CLIMATE CHANGE ADAPTATION IN SEMI-ARID DODOMA: AN EXPERIENCE FROM ECO-VILLAGE

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ABSTRACT

Climate change has manifested to largely affect the most vulnerable areas in developing countries. Semi-Arid areas are among the most vulnerable. To lessen the impact, different areas are trying to adapt to the changing climate. The adaptation is, however, relative to specific areas’ social-economic and physical set up. It is against this fact that semi-arid areas also have their own technologies and strategies to adapt to climate change. Therefore, the study was carried out at Chololo village in Dodoma Municipality, which is a semi-arid area, to analyze Climate Change Adaptation Technologies in Semi-Arid Areas. A total of 110 respondents were interviewed. Majority of the households (92.5%) were reported to depend on agriculture as the main stay of their economy. The major findings of the study revealed that adaptation to climate change is more on the use of natural resources and livelihood at large. Therefore, there are adaptation strategies in Agriculture, Energy, Water, Livestock and Economic technologies.

Keywords: Climate, Climate change, Adaptation, Technologies, Strategies, Semi arid areas, Eco village

Contribution/ Originality

This study documents adaptation mechanisms employed by people living in semi arid areas against climate change impacts on their livelihoods. Communities in semi arid Tanzania and particularly in Dodoma are agro-pastoral and therefore highly vulnerable to climate change impacts as their livelihood depends solely on nature.

1. INTRODUCTION

The changes of the climate and its impacts are already occurring and touching the lives of poor people all around the world, especially in developing countries (The United Republic of Tanzania (URT), 2011)
Climate change affects men and women differently because men and women play different roles and have different responsibilities in the societies. Inequality is one of the three concepts of well-being along with poverty and vulnerability (Msaki et al., 2011).

People’s economy is very dependent on the climate (The United Republic of Tanzania (URT), 2011) because a large proportion of the GDP is associated with climate sensitive activities, particularly agriculture (Agrawala et al., 2010). Rainfall seasons have shifted, become shorter and more irregular, thus affecting the potential growth period for the crops growing in semi-arid areas, such as sunflower, maize, beans, sorghum, nuts and millet (Mwanfupe, 2012). These climatic shifts also affect regeneration of rangelands, resulting in insufficient grazing opportunities for rural livestock populations especially in semi-arid areas (Kandjie et al., 2006). The Ministry of Energy and Minerals (Yanda et al., 2007) reported that current climate change and variability cause extreme events such as droughts and floods, which lead to major economic costs in Tanzania. Individual annual events have economic costs in excess of 1% of GDP and occur regularly, reducing long-term growth and affecting millions of people and livelihoods, especially women (United Republic of Tanzania - URT, 2010b). Future climate change could lead to large economic costs, while uncertain, aggregate models indicate that net economic costs could be equivalent to a further 1 to 2 % of the GDP year by 2030 (Boko et al., 2007).

Tanzania is not adequately adapting to the current climate change. The country therefore has a large existing adaptation deficit which requires urgent action especially in semi-arid areas (United Republic of Tanzania - URT, 2010b). This is pronounced to the result of extreme poverty of the developing countries, especially the most vulnerable semi-arid areas. Chololo village is among the poorest villages in Dodoma Municipality, because Dodoma region is characterized by erratic rainfall with an average annual precipitation level of 570mm, where 85% of the rain falls in the months between December and April (Sakai, 2012). Such rainfall pattern in Dodoma makes it impossible to maintain agricultural societies through unstable and capricious rainfall (Ndaga, 2012; Sakai, 2012). The area is pronounced to have frequent famines caused by semi-arid natural conditions (Ndaga, 2012). Because semi-arid areas are by nature vulnerable to climate change, understanding their adaptation strategies to climate change is of significant importance. This is to be able to mitigate potential impacts of climate change to these communities. Therefore, this paper aims at highlighting and analyzing climate change adaptation strategies in semi-arid Dodoma.

2. MATERIALS AND METHODS

2.1. The Study Area

The study was conducted at Chololo village in Dodoma Municipality. The village is located about 46 km outside of Dodoma town, 15 km from the Dar Es Salaam road. Chololo village is the village found at latitude -6.2428 and longitude 36.0003. The village has six different sub-villages: Kawawa, Lusinde, Jamhuri, Muungano, Siasa and Kizota.
The total number of households at Chololo village is 1111 and the total population according to the census of 2012 was about 7500 people. Chololo was selected because at Chololo village there are six agencies from Dodoma working together under the lead of the Institute of Rural Development Planning with the aim of transforming Chololo village into an Eco-village. The project is supporting and empowering the community to test, evaluate and take up new innovations in agriculture, livestock, water, energy, and forestry. 90% of the project support is from the European Union.

2.2. Data Collection Methods

This study employed qualitative study where descriptive analysis was used to collect both primary and a secondary data. Primary data were collected by using:-

Direct observation method, Face to Face Interviews: structured questions which permits detailed & in-depth questioning and minimizes non-response. Telephone Interviews: semi structured telephone interviews with individuals were used during the collection of the data. This method was used mostly to the key informants like Officers in Dodoma Municipality and potential people like the Village Chairperson and the Ward Counselor.

Secondary data were collected to support primary data by using documentary reviews where relevant: reports, journals, text books, articles, published papers, and electronic libraries were reviewed. Enon. et al. (1998) explained that documentary review method involves deriving information by careful studying written documents. In this case, documentary reviews were also used for understanding the background of the problem.

2.3. Organization, Analysis and Presentation of Data

The information obtained from different respondents was well organized from raw data to information, from information to fact, and from fact to knowledge. The knowledge was expressed with statistical degree of confidence. The content analysis systematically extracted the large amount of textual information from open ended questions and focus group discussion. Content analysis is the systematic, replicable technique of compressing many words into fewer content categories based on explicit rules of coding.

The Data collected during surveys were processed through coding where Statistical Package for Social Science and Excel were used; this stage helped to identify and remove errors. The second stage was analysis and interpretation, where SPSS was used. The analyzed descriptive statistics were presented in tables, frequencies, percentages, averages, minimum and maximum values of various variables to provide clear statistical interpretations on the involvement of gender in addressing climate change adaptations technologies.
3. RESULTS AND DISCUSSION

3.1. Climate Change Adaptation Technologies Used at Chololo Village

3.1.1. Agriculture Adaptation Technology

The Agriculture Adaptation Technology was identified as one of the key adaptation technologies implemented at Chololo village, as the majority (92.5%) of the villagers were reported to depend on agriculture as the mainstay of their economy. It was identified that agriculture was the main technology used to address climate change at Chololo village, as the majority of the people in Dodoma Municipality (75%) depend on agriculture as the mainstay of their economy. In order to increase crop production, several interventions were implemented. A good number of farmers (400) were trained on good agricultural practices like tillage, land preparation, spacing, intercropping. Also, 45 farmers were trained on soil water conservation and 33 farmers were trained on production of quality declared seeds. Apart from that, there was the introduction of the 24 ox-drawn tillage for magoye ripper, ox-weeder, ridger plough, where 80 farmers were trained on the usage of the ox-drawn magoye ripper which breaks up the hard pan, allowing rainwater to enrich the soil. Furthermore, farmers were supplied with improved seeds (drought-resistant, high-yielding and early-maturing), in which 100 farmers were trained on sorghum planting, 190 farmers were trained on pearl millet usage, 122 farmers were trained on cowpeas planting, 8 farmers were trained on groundnuts planting and 112 farmers were trained on sunflower planting.

3.1.2. Before Starting of the Project

Benefits of the agriculture adaptation improvements done at Chololo Village were identified. Before and after the start of the Eco-village project, Millet and Sorghum were taken as the main food crops. Before starting of the project crop production was relatively low. Table 1 shows the crop production harvesting categories before the start of the Chololo Eco-village project. Categories were: 100–500kg harvesting per acre, 501–1000kg harvesting per acre and more than 1000kg harvesting per acre. Crops assessed were sorghum and millet, which were notified as the main food crops in Chololo village. However, results show that in the year of 2010/2011 before the Eco-village project, the majority of the farmers (76%) harvested 100kg up to 500kg of sorghum and millet per acre. And 20% of the people in Chololo village harvested 500 – 1000kg where 3.6% of the people harvested above 1000kg of millet and sorghum as well.

Harvesting implied that 76.4% which are the majority harvested one up to five (1 – 5) sacks of sorghum and millet per acre. There are many reasons to comment on the harvesting series, among which is poor agriculture technology used before the project.
Table 1. Amounts of millet and sorghum harvested per acre 2010/2011 in Chololo village before the project

| Amount harvested per acre | Number of respondents | Percentages |
|---------------------------|-----------------------|-------------|
| 100kg – 500kg             | 84                    | 76.4        |
| 501kg – 1000kg            | 22                    | 20.0        |
| 1000kg and above          | 4                     | 3.6         |
| Total                     | 110                   | 100         |

3.1.3. After Starting of the Project

Addressing climate change technologies after starting of the project has shown a sharp and clearly defined increase of the agriculture crop production. The introduction of agricultural innovations has led to very promising results, particularly in food security.

Good trained and adopted agricultural practices included correct spacing, intercropping, soil water conservation and seed production. Tables 2 and 3 show the increases of production rates and expansion of farm sizes after the initiatives of addressing the Agriculture Adaptation Technology at Chololo village. The majority of the farmers (46.4%) in the year of 2011/2012 harvested 500kg up to 1000kg of millet and sorghum per acre this depict positive improvements compared to previous harvesting before the project.

See Table 2&3 here below.

Table 2. Amounts of millet and sorghum harvested per acre in 2011/2012 in Chololo village after the start of the Chololo Eco-village project

| Amount harvested per acre | Number of respondents | Percentage |
|---------------------------|-----------------------|------------|
| 100kg – 500kg             | 42                    | 38.1       |
| 501kg – 1000kg            | 51                    | 46.4       |
| 1000kg and above          | 17                    | 15.5       |
| Total                     | 110                   | 100        |

Table 3. The number of the people and the farm size used to cultivate sorghum and millet in three years concurrently

| Farm size in acre | Year, Number of Household and Percentage |
|-------------------|-----------------------------------------|
|                   | 2010 | 2011 | 2012 |   |
| 0 – 2 acre        | 58   | 55   | 50   | 18  | 16.3|
| 3 – 4 acre        | 40   | 42   | 38.2 | 74  | 67.3|
| 5 acre and above  | 12   | 13   | 11.8 | 18  | 16.4|
| Total             | 110  | 110  | 100  | 110 | 100 |

The start of the Eco-village project has contributed to a very significant agriculture improvement. Majority of the farmers 58% in 2010 used to cultivate 0 – 2 acres of sorghum and millet, and 55% of the farmers in 2011 used to cultivate 0 – 2 acres of sorghum and millet. There is a noted sharp increase in the expansion of the farm size, where the majority of the farmers 74% at Chololo village in 2012 used to cultivate 3 – 4 acre of sorghum and millet as the potential food crops. Farmers have improved the capacity, knowledge and skills of applying fertilizers in the farms; such improvement is the results of the seminars provided in the village. Majority of the
farmers (90%) in the year of 2010 did not apply fertilizers and 87.3% of the farmers in year of 2011 also did not use fertilizers. During 2012, an increment of users of fertilizers was witnessed by the results of the introduction of the Agriculture Adaptation Technologies (see Table 4).

Table 4. The application of farm manure fertilizers in three years concurrently

| Total number of fertilizers application | Year and percentage |
|----------------------------------------|---------------------|
|                                        | 2010 (%) | 2011 (%) | 2012 (%) | 2012 (%) |
| 0 – 1                                   | 08       | 7.3      | 13       | 11.8     | 39       | 35.5     |
| 2 – 3                                   | 03       | 2.7      | 01       | 0.9      | 18       | 16.4     |
| More than three times                   | -        | -        | -        | -        | 03       | 2.7      |
| None                                    | 99       | 90       | 96       | 87.3     | 50       | 45.4     |
| Total                                   | 110      | 100      | 110      | 100      | 110      | 100      |

On acknowledging the benefits of the improved agriculture technologies one respondent (56 years old) declared that:

“As you can see, my farm is for Farmer Field School. Since the introduction of the project now I have ability to harvest more than ten sacks of millet and ground nuts per acre and I know how to keep my farm free from soil erosion. I know how to prepare timely the farm, and I know how to control the weeds. In conjunction to that, I know to select good seeds for a subsequent season and how to store them. All in all I thank those who introduced the Eco-village Project in our village as they have made free from hunger together with my family. I am very proud of my farm, and I request you to take a picture of my farm.”

Further assessment was done to identify the common crops produced in each sub-village. Results were presented graphically (see Figure 1).

The majority of the millet and sorghum producers in Chololo village are from Jamhuri sub-village where 30% of the millet and sorghum are produced and Muungano sub-village 25%. The producers of least millet and sorghum are from Kawawa 8% and Siasa 10%. Farmers in Januhuri sub-village produced 1100 – 1400 tons of millet sorghum in the year of 2012, where farmers in Kawawa sub-village produced 300 – 400 tons of millet and sorghum.

Figure 1. Percentage production of Millet and Sorghum in different sub-villages in Chololo village in 2012.
3.1.4. Water Adaptation Technology

Water is among the vital resources in life; before the start of Chololo Eco-village project, the availability of water was pronounced to be the main problem in Chololo village. There was no permanent source of drinking water in the village as the borehole equipment had broken down, so people (mostly women and girls) had to walk for two hours a day to get a bucket of water from the next village. When it rained, the water soon ran away, creating gullies and causing soil erosion, while the groundwater aquifer was not recharged.

Table 5. Sources of water before Chololo Eco-village project (2010-2011) and after the project (2012)

| Source of water            | Year, number of people and percentage |
|----------------------------|----------------------------------------|
|                            | 2010 (%)  | 2011 (%)  | 2012 (%)  | 2012 (%)  |
| Well seasonal water        | 98 (89.1) | 92 (83.7) | 22 (20)   |            |
| Pond seasonal water        | 10 (9.1)  | 14 (12.7) | 04 (3.6)  |            |
| Rain water harvesting tank | 02 (1.8)  | 02 (1.8)  | 34 (30.9) |            |
| Tap permanent water        | 00 (0)    | 02 (1.8)  | 50 (45.5) |            |
| Total                      | 110 (100) | 110 (100) | 110 (100) |            |

As seen in Table 5, majority of the people (89.1%) in the year 2010 depended on well seasonal water. In the year 2011, the majority of the people (83.7%) were still depending on the well seasonal water. Well water is not safe and not easy accessed. After the establishment of the project in Chololo village, the majority of the people (45.5%) in the year 2012 started to depend on tap water. Tap water is hygienically safe and is easily accessed. The reasons for the sharp improvements were the application of different innovative skills and knowledge on solving the water problem. Among the innovations skills were the restoration of the water supply tap and repair of the village borehole equipment. The village primary school was equipped with roof rainwater harvesting equipment, capturing 60,000 liters of water in underground tanks. The nearby riverbed fills up with water in the rainy season, then runs dry as the water flows away downstream. The project constructed a sub-surface dam to capture thousands of tons of water in the sandy river bed, providing water for domestic use and livestock through the dry season. Finally, a sand dam was built to capture rainwater and recharge the groundwater reserves.

The mentioned innovation skills were done in order to ensure enough water supplies. The process of converting Chololo village to an Eco-village has reduced the problem of water to some extent; people at Chololo village are enjoying the life. One of the respondents (45 years old) said:

“Before the coming of the project, we had no permanent source of water, especially those people around this street, we used to move in different sources like visiting the seasonal river which is found around us. We used to walk for about three hours going to our neighboring village to search for water. We did this during the time of no rain, but during the rainy season we got water from different sources, so to me now days since 2012 we have a specific source of water.”
3.1.5. Energy Technology

Before the Chololo Eco-village project started, households using biogas, energy serving stove, light gas stove and solar energy for cooking were in small numbers compared to those who used firewood as the source of energy for cooking. Firewood was pronounced to be the most common source of energy in Chololo village. The search of firewood had more consequences on women. Women used to walk five hours to collect firewood from the forest, as the trees had been cut down for fuel charcoal and construction. Normally, trees are important in stabilizing soils, provide shade and protection from the wind. The loss of trees increases soil erosion, wind speed and land degradation.

The Chololo Eco-village project has managed to train 133 community members and village leaders on afforestation, nursery management and tree planting.

On top of that, the project has facilitated the planting of trees where 14,668 tree seedlings (leucaena, acacia polycanth, neem, mango, guava) have been planted at 208 households, six churches, the primary school, and the dispensary. Also, 3,000 trees have been planted in three acres of village forest reserve. Thanks to this process, in days to come soil erosion and land degradation will not be observed at Chololo village.

After the coming of the Chololo Eco-village project, the number of households which started to use the biogas and energy saving stoves as the source of energy at household level increased (see Table 6).

Table-6. Household source of energy before the project (2010-2011) after the project (2012)

| Source of Energy       | Number of the Households and percentage |
|------------------------|----------------------------------------|
|                        | 2010 (%) | 2011 (%) | 2012 (%) |
| Biogas Plant           | 01       | 0.91     | 1        | 06       | 5.45 |
| Energy saving stove    | 04       | 3.64     | 5        | 4.55     | 22   | 20 |
| Solar energy           | 03       | 2.72     | 3        | 2.72     | 4    | 3.64 |
| Firewood               | 102      | 92.73    | 101      | 91.82    | 78   | 70.91 |
| Total                  | 110      | 100      | 110      | 100      | 110  | 100 |

Residents were supported to take up the test and evaluate a range of renewable energy technologies, including energy saving cooking stoves and low cost biogas plants. Energy saving stoves were reported to reduce the amount of wood needed to cook and thereby reduce pressure on forest resources, while saving women time and effort and reducing harmful smoke in the home.

Villagers were empowered (literally) with 10 domestic biogas plants producing energy for cooking and lighting and 60 energy saving cooking stoves which were installed in 60 households, using half as much wood and evacuating smoke through a chimney. After the initiatives of the Chololo Eco-village project, most of the villagers were happy to accept the new energy technology by volunteering and using money and time to install the cooking stoves. Data collected revealed that the total number of the household using biogas and energy saving stoves increased from 4.55% in the year of 2010, 6% in 2011 to 25.45% in 2012.
3.1.6. Food Security Adaptation Technology

Food crises emerge when shocks such as drought, flood, pest, economic downturn or conflicts occur and affect this chronically insecure population (FAO, 2007).

Tanzania is among the Sub-Saharan countries which suffer food insecurity; among the most affected places in Tanzania are the semi-arid areas and Dodoma region is among the most affected semi-arid area. Chololo village is a semi-arid area where most of the people suffer from food insecurity. There are many reasons which contribute to food insecurity in Chololo village, among which: poor and inadequate rainfall (erratic), serious drought, soil erosion, poor technology and lack of resistant seeds as Kalumanga et al. (2014). Chololo Eco-village project noticed all these problems and created the way forward to adapt, mitigate and hence solve these problems. The project supported and empowered the community to test, evaluate and take up new innovations in agriculture and other related climate change adaptation technologies.

Fourteen climate change adaptation interventions have been tested so far in Chololo village via Chololo Eco-village, with evaluation underway. This intervention includes the provision of the improved harvests of crops, notably early maturing sorghum, pearl millet and sunflower, which are contributing to the food security of hundreds of farming households and increasing household incomes for over 100 farmers at Chololo village, while 123 chicken keepers, mostly female, were all empowered to start and test the results of improved breeding and livestock management.

Female are the family bread winners to most of the poor countries like Tanzania, empowering of women is empowering of the whole community this can not only be seen in food security but in all spheres of developments like social, political and economic sphere. (Kalumanga et al., 2014)

Figure 2 shows the distribution of different food crops grown in different sub-villages in Chololo village. Kawawa and Muungano sub-villages are noted to produce many tons of millet and sorghum in the year of 2012, where more than 330 tons of millet were produced from these two sub-villages. Kizota and Siasa were noted to be the producers of least food products in the year of 2012, with less than 200 tons of millet and sorghum. The reason behind the different productions is that a larger number of farmers from Kawawa and Muungano got the seminars on adaptation skills, where fewer people from Siasa and Kizota attended the seminars (see Figure 2)
3.1.7. Economic Adaptation Technology

Chololo Eco-village project realized the importance of stabilizing the community economy at Chololo village by improving capacity of most of the groups in Chololo village, especially women groups. The project has trained women to make the normal skin of cattle into leather through tanning processes.

Chololo Eco-village project has done a lot in raising the villagers’ income. After the start of the project, villagers have diversified the source of income. Instead of depending on agriculture as the only source of income, people started to depend on the chicken keeping project, fish keeping project, milk exotic cow keeping project, bee-keeping project and tanning skin into pure leather project. All of these projects have caused the increase of the individual income and household income. Through the diversification of projects, villagers have gained the ability to run their lives easier. Data showed that before the project, the majority depended on agriculture production crops as the only means and source of income (see Table 7).

| Economic activity contributing income at household level | Year and percentage | 2010 (%) | 2011 (%) | 2012 (%) |
|--------------------------------------------------------|---------------------|----------|----------|----------|
| Agriculture (selling of food & cash crops)             |                     | 81       | 73.6     | 74       | 67.3     | 45       | 40.9     |
| Fish keeping (selling of fish)                         | -                    | -        | -        | -        | -        | 09       | 8.2      |
| Tanning of skin (selling of processed skin)            | -                    | -        | -        | -        | -        | 11       | 10       |
| Chicken keeping (selling of eggs and chicken)          | 12                   | 10.9     | 17       | 15.4     | 22       | 20       |
| Cow keeping (selling of milk and cow)                  | 17                   | 15.5     | 19       | 17.3     | 13       | 11.8     |
| Bee keeping (selling of honey)                         | -                    | -        | -        | -        | -        | 03       | 2.7      |
| Others (women crediting groups)                        | -                    | -        | -        | -        | -        | 07       | 6.4      |
| Total                                                  | 110                  | 100      | 110      | 100      | 110      | 100      |
As the result of the project, the majority of the people (59.1%) started to depend on other sources of income rather than agriculture crops. Data shows that 10.9% of the household’s income in 2010 depended on chicken keeping and 15.5% of the household’s income depended on cow milk. After the start of the project, many income diversifications was noted, where in 2012 many households started to have several sources of income apart from agriculture crops production. In 2012, only 40.9% depended on agriculture as the main source of income. In conjunction to that, in 2012 20% of the households depended on chicken keeping as the main source of income, while 11.8% depended on cow milk, and 10% and 8.2% depended on selling of the processed skin and fish respectively. All of the explanations implied that the coming of the project seemed to be of great important to the people of Chololo village, as the project opened the door for a highly and notable increase of per capita income of the villagers.

On assessing the household yearly income, data revealed that in the years 2010 and 2011, before the project, the majority of the households (59.1% and 50.9%) were noted to have their annual income range of Tzs. 100,001 to 300,000. In 2012, after the start of the project, household income increased highly. The majority of the households in 2012 were noted to have the annual income ranges from Tzs. 300,001 to 500,000. Data revealed that the household income rose by 34% from the year of 2010 to the year of 2012, proving the importance of the project (see Table 8).

| Range amount for the Household income in Tzs. | Year and percentage | 2010 (%) | 2011 (%) | 2012 (%) |
|------------------------------------------------|---------------------|----------|----------|----------|
| 0 – 100,000                                    |                     | 33       | 41       | 17       | 15.5     |
| 100,001 – 300,000                              |                     | 65       | 56       | 23       | 20.9     |
| 300,001 – 500,000                              |                     | 09       | 11       | 57       | 51.8     |
| 500,001 and above                              |                     | 03       | 2        | 13       | 11.8     |
| Total                                         |                     | 110      | 110      | 110      | 100      |

Similarly, the number of the household who earned Tzs. 500,001 and above increased. Data showed that the number of households which earned more than Tzs. 500,000 per year increased from 2.7% in 2010 to 11.8% in 2012. This data revealed that the coming of the Chololo Eco-village project showed a positive impact in the economic development of the majority of the people, as it rose the per capita income of the individual and the household at large.

4. CONCLUSION

Climate change adaptation technologies used at Chololo villages are: Agriculture Adaptation Technology, Water Adaptation Technology, Energy Technology, Food Security Adaptation Technology and Economic Adaptation Technology. All of the five technologies have been well addressed and provided positive results in converting Chololo village into an Eco-village.
Agriculture technology was among the first technologies used at Chololo village. The aim was to improve the agricultural status of Chololo village and combat hunger. Livestock keeping was the second adaptation technology addressed at Chololo village, with the aim of improving the livestock keeping status of Chololo village. The third adaptation technology was water; the aim was to re-strain and combat water problem in Chololo village. Energy was the fourth adaptation technology addressed in Chololo village with the aim of reducing deforestation and conserving environments. Economic adaptation technology was the fifth identified technology, with the aim of improving the living standard of the people in Chololo village. All of these technologies provided positive results at Chololo village.

5. RECOMMENDATIONS

Changes or converting of any Village into an Eco-village is real possible, and if well done it will take poor villages like Chololo village into sustainable development.

From this matter emphasis should be highly put in the usage of simple energy serving stove like the pyrolytic stove, one of the new technologies pronounced to be suitable in Dodoma region. It is suggested that the village should use the new technology like Pyrolytic stove technology which has been introduced at St. John’s University in Dodoma by the Institute of Development Studies this will prohibit the deforestation processes taking place at Chololo village and Dodoma in general, since the pyrolytic stove uses plant residue and animal dung.

The community should use good agriculture methods for conserving the land, for example mixed cropping, stopping gentle slope cultivation and finally the use of drought resistant plants should be more applicable, because Dodoma has a poor and erratic rainfall distribution.

The government should assist the institutes in the donation of the required 20% by the Project funders, should construct good policies to the project implementers and funders, which dictate a higher involvement of women when addressing climate change. This should increase the speed of alleviating poverty in all dimensions by equipping the community with quality Education, Infrastructure, Health centers etc.

It is recommended that, the Government and other development stakeholders should increase many projects like that of Chololo villages in order for the country to reach its Millennium Development Goals.

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