jotoafrika

Low emission and climate change adaptation actions

August Issue 18, 2016

Highlights

About Joto Afrika

Joto Afrika is a series of printed briefings and online resources about low emission and climate change adaptation actions. The series helps people understand the issues, constrains and opportunities that people face in adapting to climate change and escaping poverty. *Joto Afrika* is Swahili; it can be loosely translated to mean 'Africa is feeling the heat'.

A youth group member trellising tomato plants to provide better air circulation and help prevent diseases making it easier to see and harvest the fruit. ©Vivian Atakos (CCAFS)

Youth and Climate Change - A Call to Action

Editorial

Climate Change remains one of the greatest threats to civilization today. Its impacts continue to threaten lives and livelihoods of the most vulnerable groups living in the global south. There is a broad consensus that Africa stands to be most impacted by the effects of global warming and that the significant population groups living below the poverty line make African countries particularly vulnerable

The increased frequency in occurrence of extreme weather events, growing rainfall variability and related increase in incidences of natural disasters demands urgent attention to translate the Paris Climate agreement into concrete actions at grassroots levels. Further, it is important to appreciate that measures instituted to mitigate against global warming may – if not well ordered, result in constricting developmental processes for climate vulnerable groups who also suffer the added burden of being 'energy poor'.

Recognizing the commendable efforts of the Government of Kenya to address climate change and shift towards a low carbon development pathway, the challenge going forward is to effectively translate these concrete actions into tangible engagements at county government levels and further on at community level. Of necessity, is the need to integrate these national climate actions to other overarching interventions including the UN Sustainable Energy For All (SE4ALL) of which Kenya is a signatory and has also developed its SE4ALL Action Agenda and Investment Prospectus. Thus, it is crucial that efforts are made to secure congruence in the engagements as these national climate and energy commitments and ambitions are translated into interventions at county and grassroots level.

It is in enabling transition to community level actions that we see a clear role for youth in Kenya. Considering that close to 50% of the Sub-Saharan population is under the age of 30 years and given the high levels of unemployment in the region, youth remain particularly vulnerable to climate threats and the impacts thereof. It is thus imperative that youth are not only seen as a target of remedial actions but, should be better engaged to become drivers of programs instituted to address climate change and energy poverty.

It is with this background that this edition seeks to look into the role and involvement of youth in addressing climate change and further, highlight opportunities that need to be leveraged to consolidate ongoing engagements and build to scale successful youth led interventions.

Most evident, is the leading role youth in Kenya have played in championing for climate justice in global climate negotiations, their proven actions in conservation, afforestation, green energy and smart agriculture. Of significance are their recent pilot actions to secure domestication of the National Climate Change Action Plan (NCCAP) in specific counties in Kenya. These youth climate actions, which are profiled in this Joto Issue, clearly illustrate the commitment and long-standing inputs that have been made by youth in their endeavor to institute actions to mitigate and adapt to climate change.

The call goes out to national and county governments to recognize that youth– in many instances, are clear on what needs to be done to reverse this worrying decline towards a global climate catastrophe. It is with this background that the public and private sector with the cooperation of civil society, need to devise coherent strategies and mechanisms to consolidate ongoing youth climate actions and further provide the necessary support to scale these up to embrace all youth.

This call to action not only provides a remedy to the climate challenge Kenya faces today but also provides an opportunity to capitalize on the creative energies of youth to realize the country's ambition to transition into a low carbon climate resilient regime. In so doing, Kenya not only arrests the widening impacts of climate change but, also secures the gainful involvement of our youth in building a greener nation.

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Youth Successes in Climate Actions in Kenya and Beyond

Youth in a consultative meeting with civic leaders in Mpeketoni. ©Norwegian Church Aid

Faced with the threat of climate change and the concern that not enough has been done to secure their future, youth in Kenya came together in 2008, to raise awareness and demonstrate concrete actions to reverse the trends. The early notions of a youth-led advocacy campaign began to bear tangible form when a group of over 50 youth met in Matuu, Yatta under the banner of the 1st National Youth Climate Change Conference (NYCCC - 1). It is from this engagement that the Kenya Youth Climate Network (KYCN) with the support of Norwegian Church Aid, was born leading to what has been a momentous journey for the youth who both gave leadership and enabled commendable climate actions over the years.

The youth movement that emerged comprised of youth organizations and networks active in climate related sectors and encompassed amongst others – the African Youth Initiative on Climate Change, Korogocho Community Radio (KOCH FM), Kama Si Sisi Artist Group, Baringo Change Makers (BCM), Young Environmental Network in Africa (YENA), Youth from Mully Children's Family, Kenya Young Greens, World Youth Alliance, Third Movement and Life Ministries, Inter-Varsity Environmental Network (IEVN) and St John Community Centre youth.

The Kenya Youth Climate Network (KYCN) was formed as a platform to enable broad based mobilization of youth around climate change in both rural and urban settings. The platform sought to draw them into a coordinated engagement organized around their participation and contribute in the Annual Conference representing their respective constituencies. The 3rd NYCCC held in 2010, saw key Government entities including the Ministry of Environment and Office of the Prime Minister make presentations and financial contributions to support the conference.

KYCN Advocacy actions

In 2011, KYCN embarked on its most ambitious endeavours to mount a continent-wide advocacy action which would see youth from various countries traverse the continent on a road caravan to Durban, South Africa to present the Youth petition to the UNFCCC Conference of Parties Session 17 (COP – 17). This engagement was conducted jointly with the global Ecumenical Fraternity under the auspices of the We Have Faith – ACT Now for Climate Justice Banner. This KYCN advocacy action was dubbed the African Youth Climate Caravan which saw 250 youth from 23 countries converge in Nairobi for a Conference marking the 4th NYCCC, from which 161 youth from 18 countries were flagged off to South Africa passing through 11 countries.

The caravan collected over 250,000 signed petitions which were handed over in an Ecumenical Service presided over by Archbishop Desmond Tutu making a landmark event held in the opening fringes of COP – 17. For the first time in the history of the Youth COP, a singular action of a youth constituency was highlighted and awarded a commemoration in recognition of the significant impact the African Youth Climate Caravan had on the COP 17 event.

Key results

1) KYCN as a platform has grown and developed a Kenyan youth climate position paper on the climate negotiations which was presented to the Ministry of Environment and Natural Resources in 2012.
2) KYCN devolved its engagement to the county level through holding its Youth Climate Conferences beginning in 2013.
3) In 2014/15, concrete interventions were realized in Youth Climate Actions in the counties of Tana River, Lamu and Kajiado.
4) Over 10,000 youth were engaged in the climate change awareness activities with 80 youth trained as facilitators on climate smart agriculture in the respective locations.
5) Consultative forums were held with county officials to domesticate the National Climate Change Action Plan resulting in the drafting of two climate Action policies in Lamu and Kajiado.

KYCN in the run up to the Paris COP 21 organized a bicycle marathon dubbed Road to Paris where cyclists rode from Maputo Mozambique on 31st August arriving in Nairobi Kenya on 8th November 2015.

In order to unlock the potential of youth in Kenya and beyond, there is need to support more coherent imperative actions at governmental levels that seek to leverage the existing momentum built up by KYCN. These efforts will help deliver Africa from the throes of climate threats to a future of green growth and employment.

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Youth Participation at the United Nations Volunteers Programme

Asha Sitati UNEAP National UN Volunteer was part of the team behind the Science Policy Forum at UNEA-2. ©UNDP Kenya

The United Nations Volunteers (UNV) programme provides an excellent case that can provide useful lessons on mobilizing the energy of youth for sustainable development through volunteerism. The UNV philosophy is premised on the idea that everyone has the potential to make a difference and that our societies will prosper or fail depending on the level of engagement and inclusion of the marginalized yet critical segments of the population.

A case in point was the second United Nations Environment Assembly (UNEA-2) by the United Nations Environment Programme (UNEP) held from 23rd to 27th May 2016. UNEA is the highest-level UN body ever convened on the environment. It enjoys universal membership of all 193 UN member states as well as other stakeholder groups. UNEA-2's overarching theme was focused on delivering on the environmental dimension of the 2030 Agenda for Sustainable Development. The organization of an event of such magnitude definitely required detailed professional, logistical and communication support to handle various elements involved.

UNEP and UNV programme in Kenya have a close working relationship with more than 50 UN Volunteers currently serving in different work programmes in UNEP. Over 40 of these UN Volunteers were actively engaged in spearheading various tasks to make UNEA-2 a success, providing varied support ranging from resolution drafting and communication to conference logistics. This background provided the framework within which additional capacity for the event was sought with the deployment of short term conference youth volunteers.

The UNEA-2 youth volunteers were intended to enhance learning and developmental experiences that compliment either their university studies or professional career. Further, their enlistment entailed providing them with the opportunity to make substantive contributions to UNEA-2 and complementing the regular UN Volunteers in providing substantive inputs to the Assembly's agenda.

As Ms. Eunice Migwi, one of the energetic UNEA-2 youth volunteers narrated during the de-briefing sessions with the UNV Kenya Field Unit, *"UNV to me represents an opportunity to be a part of greatness; something bigger than any one individually; a chance to make a difference in every possible way that one can. Through this interaction with peers from different schools and a variety of career paths taken by each individual, I have learnt that everyone whether younger or older has something to offer. Given a chance, the youth can change the world and UNV is facilitating exactly that by offering young people with great minds opportunities to make a difference and change the world for the better, one volunteer opportunity at a time. I consider being a volunteer one of the greatest achievement in my life.'*

The UN youth volunteers provided support to key components of the event; from the development of the event web platform, to the drafting of the global assembly's resolutions, to the engine behind the colourful side events and to the weeklong social media trending of the event; the youth volunteers were at the very core of the world's parliament for the environment. However, what was even more crucial was the continued interest by the volunteers to continue contributing their time for the implementation of the outcomes of the assembly on a voluntary basis. This was demonstrated by the self-motivated emergence of a national volunteer platform for young people by the UNEA-2 youth volunteers aimed at mobilizing community action for environmental conservation and climate change adaptation.

Such self-motivated actions will be very crucial for the actualization of the ambitions of the outcomes of important global agreements such as the Paris climate change agreement and the UNEA-2. The recognition of volunteerism as a path to inclusion was specifically acknowledged by the United Nations General Assembly (UNGA) in 2000, when governments identified volunteerism as an additional mechanism in the promotion of social integration. In 2001, the UNGA further recognized volunteerism as a particularly important component of the range of strategies aimed at overcoming social exclusion and discrimination.

Going forward, a call is made to both National and County Governments to institutionalise youth volunteerism into government climate change programs and operations. While we recognise the ambitions envisaged in programs such as National Youth Service, the call is to broaden this to include all Kenyan Youth in a country wide framework that affords all youth an opportunity to engage and volunteer.

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Smart Farming Technologies that Youth can Adapt

Young farmers learning about vertical gardening at Real Impact. ©Norwegian Church Aid

Farmers in Kenya as in elsewhere experience several challenges in making a living from their farming including an increasingly aging farming population, lack of access to farming inputs, credit and more recently unpredictable weather patterns. While some of the challenges can be solved by human intervention, some like weather are difficult to manage and at best adaptation remains the only viable option. The growing phenomenon of global warming and resultant climate change remain critical threats to Kenya's agriculture and food security.

Being an agricultural country, Kenyan farmers have already started feeling the effects of climate change. In light of this, the adoption of innovative and smart farming technologies would not only entice the involvement of youth in agriculture but also address climate challenges presently threatening food security in Kenya.

Vertical farms or gardens are tall sacks filled with soil from which plant life grows. This concept for a small, portable garden is good for areas where the gardener may have to continually relocate, or for areas where there is little or no healthy soil. Due to their vertical nature, sack gardens are fairly efficient in using water and easy to manage.

Vertical bag gardening is a popular farming system especially in urban centres and it involves growing vegetables in both gunny and sisal bags. This farming system is an effective way of enhancing production of vegetables in a cost effective manner with minimal use of space.

Mr. Reuben Thuita a 25-year-old resident who lives in the sprawling Kiandutu informal resident in Thika town produces food using the vertical bag gardens in his compound. He recalled that he had watched television stories featuring ingenious farming methods that some urban residents used to ensure that they had a constant supply of fresh vegetables through farming in sacks.

However, this practice has been rudimentary and fraught with many challenges because the bags were not manufactured to suit this purpose. In addition to losing water frequently, the bags were also not durable. The "one bag fits all" has also not taken into consideration the specific growing requirements for different types of vegetables, which in turn has affected negatively the quality and quantity of produce.

To solve these shortcomings and modernize portable gardening, a local non-governmental organisation, Real Impact, has come up with new vertical farm bag technology targeted at both urban and rural farmers. The bags range in size from small to large that can accommodate 40 to 100 plants. There are also ready planted balcony bags that contain a mixture of plants including strawberries, tomatoes, coriander, Sukuma (kale), spinach, herbs, lettuce and carrots.

Ms Louise Labuschagne, Real Impact Joint Managing Director says, "Bag farming is a very productive way to farm on small areas of land. In addition to improving food security by increasing six fold the number of leafy vegetables that can be grown per square metre, this revolutionary technique makes good business sense and creates employment for youth while utilising minimal resources including land."

Today, Thuita has become a prominent farmer, courtesy of the training he received at Real Impact and is an inspiration to neighbouring youth! He says that in addition to ensuring food security to his wife and two children, he generates about Shs 10,000 (USD100) every month selling surplus vegetables to his neighbours and the local market.

The main advantages of using the modern customised bags include; water retention for a long time, durability - bags last for over three years, minimal labour is required and they are affordable. Real Impact runs a demonstration farm at the Small Holder Enterprise Centre in Thika, where for a small fee, visitors are given practical training in drip irrigation management, bag farming among other water efficient technologies. Since young farmers have a challenge to access land for farming, this is an ideal technology that does not require large space, yet produces enough food for family and income generation!

A call is made to policy makers, Micro-Finance Institutions and other finance mechanisms targeting youth to adopt their empowerment programs and credit products to better incorporate the adoption of such youth friendly agri-innovations and offer young people opportunities to incubate such innovative agri-businesses to establish and succeed.

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See also

Agro nutrition technologies, training by Real Impact, Kichozi Farm Thika, Kenya
http://www.realimpact.or.ke

Do you Know about NETFUND Green Innovation Award?

The National Environment Trust Fund (NETFUND) is a state corporation under the Ministry of Environment and Natural Resources (MENR). NETFUND was established within the provisions of the Environmental Management and Coordination Act (EMCA) 1999 to facilitate research intended to further the requirements of environmental management, capacity building, environmental awards, environmental publications, scholarships and grants. NETFUND was launched by the MENR in November 2015 with the aim of tapping and incubating unique innovations on environmental solutions in the areas of energy, waste management, water conservation and agribusiness. The fund supports and grows green business enterprises in Kenya categorized as primary and secondary schools, individuals, small and medium enterprises, civil society organisations and women groups. The award is a unique scheme that identifies rewards and nurtures innovative ideas and projects into income generating green enterprises that contribute to poverty alleviation. Be on the lookout for the next issue that will feature some of the supported projects and call for proposals.

For more information about the fund visit: **www.netfund.go.ke** or contact **Caroline Kinyulusi (ckinyulusi@netfund.go.ke)**

Youth and New Media for Climate Change Action

Youth in Nguruman Maarifa centre learning how to engage with new media tools. ©Noah Lusaka

The quest for relaying the climate change message across the various channels has evolved over time with new media taking the lead in advocating for the climate change agenda across different parts of the world. New media is the 21st century tool in engaging audiences, especially the youth with climate change. New media is defined as everything that is related to the internet and the interaction between technology, images and sound. Some examples of new media include blogs, social media, ebooks and wikis. In the recent past, coverage of climate change related information has often left the public ill-informed due to the use of ambiguous scientific language with climate change taking an international angle rather than contextualising it to fit the local audience that is affected in one way or another.

Climate change affects each and every individual regardless of their geographical, social or economic status. It is a global phenomenon that requires everybody's attention, both young and old. The youth representing the highest population segment in the world can be the best purveyors of the climate change message. Being fast and versatile the youth have proven ready to embrace new channels of communication.

According to the United Nations office of the Secretary General's Envoy on Youth, there are about 1.8 billion young people between the ages of 10 and 24 – the largest youth population ever. Many of them are concentrated in developing countries. In Africa, about 65 percent of the total population of Africa are below the age of 35 years, and over 35 percent are between the ages of 15 and 35 years – making Africa the most youthful continent. If these projections from the African Union are anything to go by, then the biggest opportunity in disseminating the climate change adaptation message lies with the youth.

The community radio station - 99.9 Koch FM, owned and run by the youth in Korogocho's informal settlement in Nairobi has every year engaged the youth in adaptation and mitigation activities. Using its radio platform, Koch FM has organised regular community forums to facilitate discussions on issues of concern for the local communities and key amongst these related to water quality, sanitation and environmental issues. Discussions have been particularly effective in mobilising local actions to address the concerns and drum up support to push for action by government actors and departments.

Koch FM team leader Tom Mboya and trainer with the Kenya Community Media Network adds that during this annual event, the youth hold environmental exhibitions and talks in an attempt to create awareness on climate change. "Various issues such as sanitation and proper waste management are discussed," says Mr. Mboya. Personal behaviour change messages on climate change are crafted and aired on radio which Mr. Mboya says have contributed to the environmental awareness by the residents in an effort to keep the community clean through proper waste management and advocacy for sustainable agriculture practises such as planting in gunny bags.

In addition, the youth also plant trees in the informal settlement courtesy of seedlings from the large-scale tree nursery established at Mully's Children Home in Ndalani-Yatta, Machakos. Through the Kenya Youth Climate Network (KYCN), the community radio station also participates in national tree planting exercises and further holds national climate change campaigns and interviews to raise awareness and support youth-led climate actions. As the United Nations Framework Convention on Climate Change (UNFCCC) hosts the conference of parties in December annually, Koch FM simultaneously hosts its own version dubbed Conference of People in Korogocho where the youth and the local community are brought together to engage in climate change activities.

Other important days that are marked yearly by youth across the world with related themes include Earth Day which comes on 22 April, International Youth Day on 12 August, World Water Day on 22 March and World Day to Combat Desertification and Drought marked on 17 June. During the World Environment Day marked every year on 5th June, the youth in Korogocho conduct a major clean up exercise through the National Youth Service. These provide the opportunity for climate change messages that can be localised and centred around the themed days.

The role of new media as a tool to engage the public and spread information on climate change cannot be ignored. Youth in developing countries are tech-savvy and can be instrumental in acting as climate change activists. Blogs, mailers, images, video clips, hashtags, SMS, emails and group chats platforms such as LinkedIn, Facebook, Instagram, Twitter, Google+, YouTube and community radio can be used in consistently creating awareness. The stage can easily shift from reliance on mainstream media and experts to disseminate messages to the youth owning and spreading the message.

The game needs to shift from looking for information and solutions from the science experts and being in charge of the information, breaking it down and localizing adaptation measures through existing platforms. With the right information at hand, the youth are able to articulate and amplify climate change messages using social networks to reach local communities and leaders.

As the United Nations Framework Convention on Climate Change says in Article 6, education contributes to the solutions being developed to respond to the challenges and opportunities presented by climate change. New media presents a wealth of information on a variety of topics on climate change, fosters interactivity by providing opportunities for people to engage and network in different contexts and shaping perceptions and actions. The spread of information and public awareness on the matter translates to public discourse and an increase in mitigation actions through a country that is fully aware of its actions.

Learning from the Korogocho experience, it is critical to appreciate the significant role the community radio platform has played and indeed how youth at Koch FM have utilised other social media to further extend their impact in other sectors. This presents an important platform to help unpack and demystify the climate change message to reach the most affected groups and all actors in the climate change arena are called to leverage on such communication opportunities.

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Youth Making Eco-friendly Bricks in Makueni and Machakos Counties

Kikuu Youth Group Members making stabilized soil bricks in Machakos. © Andrew Nyamu

In arid and semi arid areas of Kenya communities are becoming more vulnerable in their efforts to harness their livelihood from already degraded environmental resources. In Makueni and Machakos Counties, water resources are decreasing at alarming rates due to adaptation practices such as charcoal burning, sand harvesting and cultivation along the river banks. This article highlights innovative methods of making bricks by three youth groups using minimal water resources and using naturally available solar energy for curing instead of using firewood.

Inades Formation Kenya has been in the forefront of building community resilience to climate change through enhancing climate change adaptation capacities. In May 2014 three youth groups in Kasikeu, Mwala and Matiliku locations were identified for capacity building on making bricks using environment friendly methods. Initially the three groups were making bricks using traditional methods that utilize a lot of water and need tons of firewood for curing.

The groups were Mbite Ngwitike from Kasikeu with 27 (25 male and 2 female), Kikuu Youth group from Matiliku with Membership of 46 members (34 male and 12 female) and Ngulini Water Project group of 42 (23 male and 19 female). This decision to engage the youth groups was informed by the understanding that youth are faced with myriad of challenges with earning income due to high unemployment levels and therefore they resort to brick making as an enterprise. Land which is a key factor of production has been elusive to the youth as they lack title deeds and right of use. They therefore have to hire land or make bricks along riparian zones therefore degrading the environment and causing massive soil erosion.

Conventionally, bricks are made using soil and water and later baked using wood fuel to make them durable. This process is water intensive and requires large mass of wood fuel for baking processes. This entire process leads to large usage of water resource and loss of forest cover. The transition to stabilized soil blocks technology affords an opportunity to adopt a climate friendly production technology that also promotes the transition to a greener construction sector – especially in the rural areas. Interlocking brick making technology is a press heavy duty machine which is manually operated and makes durable bricks from a mixture of cement and soil without having to bake the bricks in traditional kilns which is not eco friendly.

The process involves testing the soil to ensure suitability and appropriate soil-cement ratios for the particular soil. Once the rations and suitability have been secured, appropriate amounts of soil and cement are assembled at the brick making site suitably located close to the interlocking machine. The bricks are made by first mixing the soil and cement with some water then compacting the mixture using the interlocking machine. The bricks are then cured by placing them under a shade or in the open covered with polythene paper. To ensure maximal durability the curing process involves watering the brick for seven days.

The three groups were selected for training due to the good quality bricks made using the interlocking machine and use of minimum resources. The three groups' initiatives have been recognized and are being contracted to make bricks for neighboring communities. These machines have proved to be the solution for the environmentally destructive construction industry especially in the rural areas. In Kasikeu, Mr Raphael Kimundi used the Machine and contracted some of the trained youths who were able to make over 6000 brick in a record 5 days. Mr Kimundi says the cost of making such bricks was over 50 per cent lower than using baked brick which are expensive both monetory and time-wise. The contracted group members from Mbite Ngwitike youth group were able to make Ksh500 (USD50) per day.

The production of high quality bricks, uniform in size and shape with defined edges and smooth surfaces, makes constructions easier and uses less cement for binding. There is mobilization and empowerment of communities to create local infrastructure and facilities which are eco-friendly. The machines provide long term income generation with minimal maintenance costs and are suitable for a wide range of soil structure and requires minimal skills and know-how to operate. Unskilled people can quickly be trained to use the interlocking brick making machine which further enable the creation of employment for youth.

On-site manufacture of interlocking bricks dramatically reduces transportation costs and the inherent brick damage that occur during transportation. Cost benefit analysis done by INADES revealed that savings of up to 50% were achieved in the construction of water tanks, houses and classrooms. Curing was done by sprinkling water on the bricks and not baking which drastically reduced the environmental damages of construction as compared to soil fired bricks.

The groups are very grateful for the support and remained optimistic that they would secure markets for their bricks. Through their leaders, they have been approaching county officials, schools, dispensaries and individuals to secure contracts for brick making**.** The groups are encouraging brick users to consider eco-friendly bricks to reduce environmental degradation.

With declining sources of income for the youth and changing climate, innovations such as interlocking machine continue to provide the much anticipated eco-friendly solutions that ought to be promoted by all stakeholders. Youth make over 55 per cent of the population in Kenya and efforts to provide job opportunities need to be availed.

The call goes out to governments at both national and county level to tangibly effect the 30 per cent youth procurement rule by providing contracts to youth for the provision of school and other government buildings. Provision of capacity development for youth in the area of small scale contracting will enable them acquire skills and capacities to engage in professional tendering and the proper management of contracts. Finally beyond building and construction, there exist opportunities to adopt green technologies in road construction that should also be embraced to enable youth eco-enterprises in the improvement of rural infrastructure.

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Harnessing Bagasse for Mushroom Production in Western Kenya

Stephen Inyaza and Everlyne Otondi who are students of MMUST displaying mature oyster mushroom grown from bagasse. ©Noah Lusaka

Western Kenya farmers are leading in sugarcane farming and sugar processing for marketing. Kakamega County has four sugarcane factories that contribute significantly to the local economy. The factories in the region face myriad challenges related to waste management especially bagasse amongst others. A number of sugarcane growing families are challenged with hunger and malnutrition due to poor diets. This article highlights how a local university, through research and experimentation has developed alternative uses of bagasse.

Bagasse is the sugarcane fiber waste left after juice extraction. Most sugar factories dump or incinerate the waste thus contributing to carbon emissions. The bagasse waste is acidic and therefore interferes with soil structure where it's dumped and its continued accumulation makes it a solid waste management challenge. These environmental risks posed in the disposal of bagasse prompted students from Masinde Muliro University of Science and Technology (MMUST) to explore alternative uses while integrating these to measures to alleviate hunger and poverty in Western Kenya.

Among the innovative products interrogated by the students included using bagasse to grow oyster mushrooms and converting the used substrate for animal feeds and other by products. These innovations proved to be a milestone in MMUST's research activities and its contribution to climate smart solutions that increase community's resilience to climate change impacts.

Mushrooms are regarded as 'vegetable meat' due to their high protein content. Oyster mushrooms are a nutritious and affordable alternative to meat protein in addressing food scarcity and malnutrition.

According to Mary Goretti Kariaga, a lecturer at MMUST, "mushroom cultivation can be a lucrative enterprise and affordable production technologies have been developed for adoption by youth and small scale farmers."

Production and consumption of mushrooms can be a game changer in addressing some of the basic problems of food shortage, diminishing quality of human health, youth and women unemployment, vulnerability to climate change effects and pollution of the environment. The very nature of growing mushrooms indoors ensures that production is insulated against climate vulnerabilities and capitalizes on intensive production and higher income potential all of which are attractive to youthful entrepreneurs.

Facts about Mushrooms
Mushroom is a fungus that does not rely on rainfall therefore can be cultivated throughout the year under controlled environmental conditions. Mushrooms are a high value crop with a short growth cycle and can easily be grown by unemployed women and youth who normally have no access to land for farming. The health benefits include; regulating high blood pressure, recommended diet for diabetic management, antioxidants that enhance the body's immune systems and contains compounds that lower cancer risks.

Stephen Inyaza Salanoh and Everlyne Otondi both fourth year students at MMUST are involved in the cultivation of oyster mushrooms and related value addition operations.

The production process involves three stages as follows; substrate preparation involves mixing the bagasse with molasses and lime in the ratio of one to one (1:1).

The mixture is stirred with water ensuring it does not soak. The second stage involves sterilization where the substrate is placed in plastic bags and then put into a metallic drum with 20 litres of water and heated to boiling point. A stand is placed in the drum to ensure there is no direct contact of the substrate with water. The drum is covered to ensure no steam escapes. The process takes four (4) hours to kill any pathogens. After steaming, the substrate is left to cool down overnight inside a house on clean materials.

The third stage involves colonization. The mushroom spawn (seed) is introduced into the substrate and placed in a dark room. The mushroom spawn will then colonize in the polythene bags that will turn white. The substrate is watered daily using a knapsack sprayer to make the surface of the polythene bags moist. It is also important to pour water on the floor to increase room moisture. After 21 days, the mushroom will start germinating and harvesting starts within 2-3 days later for the next 14 days. The spent substrate is used to make animal feed when mixed with molasses.

MMUST has developed mushroom flavoured yoghurt called MMUST YOGO. The students believe that youth can earn more through yoghurt value addition than by selling at farm gate price.

Success in mushroom cultivation requires use of quality mushroom spawn which is produced under sterile conditions in a laboratory. Other basic requirements include the mushroom house, polythene paper grow bags, methylated spirit, gunny bags, water, mesh wire, bagasse, lime, molasses and metallic drums.

It is clear that in the face of increasingly smaller farming land sizes under pressure from growing population, the strategy to transition to mushroom farming is part of the solution. The use of waste bagasse as the growth medium puts to good use a sugar processing by-product that is an environmental challenge in Western Kenya and further conversion to animal feed of the waste products from mushroom production secures full life cycle management of the sugar cane growing process. What remains critical is the importance of consolidating these important research outcomes with a view of transitioning them to commercial production with possible linkages to youth employment in production and industrial partnerships in value addition and marketing.

This calls for coordinated action between research institutions, private sector, and relevant government entities to adopt a sector-wide approach to secure the incubation and nurturing of new innovations.

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For trainings See also http://bit.ly/2cefJHY

Making Charcoal Briquettes from Bagasse

Violet of Nakuru produces and sells briquettes among other items. @Practical Action

Eco-friendly charcoal briquettes from bagasse is gaining popularity in Western Kenya as students from Masinde Muliro University of Science and Technology (MMUST) use an innovative process that provides briquettes as an affordable substitute for firewood and wood charcoal.

The students from MMUST have taken the initiative to lower demand for charcoal and firewood, reduce the rate of deforestation, increase carbon sinks by forest and contribute to soil and water conservation.

Their technology has huge potential considering that annual bagasse production stands at over 1.0 Million tonnes[1] and Kenya having an estimated demand of 430,000 tons of charcoal, utilization of bagasse provides an ideal substitute for charcoal and further affords an ideal bagasse waste management strategy.

The briquetting process involves drying, carbonization, binder preparation, mixing of carbon with cassava starch binder, compression using a briquetting machine and finally drying.

The first step involves sun drying the bagasse on a nylon sheet. Drying takes a day during sunny seasons. Next is carbonization, which involves exposure of the dried materials to intense heat through a carbonizer for four hours in order to obtain the black powdery carbon.

Preparing binders that are then used to make the compressed carbon stick so as to maximize energy density. Binders include molasses, clay, or cassava starch. The carbonized material of sugarcane bagasse is mixed with saw dust in different portions with the already prepared cassava starch binder mixed in a ratio of 100:15. The starch and the carbon is well mixed without forming a mixture with high moisture content. High moisture content due to excess addition of water reduces both the durability and density of the briquette.

Thereafter the mixture is compressed using a briquetting machine resulting in ejection of the compressed briquettes, which should continue until exhaustion of all the mixture. The simplest and cheapest manually operated Briquetting machine is built up from the adaptation of a car jack, moulds and piston. The carbon -binder mixture is hand fed into the moulds and compacted to form the briquettes by the pistons.

After ejection of the briquettes, they are sundried for 3-4 days in order to improve their strength and durability. Packaging of the eco-friendly charcoal briquettes depend on target market and demand.

With effective monitoring of the cost of production, prices of briquettes can be as low as ksh.900 ($9) per sack while a sack of charcoal usually retails at around Kshs 1,500 ($15). In addition, 8-10 kilogrammes of wood are normally required to produce one kilogram of charcoal produced through traditional kilns while 100kg of bagasse can yield 40kgs of briquettes. Further, briquettes have a higher calorific value than charcoal hence produce more heat, burn for a longer period and produce less smoke. However, it is noted, current production methods are laborious e.g. hand-forming thus potential exits to enable the acquisition of mechanized production units to enhance productivity and profitability.

Evidently, briquettes provide a good alternative to charcoal and firewood and their potential of addressing the environmental challenges posed by the large volumes of bagasse cannot be understated. Indeed, capitalizing on this potential to promote the development of youth-led eco-energy enterprises is an opportunity for both national and county governments to address the threats posed by youth unemployment and climate change.

A call is made for research insitutions and government actors to tailor support measures to enable the development and success of youth-led eco-energy enterprises not only at level of technology development, cedit support but also at market levels. The latter is particularly significant considering commercial lenders tend to be apprehensive of such eco-energy initiatives and thus, commitment of government to off-take briquette production to meet the energy needs of government institutions would be a good starting point.

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MMUST students showing bagasse that is the main raw material for production of charcoal briquettes. ©Noah Lusaka

1 Review of Bioenergy Policy in Kenya, Overiew fo Policy Implications on Solid Biomass, Biogas and Liquid Biofuels Utilization, 2014, Norwegian Church Aid, Kenya

Schools Championing Environmental Stewardship in Eastern Kenya

Kalatile Primary School Pupils preparing to plant trees. © KenGen Foundation

Kenya has a relatively low forest cover at only 6.99 per cent of its territory, which falls short of the required standards by the United Nations Environmental Programme (UNEP). Article 69 of Kenya's Constitution establishes that, "the State shall work to achieve and maintain a tree cover of at least 10 per cent of the land area of Kenya." Additionally, the 2010 UNEP report shows that deforestation deprived Kenya's economy of approximately KSh5.8 billion giving impetus to concerted efforts towards tree planting initiatives.

Environment and natural resources in Kenya are valuable national assets that must be sustainably managed. They offer a range of benefits and opportunities for local and national economic development. Trees and forests play an important role in regulating the earth's temperature and weather patterns by storing large quantities of carbon and water. This regulatory function has a profound effect on both the local and the global climate. Locally, trees provide shade, which lower temperature and prevent the soil from drying out while reducing storm damage by providing shelter from wind. Globally, forests regulate the global carbon cycle, having a profound effect on the climate. In addition trees regulate river flows, flood mitigation, recharge of groundwater, reduced soil erosion and siltation and conservation of biodiversity.

Forests also support key economic sectors including energy, tourism, agriculture and industries. In the past, environmental conservation efforts have faced numerous challenges such as rapidly growing human population, habitat destruction, overgrazing, deforestation, pollution, unsustainable harvesting of natural resources and poor waste management. These challenges can be addressed through public and private partnerships. To ensure sound management of the environment, it is imperative that tomorrow's leaders 'the youth' be equipped today with conservation knowledge. It is everybody's responsibility to provide the youth with environmental education and mentor them to become the next generation of conservation leaders by involving them in activities such as tree planting to ensure that the country builds a sustainable future.

In a bid to ensure school youth become environmental conservation champions, Bamburi Cement, KenGen Foundation and Better Globe Forestry rolled out an innovative environmental conservation project to steer the country to achieve its targets as outlined in the Medium Term Plan II under environment, water and sanitation pillars. Dubbed Green Initiative Challenge (GIC), the project aims to green schools and communities in arid and semi-arid land areas. Working with schools around the Seven-Fork dams, the project aims at planting trees in approximately 460 acres in Machakos, Kitui and Embu counties within the next ten years.

St. Martin Kaewa Secondary School in Machakos County was among the 81 schools that participated in GIC's first phase. The school emerged the winner of the Challenge after recording the highest survival rate of over 1000 multi-purpose *Cassia siamea (Muveshi)* and *Melia volkensii (Mukau)* tree seedlings in our 0.5 acre school plot.

The school boasts of an impressive small forest and woodlot that has changed our school's environment. Since the school's establishment in 2007, it has been planting and caring for the trees in the compound. Its strategy is that each student right from form one plants and cares for a tree or more for the next four years to ensure its survival. The 400 boarding students have good shade for discussions and private reading under a cool micro climate. The Mukau tree is good for timber and soon we will start harvesting. Our school uses improved cooking stoves and we just prune the branches that we use for cooking school meals reducing the cost of buying firewood.

On top of these benefits to our school, the students were rewarded for their efforts with a one-week tour to Mombasa City. The students visited among other places, Haller Park and Bamburi Nature Trails in Mombasa, which Bamburi Cement Ltd pioneered and transformed from quarry wasteland to a world renowned nature and environmental park known for its biodiversity in plant and animal species.

The Green Initiative Challenge is a move in the right direction in complementing and supporting Government initiatives in environmental conservation efforts by involving youth as part of a long-term strategy to inculcate a tree growing and nurturing culture in society. A call goes out to stakeholders – particularly county governments and the Kenya Forest Service to design a national school based programs that expands the 'adopt a tree' approach where each school-going child is made responsible for a tree for the duration of their studies at the school. This would inculcate the right values and further contribute to expanding Kenya's forest cover for the benefit of the nation.

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Kaewa secondary school students learning under tree shade. © Margaret Kitavi

Could Bamboo be Part of the Solution for Climate Change?

Youth tending to bamboo seedlings at Kitil Farm in Kajiado. ©Patrick Maina

The Bamboo plant is the strongest and fastest growing renewable natural resource on Earth supplying a global trade worth US$2 billion per year. Belonging to over 1250 grass species, bamboo absorbs carbon dioxide and releases over 30 percent more oxygen into the atmosphere compared to an equivalent mass of trees. This makes bamboo excellent for restoration of degraded landscapes, absorbing greenhouse gases, combating desertification, global warming and as an alternative to increasingly scarce tropical hardwood.

A recent scientific report by MOSO International, Europe's leading producer of industrial bamboo products, Delft University, Netherlands and the International Network for Bamboo and Rattan (INBAR) titled: *'Environmental Impact of Industrial Bamboo Products: Lifecycle Assessment and Carbon Sequestration'* that was shared at the COP21 Paris climate conference proves that products made from Bamboo are 'green' or environmentally sustainable. The report shows how items made from bamboo can be carbon neutral-or even carbon negative over their lifecycle.

In Kenya, bamboo is an underutilized resource and its farming is increasing considerably as people learn about its importance in environmental conservation even in arid areas and its many uses. Over eighteen species suitable for various ecological zones have been introduced.

Youth group promoting Bamboo

The Green Galaxy youth group is based in Naivasha within Nakuru County and is composed of 15 members (10 men and 5 women). Established in 2014, the group is led by Mr. Patrick Maina who is the chairperson. While pursuing a degree course on Environmental Planning and Management at Kenyatta University, Mr. Maina got interested in establishing bamboo for environmental conservation and income generation among youth. His passion for growing bamboo gave impetus to the formation of Green Galaxy youth group that promote bamboo growing among farmers within the Lake Naivasha basin. With support from Imarisha Naivasha Partnership for Sustainable Development, the group got some financial support for capacity building to establish a bamboo nursery. Imarisha Naivasha (Arise Naivasha) is a government initiative aimed at decreasing degradation of Lake Naivasha and its catchment through integrated planning and implementation of sustainable projects.

The youth group selected six members who were then trained on bamboo propagation and management at Kitil Farm Isinya in Kajiado County. Kitil farm operates the largest bamboo nursery in Africa with over 5 million seedlings with more than 20 different species for all ecological zones in the Country and beyond. According to Mr. Juvenales Njuguna, Kitil Farm Chief Executive Officer, the Naivasha based Galaxy youth group is among the many groups that have gained knowledge and skills on bamboo farming. They obtained their planting materials from Kitil farm.

Facts about Bamboo

During training sessions, the following issues are discussed in details ranging from care of seedlings, planting, management, poles harvesting and value addition:

- On one acre, a farmer can dig a 2ft by 2ft hole then plant 244 seedlings using a spacing of 5 by 5 metres. Clumps mature at 3 years and they can last for 40 years.
- An acre of bamboo produces the same yield of wood products as 4.5 hectares of eucalyptus.
- Bamboo has at least 1,500-recorded uses, which include water purification, fencing poles, making furniture, manufacture of toothpicks, matchsticks, handcraft, utensils, barbecue skewers, medicine, charcoal, pulp, bamboo tea, boards, bamboo nails, biomass for tea factories, and cloth.

After training, the youth group embarked on establishing their own nursery with a capacity of over 5000 seedlings composed of 6 different species. The bamboo seedlings are used for planting along the rivers for conservation and to enable effluent water from the flower farms to be filtered before being discharged to the lake. This is an ongoing project that will ensure the Lake Naivasha basin ecosystem is sustainably managed.

Bamboo growing is gaining popularity among farmers and water user associations who buy for planting on their farms and along riverine due to the many uses and its fast growth rate.

Recommendations

- There is room for scaling up growing of bamboo especially on government land to support green economic growth. The National Youth Service can successfully enhance bamboo growing for rehabilitation of degraded lands and along river banks and for effluent management in an effort to support green economic development contributing to national goals such as the Vision 2030.
- The county governments can initiate bamboo growing for the various value chain developments especially as an alternative source of charcoal and for vital ecosystem services to the national water towers.
- Youth groups can venture into bamboo businesses for income generation.

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http://bit.ly/2bK07vX (Watch part 1-3)
http://bit.ly/2bcBJAp

A bamboo plantation at Kitil Farm in Isinya, Kajiado. ©Noah Lusaka

Harvesting Rain Water keeps Youth Group Farming for a Better Future

The youth group members harvesting the vegetables grown under drip irrigation outside the greenhouse © V. Atakos (CCAFS)

Kamula village in Nyando, Western Kenya is home to a large population of small-scale farmers. The village's other unresolved feature is the imposing gullies drawn out in the land from years of soil erosion attributed to severe rain water run-off. The River Asao, a seasonal stream flows through the village, winding into the lower regions of Nyando, and onward to Lake Victoria. During the rainy season, the unprotected ground up stream generates significant run-off which makes the river break its banks sweeping across fields downstream and scooping tons of rich topsoil, further reducing the region's agriculture potential.

The steep deep gullies caused by runoff water from two rain seasons affect 40 per cent of the landscape around Kamula village. Severe land degradation and poverty make local inhabitants more vulnerable to climate risks, reducing the household food supply further exacerbating malnutrition. In order to address the challenges of land degradation, declining land sizes and seasonal rainfall variability, a group of young farmers are taking the lead in using new farming techniques to address the food insecurity.

Working closely with researchers from the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) and other partners, the Kamula Youth Group are piloting the smart farm concept. This involves extensive water conservation and management, adoption of greenhouse farming, integration of aquaculture and seed bulking of fodder for livestock and horticultural crops.

Jackson Onyango, the group's leader says that the farm measuring half hectare is jointly managed by 10 group members. The group has a goal of empowering each member to own a similar farm within four years in their homes, and motivate youth in the greater Nyando to follow suit. The smart farm concept is centred on harvesting the large amount of rain water run-off and collecting the same for irrigation use to support greenhouse farming. Further, aqua-culture is integrated into the dam established to supplement incomes and diversify farm activities. In the case of Jackson's group, an earth dam with a capacity of 100,000 litres of water was established on-farm to ensure a steady supply of water throughout the year.

To prevent water leakage, the earth dam was lined with special gauge of Polyvinyl chloride (PVC). 1,000 Tilapia fish are reared and harvested in six month cycles for increased income. With harvested water, a greenhouse covering one quarter of a hectare is established. Beds with drip irrigation lines were installed for efficient use of the run-off water.

Greenhouse farming is new in Nyando and represents a shift from open crop cultivation to closed systems of farming. The produce from the green house includes tomatoes and climbing beans. Outside the greenhouse, cow peas, black nightshade, spider-weed, kales, cabbages, onions, water melons are grown in two cycles per year. On average, the smart farm set-up costs about US$ 3,000 as initial investment and yields at least twice that amount in a year through farm produce sales.

Estimated yearly earnings from fish are US$ 2,000 per earth dam. The horticultural produce is expected to yield about US$4,000. The March 2016 harvest yielded 867 fish each selling at Kshs. 150 making on average kshs. 130,000/= or 1300 USD. The group recently set up a second earth dam of 100,000 litres to increase the capacity of water storage and double the fish population for increased income. The technologies in smart farms ensures regular production cycle better timed for local markets.

Due to the nature of the intensive knowledge and skills required to establish and operate greenhouse production units, partners with specialized competencies have been identified to train the youth groups as part of the process of advancing local adaptation actions. The CCAFS partners include Magos Farm Enterprises and VI - Agroforestry, who have established four smart farms in four villages in Nyando. The farms serve as demonstration sites for youth and women groups engaged in smart agriculture.

Experts from the Kenya Agricultural and Livestock Research organization (KALRO), the Ministry of Agriculture, Livestock and Fisheries (MALF), Magos Farm Enterprises and ThinQubator Aquaculture have inculcated Kamula group members with knowledge on efficient use of water, pest and disease control and growing of improved crop varieties. The group serves as a learning focal point for the entire village. Jackson observed that at the beginning, people in the village were not sure what the group was up to or what it aimed to achieve. However, after one year, the impact of the concept is visible.

From the proceeds, the group opened a bank account to save money and purchased a solar system for pumping water into the tanks as well as from the adjacent river Asao into the earth dams. The group is providing the village with a group of model farmers taking the lead in transforming rural agriculture. The group aims to replicate these farming methods tin the entire village thereby boosting food production and improve soil and water management. School children and village people frequently visit the group to learn about new piloted technologies. What has worked for the Kamula Youth can be adopted for other youth in degraded affected regions of the country. A call is made to county and national governments to explore the potential for adopting the smart agricultural technology concept in respective locations and integration of youth empowerment into conservation programs and activities.

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Using Climate Simulation Tools in Understanding Climate Change Effects

Ellie Johnston from Climate Interactive leads a session during a simulation exercise at the LECRD offices. ©Philip Dinga

Human beings' contribution towards climate change has been a big debate over the last couple of decades. With countries having deliberated on their commitment in the last COP21 meeting in Paris, the goal to reduce global warming to well below 2 degrees above pre-industrial levels is still by and large the biggest challenge facing humanity.

In August 2015 a simulation game was developed by Climate Interactive and Massachusetts Institute of Technology (MIT). This platform provided for participants to confidently engage in a thought-provoking game which simulates the United Nations climate negotiations. The World Climate Simulation exercise was launched in an effort to engage thousands of people in the climate change debate and to help build awareness on some of the experiences and dynamics in the deliberations that take place in the UN climate negotiations.

The moderator or facilitator of the exercise takes on the role of a UN leader while the participants play the role of delegates representing the different nations. The participants form negotiating groups (i.e. blocs) and are given negotiation tasks with the ultimate goal of reaching a global agreement that successfully keeps global temperature rise well below 2˚C above preindustrial levels. The exercise runs for about 2-3 hours depending on the discussions and related materials for leading the simulation are available for free online. Participants are encouraged to utilize the same in their respective group work.

Ellie Johnston from Climate Interactive who recently led a World Climate exercise in Nairobi explained that the simulation is framed by current climate change science and is run through C-ROADS, a computer simulator which is interactive and easy to use. She further added that the use of a computer simulator helps participants appreciate how their decisions impact on the wider global climate system in real-time. Climate Interactive seeks to create interactive, easy-to-use, and scientifically rigorous tools that help people understand how to address the complex, interconnected challenges that affect our lives.

More than 15,000 people have participated in the World Climate simulations across the globe since its inception. All the tools used for the World Climate are available free and in multiple languages on the Climate Interactive website. Climate Interactive has created computer simulations and interactive workshops on topics including clean energy, disaster risk reduction and resilience.

In May 2016, the Low Emission and Climate Resilient Development (LECRD) Project in collaboration with Climate Interactive held a World Climate Simulation event in Nairobi, Kenya at the National Climate Change Resource Centre (NCCRC). Participants were tasked with the responsibility of negotiating a global climate agreement. They were grouped according to negotiating nations/blocs which included the United States, Europe, Other Developed nations, China, India and Other Developing Nations. Their goal was to negotiate a global agreement to reduce greenhouse gas emissions that achieves the best outcome for global economies whilst factoring in their respective national interests as well.

The six teams were tasked with developing appropriate actions to reduce carbon emissions, make commitments towards the reduction of deforestation, increase reforestation or afforestation and further contribute to the Green Climate Fund which is intended to provide at least $100 billion per year by 2020 to developing countries to reduce their emissions and adapt to climate change.

It is with this background that the LECRD project in collaboration with the Kenya School of Government is working to develop a curriculum that integrates policy, planning and budgetary processes to inform County planning. Climate Simulation tools will be a key component throughout the training developed for policy makers and planners.

More at: climateinteractive.org

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