Climate Change Mitigation & Biodiversity Conservation

PELUM Kenya Intervention Efforts

A Publication of
Participatory Ecological Land Use Management Association
(PELUM-Kenya)

Important Notes:

Editorial

To all the readers,

The case studies selected by PELUM-Kenya and its partner organizations document the way small scale holder farmers interpret climate change and adaptive mechanisms for sustainable livelihood improvement and effort for biodiversity conservation. We felt that some of these unique best practices should be documented and shared with other communities living and working in related ecological zones.

These best practices contribute to restoring and conserving local biodiversity. We hope that these experiences will stimulate others to explore and develop new adaptive mechanism that will help small holder farmers guard themselves against the harsh effects of climate change and its negative effects as we work together towards our goal of promoting a sustainable livelihood and contribute to the development of a greener environment capable of resisting some of the impacts of climate change. It also our hope that these innovative practices will be rolled out, replicated and scaled-up for domestication by other communities world wide.

We thank the Swedish Society for Nature Conservation (SSNC) for supporting this initiative and also partnering with PELUM-Kenya in its concerted efforts and endeavors to improve the livelihood security in Kenya and the region.

Zachary Makanya
COUNTRY COORDINATOR
PELUM-Kenya

Foreword

Climate Change Mitigation and Biodiversity Conservation

PELUM Kenya Intervention efforts:

It is irrefutable that the complexity of Climate Change has affected livelihoods of communities in Kenya, with famine as a typical phenomenon characterized by government relief food aid and hundreds of related fatal results of starvation reported over the last 10 years. To enhance sustainable livelihoods, communities have deliberately taken charge of their own situations in collaboration with development agencies.

Participatory Ecological land Use Management (PELUM) Kenya, a network of 36 Civil Society Organizations working with small scale farmers in Kenya has been on the forefront in creating awareness by enhancing the capacities on effects of global warming and climate change as well as the importance of biodiversity conservation. This publication shares some case studies of PELUM Kenya Member Organizations' work using different strategies aimed at coping and eventually mitigating the effects of climate change and biodiversity conservation.

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PELUM Kenya

The Case Studies...

Using 50 Beds Unit Technology for Grow Bio-Intensive Agriculture;

Farmers learning to use 50 Beds Unit approach at Manor House Agricultural Centre (MHAC) in Kitale Kenya as a best practice in Grow Bio –Intensive Agriculture

Over 2100 farmers are practicing Calorie and Carbon Crops Production also known to be the 50 Beds Unit in Western Kenya counties; this is in the spirit of Grow Bio-Intensive Agriculture. There are 42 mini training centers established at community level by Manor House Agricultural Centre. Each of these centers has at least 50 farmers who have adopted this practice. One of the outstanding Mini training centers is JOAN – Junior Organic Agriculture Network - in Bungoma District.

What Is Grow Bio-Intensive Agriculture?

This is a method of farming which re-links people with the whole universe, in which each one of us is an interwoven of the whole. People relate and cooperate well with the sun, air, rain, soil, moon, insects, plants and animals rather than attempting to dominate them.

It focuses on Composting to improve soil fertility, deep soil preparation to enhance growth, Mulching to conserve moisture, Close spacing to increase productivity and Non-chemical pest and disease control to manage plant diseases and pests.

If correctly practiced, it has the potential to increase crop yields 2- 4 times per unit land area more than in conventional agriculture.

The components of this the system includes; Deep soil land Preparation - double digging to enhance growth, Compost manure to improve soil fertility, Close Spacing to increase productivity (diagonal offset). Companion Planting and crop diversification, Calorie and Carbon Crops Production, Open-Pollinated Seeds to enhance plant genetics resource conservation and utilization, Non Chemical Pest and Disease Management.

Example of 50beds unit at Manor House Agricultural Centre

The 50 beds unit is enough to produce food for one person. Maize growing is mainly for Carbon and food but for income go for high value crops. Demonstrated on close spacing Different crops have different spacing – Maize, kales and managu is 30x30cm; spring onions and spinach is 15x15cm – all on diagonal offset. A bed of 1.5x6m carries 99 plants, flowers, and the 50 bed unit on practice, crops and the space under the design. The 50 beds occupy 5.4 portion of an acre. This is equivalent to a fifth of acre.

Manor House Agricultural Centre (MHAC) was established in 1984 as non-profit Trust to promote Bio-Intensive Agriculture (BIA), through Training, Research and Extension. One of their approaches is Grow Bio – Intensive Agriculture used for training is the 50 Beds Unit that includes Calories and Carbon Crops Production

50 Beds Unit Technology

This is the smallest and economical area that one can use to grow crops. This area is further divided in percentages and number of beds represented. 60% (30 beds) should be for carbon crops, 30% (15 beds) to be under Root / Calories. The 10% (5 beds) they are meant for Vegetables for income generation. When growing arrange in such a way that crops from different families follow each other in a rotational manner. Maize can be followed by beans then followed by sunflower then vegetables.

Benefits of Grow Bio-Intensive Agriculture

a. Higher production as a result of maximizing on the diminishing land available for agricultural production

b. Material for composting does not need to be harvested from external sources as this bed provides enough material to compost for fertilizing the entire unit

c. There is high crop diversification due to the different families of crops

d. It is easier to plan for crop rotation on your farm

e. The bed leads to sustainability since all the required nutrients (for human consumption as well as nutrients for soil fertility) are sufficiently addressed on the unit

Manor House Agricultural Centre (MHAC) was established in 1984 as non-profit Trust to promote Bio-Intensive Agriculture (BIA), through Training, Research and Extension.
Since its inception many small scale farmers from all over the world have benefited and adopted the skills.
The centre uses Farmer-Farmer Extension Approach to establish a viable demonstration plot for BIA and other innovations, which is contributed by the farmers for learning purposes meant to encourage and empower farmers to educate and enrich each other with appropriate knowledge and technologies

"Over 2100 farmers are practicing Calorie and Carbon Crops Production after training at Manor House Agricultural Centre"

Approximate crop area percentage for sustainability

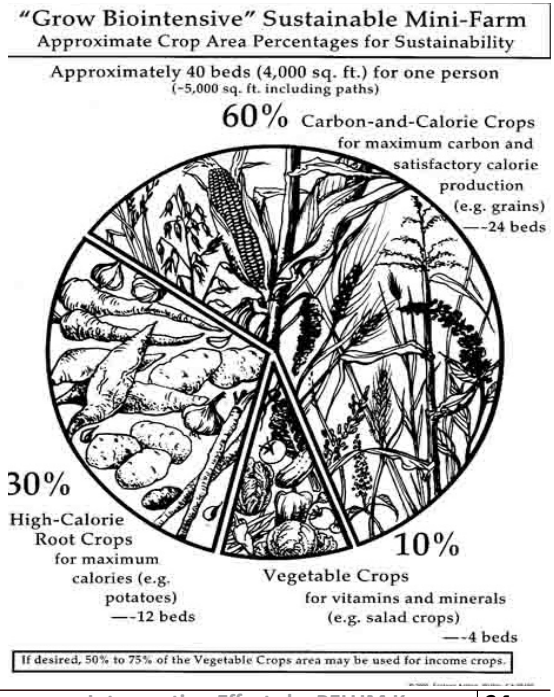
Bed % Percentage	No. of beds	Sq feet	Crop to grow
60	24	4,000	**Carbon and Calorie crops for maximum calories and satisfactory calorie production.** **Grains:** Maize, Wheat, finger millet, Cereal Rye, Oats, Barley, Triticale, Corn, Sorghum, Amaranth, Quinoa, grain amaranth.
30	12	2,000	**High calorie/ root crops for maximum calories** (preferred for high income per unit area) e.g. Potatoes, Jerusalem Artichoke, Leeks, Sweet Potatoes, Garlic, Parsnips, Salsify, cassava and others

If carbon or compost crops are grown in about 60% of the cultivated land, they can provide the compost and thus the fertility for one hundred percent of the cultivated land. Many cereal crops like; maize, beans, cowpeas, sorghum, pigeon peas, etc qualify as compost crops, providing both food and abundant compost. Additionally some of these compost crops may be grown during the winter, when the land would be otherwise unused. Certain compost crops are higher in carbon while others are higher in nitrogen, and the desired proportion of each must be grown. Also, certain compost crops take particular desired nutrients from the subsoil and concentrate them in the compost.

This proportion of 60 % compost crops is crucial to the sustainability that is the goal of the Bio-intensive method, and to the fertility of one's garden.

Bio Intensive Agriculture is a method of raising crops that is simple to learn and use, based on sophisticated principles dating back 4000 years in china, 2000years in Greece, 300 years in Europe. It was synthesized and brought to the U.S by the English master horticulturalist, Alan Chadwick, then further developed and documented by Ecology Action.

An Image of 50 beds unit design



Use of Catchment Approach as a Climate Change Mitigation strategy in Kajiado County of Kenya

… 'The elephant is not bothered by its tasks', said Mr. Sipietet Kilelu, I lost my entire herd and now am happy to have been trained on copying with climate change by harvesting grass which I had neglected as I believed cattle grazed on. I harvest grass and sell to other farmers, through this am able to re-stock, pay school fees for my sixteen children and provide to my three wives".

Just like Mr. Sipatiet, most Maasai communities in Olemurkat village, Olopelipeli location who are pastoralists rely heavily on livestock layering and nomadic way of life. In the recent years, climate change effect manifesting itself in long dry spells (drought) and short unpredictable rainfall patterns have impacted negatively on the their paternalistic way of life.

Climate change is a reality and there is an urgent need for all stake holders-civil society, government to work together in mitigating its effects as small scale holder farmers like Sipitiet are highly hit by the changing phenomenon.

Use of Catchment Approach as a Mitigation

In order to ease the situation in Olopelipeli and assist the community to understand interpret and cope with climate change, Neighbours Initiative Alliance (NIA), an NGO operating in Kajiado, introduced the "Catchment Approach" in the case of Olopelipeli (a steeply and hilly terrain)

In this model, NIA sunk a bore-hole where water is pumped to a reservoir constructed with support from county council. Trees have been planted around this borehole to protect the environment.

Neighbours Initiative Alliance is a member of PELUM-Kenya Association implementing a number of sustainable agriculture and livelihood programmes in the larger Kajiado District in Kenya.

The Catchment Approach

This is a holistic approach employed by communities with aim of resuscitating and protecting water points. It involves planting of trees on around water source and hanging of bee hives. This model uses an integrated approach where the bees benefit from the water and the water is protected by the trees which produce flowers for the bees. The result is the eventual (e.g. after 5-10years) rising of the water

table of the area. It promotes ecological sustainability where organism benefit from water and trees planted around conserves soil while pollination and other ecosystem processes are enhanced.

The Olopelipeli area used to have streams a long time ago which dried up over time due to destruction of vegetation cover for economic activities e.g. charcoal burning hence the streams dried up. The number of times the community would go without water drastically increased due to this, as well as the long dry spells caused by climate change. The community is now very keen on protecting their water resource. On that note, the community thought of methods of diversification of food and income sources with beekeeping, for honey and wax. Due to unstable rainfall patterns and the current land policy that restricts the Maasai nomadic lifestyle of moving from place to place in search of pasture. It is a way of adapting to climate change and a long term strategy to mitigate against climate change.

Within this set-up, an Income Generating Activity (IGA) Bee keeping is practiced where by bee hives have been hanged around the borehole, and the bees are able to access water from the animal's trough. The community is able to benefit by use of water for both domestic and animal watering. The bore hole has saved the community the agony of travelling long distances in such of water as animals are broughtfor watering as early as 10.00 a.m. The women who have previously been burdened with responsibility of searching for water thus travelling long distances, sometimes a whole day are now able to attend to house hold chores timely as they can now access water nearby.

"…the borehole serves about 600 families with water for both domestic use and for their livestock"

Water from the borehole is piped and flows with gravity to the primary school. This has enhanced school feeding programme as food is prepared in school and hygiene is enhanced. The bore –hole is managed by an elected team of community members who have employed an attendant that is paid by proceeds from sale of water. Every family is charged KShs 150 ($2) per month and is able to fetch water for domestic use and also give to animals as many times as they wish. The management committee benefits from proceeds from sale of honey.

Pasture management-the story of Mr. Sipitiet Kilelu

Mr. Sipitiet Kilelu hails from Olemurkat village, Engorika division Kajiado south District of Kenya. Sipitiet lost hundreds of livestock last year due to unpredictable long spell of drought. He has set aside over 100 Acres of land for grass harvesting. In an attempt to cope with climate change, Mzee Kilelu was trained on pasture management by NIA and provided with a manual bailer which is shared among community members. He is able to work with his wife in bailing pasture.

Mixed farming is beginning to be practiced in the traditionally renowned pastoralist region. The fast grasslands of Kajiado have for years supported rearing of huge herds of cattle, however the prolonged dry spells have changed this trend with many pastoralists losing livestock in great numbers to famine while others have either reduced or relocated their flock.

Pro-pollinators on the slopes of Oldonyo Sabuk Mountain, Kenya;

The assumption that pollination is a "free ecological service" is erroneous. Pollinators play an important role in the maintenance of ecosystem services and functions. The process of pollination requires pollinating agents (i.e. Pollinators) which themselves require resources for nesting, feeding and reproduction in the form of vegetation, prey and certain habitat conditions.

by Sustainable Agriculture Community Development Programme (SACDEP), pollinators are at risk of extinctions if not conserved. The principal focus of the project was to investigate and demonstrate the role of pollinators on indigenous crops at Kilimambogo.

The main reason for selection of Kilimambogo as a case study site was because of the existence of the mainly untamed forest (on the slopes of Ol Donyo Sabuk Mountain) adjacent to farmlands,

hence offering a unique opportunity for scientific study of pollination biology in partnership between community and technical people.

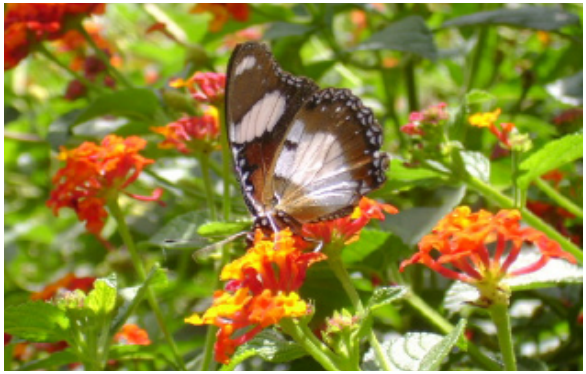
According to SACDEP, the project intended to quantify the economic contribution of pollination in agricultural yield. This was by understanding the knowledge of Kilimambogo community members on pollinator-plant dynamics, and to show them how deforestation and degradation would have an effect on pollinators and pollination?

Some of the human activities, which were found to threaten pollinators at Ol Donyo Sabuk include;

Slash and burn of natural ecosystems and burning refuse on agricultural land

Slash – and- burn systems destroy nesting sites for pollinators in the soil e.g. dead wood and twigs. This particularly evident at the Nzamabini area of Kilimambogo Mountain where the community has over the time encroached the forest by cutting down trees for charcoal burning and agriculture.

Excessive use of agricultural inputs (Pesticides, herbicides and fertilizers). Modern chemical pesticides are poisonous. They are not only harmful to human health but also kills beneficial organisms like the pollinating agents, destroying the on-farm and the external wider environment. Examples of areas with excessive agro-chemical use include the coffee growing areas of central Kenya and the extensive commercial pineapple production farm lands of Thika, Kenya. Efforts to control plant pests can have severe unintended consequences of pollination.



The impact of insecticide application on pollination services and the resulting crop yields on the kind of pesticide, dosage, formulation and timing of application.

Deforestation,

Excessive extraction of timber and other non-timber forest products destroys pollinator habitat e.g. the Mau and mount Kenya forests.

Collection of dead wood for burning as firewood.

Dead wood provides nesting sites for many insect species.

Overgrazing trample nests of ground nesting insects.

Over- grazing occurs when the animals are left too long in an area. This is largely a function of timing rather that the numbers of animals. Besides trampling and destroying ground nesting niches for insects, the animals severely damage the grass plants a second time before the root recover from their first bite. The Arid and Semi Arid Land areas of Kenya and Eastern Uganda are good examples of where overgrazing is a common phenomenon.

Pollution form industrial and urban activities as evidenced by the Nairobi River that drains to the larger Athi River.

Malathion for instance is very toxic, especially in its micro-encapsulated from where it mimics and travels like pollen grains, but can have important impacts through eliminating larval host plants (weeds) for butterflies or reducing nectar and pollen for bees.

What are the good practices then?

The expanding awareness, understanding and value of the multiple goods and services by pollinators can help make forest and agriculture more sustainable and improve productivity in agro-ecosystems.

Generally accepted measures include;

a. Conserving and restoring natural habitats needed to optimize pollinator services. Examples include the current reforestation exercises to reclaim and restore the Mau forest of the Rift Valley and Mt. Kilimambogo forest.

b. Growing flowering crop plants preferred by pollinators like; mango, pigeon peas, cashew nuts and many more. This will provide them with food and hence multiply their populations.

c. Promoting mixed farming systems. Mixed farming provides plant diversity. Plant diversity says that there should be a wide variety of different plants on land at any one time. Violation of this law brings swift repercussions particularly in the tropics and sub-tropics. In the undisturbed bushes on the edges of the cropped areas we find plants of every kind and height living harmoniously together. Here and there a plant may have some insects on it but the predators are also evident in sufficient number to prevent an outbreak.

e. Establishing nectar corridors for migratory pollinators. This will as well provide forage for plants.

f. Providing habitats alongside cropland for pollinator nesting and food.

FACTS ON OLDONYO SABUK MOUNTAIN

Oldonyo Sabuk (in Kikuyu language- **Kilimambogo**) is a mountain and an adjacent small town in central Kenya. The peak, height 2,145 meters (7,037 ft), was named by Maasai pastoralists, meaning big mountain. The Kikuyu name, Kilima Mbogo, means Buffalo Mountain. The town stands at the border Machakos District and Thika District. Lord Macmillan was the first man to settle here, and everything else that has happened since is largely attributed to him. The town is quite dusty, due to deforestation and loose ground cover, compounded by occasional rainfall. However, the area is adorned with lots of untamed beauty. This is a national park but has received very few visitors. The biodiversity Is not well taken care of so there has been encroachment by cutting trees, poaching, irregular/ grazing within the national park therefore the beauty is not tamed to bring out the best and encourage visitors.

What is pollination?

Pollinators refer to living organisms which aide the process of pollination. They are anthophiles (flower visitors), that facilitate and support pollination. They seek pollen, nectar, oil, or floral tissue to satisfy their needs. Some examples of pollinators are bees, butterflies, flies, beetles, birds and bats.

Where are pollinators found?

Most pollinators live in natural ecosystems such

as forests, wetlands and unpolluted farmlands where flowering plants occur. Pollinators are found wherever flowering plants flourish. An ecosystem with a wide diversity of plants harbors more pollinating species.

Mitigation measures for the Kilimambogo community

The pollinators project has however managed to scale down the encroachment by sensitizing the community on the importance of the forest and the relationship between their livelihoods and the forest. They (community) have been encouraged and mobilized to participate in the rehabilitation of the encroached and destroyed parts of the forest. Rehabilitation has entailed reforestation by the use of indigenous tree seedlings. The seedlings are being raised in tree nurseries owned by organized community based groups and individuals. The community has promised to take care of the planted seedlings to maturity.

They also learnt that when applying any pesticide, or other agrochemical, strict adherence to safety (operator and pollinator) guidelines should be followed. Often less toxic alternative insecticide could be used. Honey bee colonies can be covered to keep foragers in their nest during spraying, or spraying can be done at night. Bees are generally very sensitive to insecticides.

Source: Pollinators and Pollination, the role of Pollinators in Agriculture and in the Ecosystem – ©SACDEP Kenya.

Farmers Adapt to Climate Change through Fish farming in Sagana, Kenya;

The story of William Kiama, a fish farmer from Kagima Village, Sagana.

Fish farming in Kenya was always believed to be for communities who live around the lake or ocean especially around Lake Victoria, Lake Turkana, Naivasha and Indian Ocean or along rivers where fish exist naturally. These believe has tremendously changed as farmers from central Kenya's highlands have opted to venture into aquaculture as a mitigation strategy to the changing climate.

William Kiama's interview with Betty Muasya

Location: KarimaVillage, Sagana Division, Kirinyaga West District, Central Province, Kenya

Betty: Why did you start fish farming?
Karima:

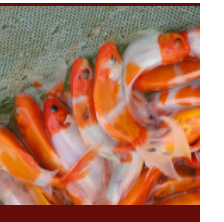
Before I started aquaculture (Fish farming), I used to do horticulture and agriculture but as you know horticulture requires a lot of water and due to these issues of global warming and climate change water has become very scarce. Rainfalls are inconsistent resulting to recurrent prolonged drought. As a result I was experiencing losses continually

Aerial view of Karima's fish ponds in Sagana, Kenya ©PELUM Kenya

and decided to look for alternatives. During that time I used to grow tomatoes, vegetables and long red cayenne pepper on this section of land that the fish pond is currently occupying. I also reared pigs and dairy cattle. But the amount water I used to irrigate my tomatoes was high; I used to pump water three times weekly or sometimes everyday from the river nearby leading to its reduced water levels. This forced me to venture into fish farming. Long before, I had trained on fish farming I had acquired some background about fish farming having been trained by the government of Kenya in partnership with Centre for Research and Industrial Staff Performance (CRISP), an American based organization, so I had knowledge on fish farming. When I compared the amount of water required in a single fish pond to what I used in horticulture I realized that fish farming required very little amount of water.

Fish farming uses 1\8th of the amount of water I use in horticulture and this is why I started fish farming. My first pond was 50meters square, it took me 4 to 5 hours to fill it with water and that whole year I never added a single drop instead I was leveling the water due to rainfall to avoid overflow that might carry the fish away. I then expanded to the 300 meters square fish ponds and I have never had a conflict with the tomato farmers around here over water usage anymore. During prolonged drought periods, I would see other farmers travelling far to search for water, but my fish ponds are here with water and am just

comfortable am not going to look for any water.



"If you put water once into the fish pond, you only need to top up a little throughout the year since the kind of fish we rear here like the Cut fish and Tilapia don't need water in and out it requires stagnant water but make sure it has sufficient oxygen and to maintain this you need to put enough fertilizer"

William Karima

Betty: What was your experience with the first fish Pond?

Kirima:

I introduced Tilapia in my first fish pond. During that time it was supposed to be 2 fish per M² sq and this pond was five by ten hence 50 M² sq but I was required to put 100 fish, the ones that are supposed to grow until they are stable i.e. 4 kilo and that would have taken me about 8 months. Since I need small fish to the half size of my palm then remove scales, intestines and deep fry it for economic value I didn't put 2 M² sq I did 12 M² sq. My fish pond here took 600 Tilapias instead of 100 Tilapias and after 2 to 3 months we were already eating fish here

It's true that the big fish has a lot of fiber or flesh as compared to the small ones ornamental fish but the calorie value of the big fish is low when compared to the small fish, I had also included 50 Gold fish together with the Tilapias, after 4 months the Gold fish had reproduced, so the Tilapia in the pond that I sold after 6 months I had made Ksh. 20 ,000 ($280) but I sold nearly 600 Gold fish at Ksh. 36,000 ($462) and that was an eye opener. I asked myself why I grew
tomatoes, spraying pesticides everyday and watering until my back is aching and am not even near that amount, so I thought to expand into the big ponds (300 meters square) to get income.

I now have a variety of fish; Gold fish, Tilapia, American Gabby, sword tail, Shubun Kill, the famous Coy caps, Oranda and expecting more.

"…at least every home in Kenya should have a kitchen pond so that when children come from school, they will say yesterday we ate chicken today we should eat fish from the pond" Kirima

Betty: How about the wooden fish ponds?

Karima:

Some people in Kenya have a lot of wood, they cook using wood and other different uses, I
decided to use wood as opposed to digging deep in the soil, after creating the wood buffer I blocked the tiny spaces using polythene and you can see farming is ongoing and others can use this example. This method is also suitable for farmers who don't have enough space and to show as an example farmers from Meru area visited and are using the wood fish pond method to build a pond and do fish farming.

Betty: What are the requirements on the depth size when constructing a fish pond?

Karima:

The fish pond requires a certain depth, deep end to have 1.3 meters and shallow end to have 1 meter. If you do 3 meters or 2 meters here in colder regions the farming won't be good because fish requires 27C to 30 C of temperature maintained. If it's too deep, for the water depth to acquire the estimated heat will take too long. So am advising farmers around here to dig 1
meter deep or slightly above but remember stalking density changes from area to area since some areas are very cold while others are very hot. On hot areas we advise farmers to stalk 3 per meter square while on colder areas 2 per meter square
On hotter areas fish farming is effective since there is enough heat and if there will be enough water places like Mtito Andei, Kisumu and the likes, by 6 months fish will have attained 300 grams water.

Betty: What are the main benefits of fish farming other than climate change adaptation strategy?

Karima:

a) Nowadays we say "fish farming for healthy and wealthy body or soul" initially farmers would grow maize, beans and other horticultural crops for food security but nowadays if you need healthy living then opt for aquaculture since it has all nutrients, you can sell for school fees, buy cattle and also a sustainable income or revenue generation activity for a farmer

b) Fish has what matters in the human body; Calcium, Phosphorus, Iron and the OMEGA 3 for the brain so that our children can grow with healthy brains and lead this country well.

c) Fish farming also produces organic compost manure that I use in my vegetable farm and that cuts cost on chemical fertilizers hence supports other farming through manure and soil nutrients

d) I have no problem with mosquitoes here since the fish prey on their eggs hence affecting breeding rates since mosquitoes need stagnant water like these ponds for breeding therefore they are controlled naturally this reduce cases of malaria by controlling climate sensitive diseased by reducing number of mosquitoes here.

Shifting from large scale farming to Kitchen Garden in Gatanga, Kenya;

Farmers in Kerura Village embrace kitchen gardens to adapt to climate change

A view of Nyagila Women group's Kitchen Garden with some members watering and pruning kales in Gatanga

"The weather has extremely changed compared to the past few years when River Kiama used to flow but now it's dried up. We used to grow Millet and black eye peas) but now they aren't doing well," said Leah Wangoi.

After noticing the weather change, Youth Action for Rural Development (YARD) trained us alternative farming methods to cope with the changing climate. Since it never rains as before, we have to water our crops through irrigation because trees that were responsible for rains were cut, but even though we have decided to replant and change the weather again.
We have tree nurseries and that a step ahead to see if the weather shall change, even if it won't be as the past with time there will be a change. Now we have avocado tree nursery, other trees were cut and taken to the tea factory

Coming together means not using a lot of space; in our kitchen garden we have planted Cassava and other crops as we were shown by PELUM Kenya. Initially there was a big vegetation cover but nowadays we have foreign trees that are used for timber since the ingenious ones were cut.
We grew vegetables before but there are no trees and the sun would burn our crops so we are working hard to grow trees and cover along here after this we decided to rear rabbits, goats and we learnt that they can be an alternative to cows When digging I don't use chemical fertilizers, I use cow dung and other compost manure chemical fertilizers can be harmful to the body Organic farming is what I prefer, the bananas I grow here are on compost manure and that's why we made the water tanks thanks to YARD. The rinsing water of utensils can be used to irrigate the kitchen garden hence we are assured of food security so every one of us here has a kitchen garden since there is an effective use of water.
The water is beneficial and the tanks are useful"

Leah Wangoi - Farmer
Nyagila Women Group,
Kerura Village, Gatanga
District, Kenya

How YARD supports Leah and the rest of her community to adapt through Kitchen gardens

Youth Action for Rural Development is a community based organization operating in Gatanga and some parts of Kirinyaga i.e., Kagio Working with small scale farmers on issues to do with food security, mitigation of food insecurity YARD works with 10 community groups Nyagila Women group being one of them. One of their main objectives is to link them to research groups as far as Climate Change Adaptation is concerned. The group members approach YARD with practices that shall help mitigate the effects of climate change since they noticed as an organization that there was a lot of changes in the climate since the last 4 years they have existed here on. Changes in seasons, the farmers get a lot of rains when least expected and very little when the need it

As a mitigation measure, the community have organized themselves into groups so that every group and group member has a kitchen garden, harvest rain water during rainy seasons and harnessed to be used in their homes and in the kitchen gardens they have.

YARD came up with drip irrigation methods,where farmers are issued with simple drip irrigation kits in order to manage the kitchen gardens and also recommended best practices to be practiced by these farmers i.e.;

i. Deep cultivation to enhance the water holding capacity of the soil,
ii. Construct water tanks with them to harvest rain water, with a capacity of storing 15,000 liters and can go for a whole season of 4 month for one family.
iii. Practice technologies that help them conserve water and soil i.e. fertility trenches whereby farmers have to incorporate organic matters into the soil.
iv. Encourage them to recycle used kitchen water for watering the kitchen gardens.
v. Trained them how to construct simple solar driers where they preserve the vegetable to be used when scarce.
vi. Organized the groups to start own small tree nurseries, encourage them to set aside an area in their small parcels of land to plant trees es pecially the agro forestry trees that will go well with the other crops.

Crops and changes in the climate

YARD is trying to strengthen traditional systems of agriculture, working with farmers to bring back some of the food crops that used to be grown here but no longer being grown, like millet, lablab, traditional bananas and other crops that used to be grown here naturally since most crops here aren't adhering to changes in the climate Since tissue culture banana don't do well we are encouraging farmers to go back to traditional cultivation by embracing indigenous food production that used to adapt well to the harsh climate

YARD and PELUM-Kenya

YARD works with PELUM-KENYA hence get information on emerging issues like climate change and translate info to farmers to create awareness on climate change hence liking farmers with research institutions and repackage research to be relevant o farmers hence have the capacity to address effects of climate change

Acronyms

PELUM	Participatory Ecological Land Use Management
CRISP	Centre for Research and Industrial Staff Performance
YARD	Youth Action for Rural Development
CBO	Community Based Organization
NIA	Neighbours Initiative Alliance

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Ecology Action website - http://www.growbiointensive.org

PELUM-Kenya
P.O.BOX 6123-01000, Thika, Kenya
Telephone:+254 20 2622 674
Email:pelumkenya@pelum.net

or visit us now at
www.pelum.net