanza Limited, and Uluguru Mountain Agricultural Development Project (UMADEP) under SUA. Others are Uluguru Nature Reserve Office in Morogoro and Wami-Ruvu Basin Water Office in Morogoro.

Furthermore, the sustainability is ensured by:

- Building capacities of local farmers on EPWS initiatives especially SWC measures including establishment of para-professionals as trained local extension contact persons to enhance extension services among farmers.
- Formation and operationalisation of the Intermediary Group (IG) which is composed of members from local communities (sellers), buyers, government agencies as well as CSOs for taking over and owning the initiative. The IG will take the lead when the role of CARE and WWF to facilitate implementation of the project comes to an end. The IG will also seek to scale-up the initiative across Uluguru Mountains.
- Formation of farmers' network to own and continue advocating for implementing the EPWS initiatives in Uluguru Mountains. This Farmer's network will also involve in scaling up and replicating the EPWS scheme beyond the current programme villages.
- Linking farmers with profitable market to ensure continuation of investing and implementing SWC measures through production of high value crops
- Bringing more buyers on board to ensure flow of resources to the upland farmers. So far contact to Tanzania Breweries Ltd has been established.

## 10. Lessons learnt

Conclusively, in the course of implementing this EPWS programme, it appears that the programme has the potential to contribute to this long-term effort by motivating and supporting local farmers to adopt and use improved/best land use practices.

This is because the EPWS programme supports on building technical capacities and financial incentives to local farmers.

Insofar as EPWS programme provides incentives for improved resource management by individuals and communities, there is emanating interests of various local farmers, local and/or central government authorities, group of people, civil society organisations and research institutions to engage in the EPWS initiatives. This has indicated signs of sustainability of the initiatives being implemented at Kibungo Juu sub-catchment.

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