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His Excellency President Uhuru Kenyatta visiting KEFRI Tree Nursery at Michuki Memorial Park



President Uhuru Kenyatta planting a commemorative tree to mark the opening of Michuki Memorial Park

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President Uhuru Kenyatta opens Michuki Memorial Park

His Excellency President Uhuru Kenyatta has announced a national clean-up campaign dubbed ‘Cleaning Up Kenya Campaign’ for the restoration of forests, recreational facilities, beautification and regeneration of the environment.

“The campaign which will commence on September 1st, 2020 will be led by cadres of the National Government Administration Officers (NGAOs) and incorporate local communities and relevant stakeholders,” the President said.

President Kenyatta was speaking during the opening of the rehabilitated Michuki Memorial Park in Nairobi County on 14th August 2020.

“Michuki Memorial Park is one of the green spaces/recreational facilities in a series of environmental rehabilitation programmes my government has initiated, not only in Nairobi, but also across the country,” the President said.

The park previously known as Mazingira Park was renamed Michuki Memorial Park in 2012 in honour of the late Hon. John Michuki who played a key role in the clean-up of Nairobi River and its environs during his tenure as the Minister for Environment and Natural Resources.

The President commended the Ministry of Environment and Forestry and its agencies KEFRI, National Environment Management Authority (NEMA), Kenya Forest Service (KFS) for partnering with Nairobi Metropolitan Services, National Museums of Kenya, Kenya Power, National Youth Service, and Kenya Seed Company for rehabilitating the park.

KEFRI has conducted a biodiversity assessment in the botanical park, established a tree nursery, a bamboo demonstration workshop, a medicinal garden and a fruit orchard as well as facilitated construction of 70 wooden benches and a 500 sitter open air amphitheater.

The nursery has a capacity of producing maximum 200,000 seedlings, mainly indigenous for sale to the public at subsidized prices.

"The nursery will avail quality tree seedlings to city residents who can also contribute to the achievement of the 10 percent national tree cover," said KEFRI's Board Chairman Dr. Sammy Letema.

Visitors to the park will enjoy leisurely walks under tree canopies, picnics along the clean Nairobi river and entertainment at the open air amphitheater.



Chairman KEFRI Board Dr. Sammy Letema, Patrick Mukora and Dr. Jane Njuguna at Michuki Park where KEFRI has established a nursery to propagate tree seedlings and demonstrate bamboo products. Among the planting materials being propagated is Vetiver, a perennial bunch grass that is useful in controlling soil erosion, a fodder for animals and pest repellent.

KEFRI - Tiva tree nursery acquires piped water

Kitui Water and Sanitary Company (KITWASCO) has supplied KEFRI Tiva tree nursery with piped-water from the main distribution lines at Kwa Vonzia market.



KEFRI Director Dr. Cheboiwo and KITWASCO Technical Manager Mr. Stephen Mutua commissioning the piped water at Tiva tree nursery

Dr. Joshua Cheboiwo while commissioning the Project on 21st September, 2020 at Tiva nursery stated that water scarcity in the area had constrained production of tree seedlings and dryland forestry research at the trial site which is of global significance.

"KEFRI with support from Japan International Cooperation Agency (JICA) has conducted an intensive dryland forestry research in Tiva trial site where 10 species from 69 collections (sourced from within the countries and outside - Australia, India, Ethiopia, Eritrea, Sudan, South Africa) had been screened and shown potential of adapting to the region. There is nowhere else in Africa such kind of research has ever been conducted," said Dr. Cheboiwo.

Dr. Cheboiwo further stated that the Tiva pilot station through its *Melia volkensii* trials and other experiments scattered in the expansive 1,150 ha is as a vital research station recognized locally and internationally for the demonstration of forestry dryland forestry technologies.

The Director recognized the scientists for their effort in *Melia* research specifically towards: successful selection of candidate plus trees (CPTs); establishment of improved *Melia* seed orchards; and pioneering *Melia* progeny trials.

“KEFRI management in the fiscal year 2020-21, has committed KSh.18 million to support comprehensive research implementation and output including construction of green house and tree seed processing unit. This is the roadmap to elevating the station to a centre of excellence in dry land forestry,” revealed Dr. Cheboiwo.

He added that the piped water would boost capacity of the centre in research and development that involves various dryland species including; *Melia volkensii*, *Acacia*, *Terminalia brownii*, *Azandrichta indica*, *Dalbergia melanoxylon*, *Zizyphus mauritania*, Tamarinds and *Osyris lanceolata* among other economically viable trees with potential for increasing the Kenya’s national tree and forest cover to the desired 10 %.



Dr. Joshua Cheboiwo (right), DERP Region Director Dr. Albert Luvanda (center) and Forester Mr. Pius Matioka during a visit to *Melia volkensii* seed orchard at Tiva, Kitui County

“KEFRI is importing improved planting material for *Tamarindus indica* and *Osyris lanceolata* from India to facilitate establishment of plantations in the country,” said the Director.

The Director urged all the scientists in the region to publish their research findings and other relevant information to guide future dryland forestry research.

The KITWASCO Technical Manager, Eng Stephen Mutua stated that, “The 4.5 km pipe will henceforth supply reliable and sufficient treated water to the tree nursery and the surrounding communities”. He also commended KEFRI for leading community oriented research in the area terming it a challenge to other institutions in the region.

The Eco-region Research Programme Director Dr. Albert Luvanda said his ambition is to reform the Tiva nursery into a semi-autonomous centre. Dr Luvanda also reported that despite the water challenge, during the last financial year the nursery produced almost 50,000 seedlings of assorted species.

Dr Luvanda highlighted that water had remained a big challenge at the Tiva nursery after the shallow well dried reducing capacity for seedling production drastically. However, with a steady supply of water Dr. Luvanda is optimistic of reviving the tree nursery and raising production of *Melia volkensii* seedlings to 100,000 per year as well as securing the woodland.

Preserving the woodland

Dr. Cheboiwo urged the regional managers to cultivate a cordial relationship with leaders and adjacent communities by creating awareness on the importance of protecting the woodland.

In a rejoinder Dr. Luvanda revealed that his office in liaison with Survey of Kenya in Kitui is in the process of re-establishing the original woodland boundaries to avert encroachment and poaching of forest products, which has remained the biggest test for the forester-in-charge.

The Director KEFRI further reported that an assistant forester and a tree breeder will be posted to support research work at Tiva station.



Ms. Winfred Mbithe, a KEFRI staff root pruning *Terminalia brownii* at Tiva tree nursery

During the same forum, Dr. Luvanda assured all stakeholders that the regional centre facilities are safe and secure, contrary to the negative media publicity that the centre had some positive COVID-19 cases.

"The facility has been inspected by the County Public Health Officers and declared safe for both staff and external customers. The centre has put in place measures to fumigate the facility regularly and observe other government protocols regarding control of the virus spread," Dr. Luvanda confirmed.

11th World Bamboo Day Celebrations

The Government of Kenya has classified bamboo as a cash crop and urged communities and individual farmers to take up bamboo growing as a commercial activity that will eventually improve their livelihoods and socio-economic status.



CS Keriako Tobiko (centre) with Director KEFRI Dr. Joshua Cheboiwo (right) and Bamboo National Chairman Victor Mwangi bequeathing bamboo at Michuki Memorial Park where 1000 seedlings were planted to protect the Nairobi riverine

The World Bamboo Day is celebrated to raise awareness on the growing and benefits of bamboo, and to promote its use in everyday life.

The event which marked the 3rd anniversary in the country was organized by the Ministry of Environment and Forestry through KEFRI, KFS and the Bamboo Association of Kenya.

The first Bamboo celebration in Kenya was held in 2018 in Migori County hosted by Nyabera Farm, a private nursery producing over 60,000 bamboo seedlings annually. In 2019, the celebrations were held at Busia Farmers Training Centre, hosted by the Busia Eco-Green, a CBO manufacturing bamboo items.

During this year's event themed 'Sustaining Kenya the Bamboo Way', the CS recognized Mr. Taratishio Ileri Kabue from Embu County for petitioning the state to recognise bamboo as a cash crop.

“Last week President Uhuru Kenyatta ascended to the request and directed that bamboo be adopted as a cash crop to avoid the many challenges being experienced in the bamboo value chain,” said the CS.

Mr. Tobiko further lauded both the late Hon. John Michuki and Dr. Benard Kigomo - former KEFRI Deputy Director for planting bamboo in the park as an initiative to clean up Nairobi River and appreciated their tireless efforts in promoting bamboo in Kenya.

“The late Hon. Michuki when stressed would go under the bamboo shade to reflect and meditate,” said Tobiko.

The CS urged County government to establish tree nurseries at their regions terming bamboo a miracle plant that provides a variety of products going along way to improving farmers' livelihoods

He further stated that the President has decreed fast-tracking completion of bamboo policy in a months' time noting that the policy is to guide harvesting, processing and marketing.

The policy would motivate scaling-up bamboo farming as farmers will quickly gain returns from their investment in bamboo growing.

Tobiko appealed to private sector to plant bamboo on a large scale noting the plant can grow in almost all ecological zones in the country.

KEFRI Director Dr. Joshua Cheboiwo, in his speech stated it has been a long meandering journey through the legal structures to make bamboo accepted as cash crop in the country.

Dr. Cheboiwo informed the forum that, “cultivation of bamboo as a cash crop will steer the institute into carrying out deep research of improving bamboo variety for farmers who will cultivate it commercially to improve their livelihoods”.

Importation of Bamboo seeds

The CS also said President Uhuru Kenyatta has granted KEFRI consent to import 4.5 metric tonnes of bamboo seeds to hasten production of adequate plantlets in the country.

"KEFRI together with KFS have been tasked to identify and approve the best seed stockist and tree nursery for bamboo in order to ensure farmers buy seedlings from registered firms," said the CS.

Register and regulate tree nurseries

The Permanent Secretary Dr. Chris Kiptoo while speaking at the same event urged KEFRI and KFS to register and regulate tree nurseries countrywide.

"As the drive towards increasing forest cover continues to gain hold in the country, farmers through the social media have challenged me to provide adequate seeds to meet their needs," he said.

The PS noted that the state of some private and public tree nurseries are worrying in terms of quality control, particularly the sources of planting material majorly seed. He challenged KEFRI and KFS to support farmers to ensure they purchased seed from certified sources.

He also called upon Kenya Water Towers Agency (KWTA) to scale up production of bamboo seedlings at the Kaptagat Forest Bamboo Demonstration Site to provide seedlings towards support of the 10 percent tree and forest cover campaign, and the planned national tree planting marathon.

The PS called upon KEFRI to create awareness and give incentives to attract bamboo farming, stating bamboo has immense benefits such as protecting riparian areas, balancing oxygen and carbon dioxide in the atmosphere and mitigating climate change.

The CS who was enthusiastic to be part of the global event planted 100 bamboo seedlings at Michuki Memorial Park stating that it is one thing to plant bamboo and another thing to grow it. "He who chooses to plant bamboo must agree to adopt it and take the responsibility to tend it," he said.

Mr Tobiko also commended the chairman of Bamboo Association Mr Victor Omwanga for sensitizing farmers about bamboo farming. He directed that the association be allocated spaces within the Michuki Park to set up a demonstration plot for bamboo planting to showcase to farmers

Eco-Pole Country representative, Mr.Velji Sonigra promised to work with KEFRI in order to reach farmers throughout the country. He reported that fifty percent of both giant and small species of bamboo utility eco-poles are used for fencing.Sonigra, stated that if bamboo is planted in a structured way it could improve farmers livelihoods through cottage industries. Eco-pole enterprise trains farmers on bamboo, conservation , value addition and commercialization.

Bidco's Agribusiness Director Mr. John Kariuki who also represents private sector alliance noted that bamboo can grow anywhere in Kenya and it takes between 3 to 4 years to mature.

Mr. Kariuki hinted that Bidco plans to contract farmers, investment groups, individuals, and Companies within Kenya and the East African region who are willing to take up bamboo growing. He said the company has planted bamboo in Aberdare Ranges and Ndakaini regions.

Mr. Kariuki appealed to other stakeholders to join hands in this venture adding that Bidco is ready to contribute in kind and in any other way.

The event was attended by the Bamboo Association of Kenya, Private Sector representatives, Nairobi Metropolitan Service County Governments, Embassies, High Commissions, state agencies which included; National Environment Management Agency (NEMA), Kenya Waters Towers Agency (KWTA), Kenya Forest Service (KFS), Kenya Meteorological Department (KMD) and Network for Bamboo and Ratan (INBAR), Chief Conservator of Forests among others.

KEFRI through the National Forest Products Programme (NFPP)- Karura displayed bamboo propagations and assorted bamboo products. Other collaborators who showcased Bamboo utilization technologies included: Tiriki tropical Gardens, Bidco Industries, Kerio Valley Development Authority (KVDA), Africa Green Revolution, Bamboo Craft Kenya- Nyaseda Farm, Eco-pole industries,Ngwa Bicycle Garage, Green pole Enterprises and Bamboo Trading Company.

DERP celebrates World Bamboo Day

The DERP Regional Director Dr. Albert Luvanda speaking to the media in his office during this year's 11th World Bamboo Day celebrations said that Bamboo is one of the flagship species for planting in Kitui and the entire eastern region.

According to Dr. Luvanda, bamboo trials have shown that it can be propagated through seeds and cuttings and reports on the same have been distributed across the Country.

The World Bamboo Organization during the 8th World Bamboo Congress held in Bangkok, Thailand on September 18, 2009 officially established the World Bamboo Day which is celebrated to increase the awareness of the bamboo globally.



Dr. Albert Luvanda displaying *Oxytennera abyssinica* and *Bambusa vulgaris* species propagated at KEFRI Kitui nursery. The two varieties thrive even in low altitudes (photo B. Mulu)

KEFRI produces 50,000 bamboo seedlings annually in the entire country of which DERP contributes between 6,000 and 8,000 seedlings mainly *Bambusa vulgaris* and *Oxytennera abyssinica*.

"The two species are fast growing and preferable in rehabilitating riverbanks and water catchments even in lowland areas," said Dr. Luvanda.

Generally, bamboo is used in construction industry but it has many other uses like in the cottage industry where they can be weaved into various products including baskets, toothpick, beads, the scientist said.

However in Kenya, bamboo has not been fully exploited for production of pulp and paper, fiber, food stuff, charcoal and medicinal products.

Dr. Luvanda said that the International Network for Bamboo and Rattan (INBAR) which has played a pivotal role in advancing development of the bamboo and rattan sector in this region.

INBAR through the Dutch-Sino East Africa Bamboo Development Programme is to enhance climate change mitigation and adaptation benefits from bamboo in Ethiopia, Kenya and Uganda, by developing inclusive and sustainable value chains for industries, and small and medium enterprises (SMEs), resulting in; increased food security, and improved environmental management, and enhanced livelihood opportunities. The programme is supporting poverty reduction, sustainable development, climate change action and international trade.

"The systematic studies of the potential of the bamboo and rattan, the previous and current uses and the social cultural and political perspectives of these resources have been invaluable in promoting the development through innovative and sustainable use of the bamboo and rattan," the scientist added.

INBAR has been instrumental in promoting technology transfer and information exchange between network partners. The organization has supported research and capacity building - including biodiversity and genetic conservation, propagation, processing, utilisation and development of policies at the national level.

The expert said the replicability in Latin America and Africa of the success stories from South and South East Asia is yet to be assessed despite the immense interest from the private sector, NGOs and government institutions in using the bamboo and rattan to fuel rural development in the region.

Challenges

Development of bamboo and rattan sector in the country is hindered by shortage of information within the value chain, noted Dr. Luvanda.

“For instance pre-treatment of bamboo culms is critical in preventing post harvest loss which generally occurs when borers attack bamboo culm due to the high sugar content in it," he said.

“In addition, INBAR has commissioned national studies from selected countries in Africa, Central and South America to review the current state and future potential of bamboo and rattan sector,” he added.

In these studies certain standard indicators will be documented to allow the regional comparisons while other information will be country-specific, he said. The regional director indicated that the national studies will enable experts decide priority areas for further research at local, national and regional levels.

“The findings will clearly define INBAR's role within these countries as a facilitator and coordinator,” he said, adding that the organization has developed an outline for these national studies.

"The outline aims to facilitate the data collection process and assist in the formulation of the case study reports," he said.

The frame work also guarantees that comparable information is provided in each national study.

"The system includes the technologies used to process the material as well as the social, political and economic environments in which these processes operates, are also covered in the the case study," said Dr. Luvanda.



Mr. Peter Gikiri, from Ngwa Bicycle Garage in Nyeri County, displaying his modified bamboo bicycle, during the World Bamboo Day exhibiton at Michuki Memorial park

Ozone Layer Day

KEFRI Senior Deputy Director for Research and Development Dr. Jane Njuguna led KEFRI delegates in observing the World Ozone Day-under the theme 'Ozone for Life', on 16th September 2020, at the newly rehabilitated Michuki Memorial Park.

The CS for Environment and Forestry Keriako Tobiko who was the chief Guest, revealed that the Country is in the process of ratifying the Kigali Amendment adopted in October 2015, to phase down hydrofluorocarbons (HFCs) and other chemicals that depletes the ozone layer.



Dr. Jane Njuguna (left) and Chief Conservator of Forests Mr. Julius Kamau (right) with other KFS staff during a tree planting exercise to mark World Ozone Layer Day at Michuki Memorial Park in Nairobi County

The CS reminded the citizens to take personal responsibility in protecting and conserving the environment, noting that COVID-19 pandemic has brought out the necessity to have recreational spaces within urban settlements.

The UN-Habitat Global Public Spaces Program Representative Ms. Cecilia Andersson, highlighted the importance of restoring and reclaiming green spaces. Under the Sustainable Development Goals (SDGs), Goal 11 –sustainable cities and communities, the UN endeavour to creating green public spaces, making human settlements safe, resilient and sustainable.

“The UN-Habitat has mapped out 864 green spaces in the country is working with government in expansion of green spaces as a measure to making cities and human settlements resilient to climate change,” said Andersson.

Other guests who graced the event included; Governer Mike Mbuvi, German Agency for International Cooperation (GTZ) Country Director Mr. Bodo Immink, PS. for Environment & Forestry Dr. Chris Kiptoo, and Chief Conservator of Forestry Mr. Julius Kamau.

KEFRI aims to improve on Webometrics ranking



source internet

The Global Cybermetrics Laboratory Research Group belonging to the Consejo Superior de Investigaciones Científicas (CSIC), the largest public research agency in Spain has ranked KEFRI at position 10,640 globally, 235 in sub-Sahara Africa and 29 nationally.

The Cybermetrics Lab, through a new emerging discipline called Cybermetrics or Webometrics is devoted to the quantitative analysis of the Internet and Web contents specially those related to the processes of generation and scholarly communication of scientific knowledge.

The Lab collaborates with other institutions of the Spanish Research and Development system (universities, autonomous governs, other public and private research organisms) and with social, economic, national or foreign agents to which contributes with its research capacity and human and material resources in the development of research projects or under the form of consultancy and scientific and technical support.

In the recent baseline survey conducted between April and July 2020, KEFRI scored under the indicators; openness (5,822), excellence (5,828), impacts (13,001) and presence (17,610) as indicated in URL-<https://www.webometrics.info/en/detalles/kefri.org>.

The Director KEFRI Dr. Joshua Cheboiwo, in a circular KEFRI/1 0/02VOL.III/(59) dated August 10th 2020, appreciated the staff for making the Institute visible in research and service provision globally.

“Let us work extra hard and live to our vision of being the centre of excellence in forestry research and allied natural resources...this is the only way to be competitive ... and we have what it takes to be the best,” said the Director in the circular.

Consequently, KEFRI Knowledge Management (KM) Team following the Board of Directors recommendation has drafted a roadmap to transform KEFRI's visibility and research output.

“The roadmap aims to raise KEFRI's profile and visibility through optimizing research for impact, increase scientific publications and access to knowledge products - online,” said Sheila Shefo Mbiru, Principal Research Scientist and expert in knowledge management.

"Amongst the key focal areas that KEFRI Board of Directors is keen to improve on is; production of quality research knowledge, raise H index for scientists, increase publications, and accessibility to research information," said Sheila (*Pictured*).



The H-index is an author-level metric that measures both the productivity and citation impact of the publications of a scientist or scholar. The index is based on the set of the scientist's most cited papers and the number of citations that they have received in other publications.

The advantage of the H-index is that it combines productivity (i.e., number of papers produced) and impact (number of citations) in a single number.

Other areas of integration in this proposed roadmap will be diversifying dissemination pathways, enhancing the corporate brand and use of mass media and social media to promote research and increase access to research information and knowledge products.

Peer-reviewed journal articles published within the Quarter

Angaine, P.M., Onyango, A.A., & Owino, J.O. (2020). Morphometrics of *Pinus patula* crown and its effect on cone characteristics and seed yield in Kenya. *Journal of Horticulture and Forestry*, 12(3), 94-100. Received: 05 May 2020. Accepted: 05 June 2020. Published: 31 July 2020. <https://doi.org/10.5897/JHF2020.0635>. <https://academicjournals.org/journal/JHF/article/abstract/EA3616F64129>.

Pinus species and other conifers have cones as an essential unit for seed production. Cone production in pines is not uniform and often varies among compartments and sectors within the crown. Many countries experience challenges in seed production from orchards due to poor practices. The present study aimed to evaluate within-crown cone production patterns, cone characteristics, and seed yield in a *Pinus patula* clonal seed orchard in Londiani, Kenya. Crown height was divided into three equal portions and a further subdivision done for each of the parts into two sections.

There were differences in cone characteristics within the crown, between the sections and compartments. The majority (67.1%) of the cones in the present study were curved. The study also showed that cone shape had no significant influence on seed yield. The present study observed cones collected from the top portion of the crown yielded the highest amount of seed (33.3 ± 4.91 seeds) ($p < 0.05$) while the bottom part had the lowest (14.4 ± 2.76) ($p < 0.05$).

The study recommends the collection of *P. patula* seeds from the upper part of the crown in unmanaged stands. Further, it suggests that management through pollarding needs to be done regularly to minimize within-crown differences.

Kaigongi Margaret M., Lukhoba C.W., Yaouba Souaibou, Makunga Nokwanda P., Githiomi J. and Yenesew Abiy. In Vitro Antimicrobial and Antiproliferative Activities of the Root Bark Extract and Isolated Chemical Constituents of *Zanthoxylum paracanthum* Kokwaro (Rutaceae). Received: 17 June 2020; Accepted: 16 July 2020; Published: 21 July 2020. *Plants* 2020, 9, 920; doi:10.3390/plants9070920 www.mdpi.com/journal/plants.

Zanthoxylum paracanthum Kokwaro (Rutaceae) is an endemic Kenyan and Tanzanian plant used in folk medicine by local populations. Although other *Zanthoxylum* species have been studied, only *Z. paracanthum* stem extracts have been profiled, even though the roots are also used as herbal remedies. As root extracts may be another source of pharmaceutical compounds, the CH₂Cl₂/MeOH (1:1) root bark extract was studied in this report. Eight root bark compounds were isolated and their structural identities were confirmed by mass spectrometry (MS) and nuclear magnetic resonance (NMR) (using COSY, HSQC, NOESY and HMBC) analyses. The structural identities were determined as follows: the fatty acid—myristic acid (1); the sterol—stigmasterol (2); the lignan—sesamin (3); two β -carboline alkaloids—10-methoxycanthin-6-one (6) and canthin-6-one (7); and three phenanthridine alkaloids—8-acetyldihydrochelerythrine (4), arnottianamide (5) and 8-oxochelerythrine (8). Some of these compounds were identified in the species for the first time. These compounds and the extract were then tested in vitro against methicillin-resistant *Staphylococcus aureus* (MRSA), *Escherichia coli* (ATCC 25922), *Staphylococcus aureus* (ATCC 29213) and *Candida albicans* (ATCC 10231) before tests for antiproliferative activity against the human breast cancer (HCC 1395), human prostate cancer (DU145) and normal (Vero E6) cell lines were conducted. Minimum inhibition concentration values of 3.91, 1.95, 0.98 and 7.81 $\mu\text{g/mL}$ against MRSA, *S. aureus*, *E. coli* and *C. albicans*, respectively, were recorded. Among the isolates, canthin-6-one was the most active, followed by 10-methoxycanthin-6-one.

The root extract and some of the compounds also had antiproliferative activity against the HCC 1395 cell line. Stigmasterol and canthin-6-one had IC₅₀ values of 7.2 and 0.42. The root bark extract also showed activity, at 8.12 $\mu\text{g/mL}$, against the HCC 1395 cells. Out of the chemical isolates, 10-methoxycanthin-6-one and canthin-6-one showed the strongest inhibition of the DU 145 cells. The root extract had significant antimicrobial and antiproliferative activities, supporting the traditional use of this plant in treating microbial infections and cancer-related ailments.

Onyango A.A., Angaine P.M., Inoti S.K. and Owino J.O. (2020). Patula pine (*Pinus patula*) cones opening under different treatments for rapid seed extraction in Londiani, Kenya. Received: 28 April 2020. Accepted: 26 May 2020. Published: 30 June 2020. Journal of Horticulture and Forestry. Vol.12 (2), pp. 63-69. April 2020. <https://doi.org/70-83>

Seed extraction from pines is challenging to the forestry sector globally. This is usually contributed by the pine cone anatomy that opens through a function of temperature and humidity which varies widely in the pine growing regions of the world and the *Pinus* species as observed in previous works done on *Pinus roxburghii*, *Pinus halepensis*, *Pinus wallichiana*, *Pinus pinaster*, *Pinus radiata*, and *Pinus sylvestris*. This study sought to reduce the extraction time and improve the extraction efficiency of *Pinus patula* seed in Kenya. The experimental design used was two factorial design with replicates of twenty cones randomly picked per treatment. Data analysis was analyzed through ANOVA with a P-value of 0.05. We present evidence that soaking does not influence the opening of cones and seed yield for the optimum temperature which the study determined to be 65°C. We also present evidence that, for rapid seed extraction, the temperature 65°C with an exposure period of between 4 and 24 h is significantly effective.

This study presents a new understanding of rapid seed extraction, which contributes to one of the Kenya Forestry Research Institute's strategic objectives of generating technologies for enhanced production of superior germplasm for priority tree species.

Ndalilo L., Wekesa C., and Mbuvi M.T.E. (2020). Indigenous and Local Knowledge Practices and Innovations for Enhancing Food Security Under Climate Change: Examples from Mijikenda Communities in Coastal Kenya. Chapter 3 In: Gasparatos A. et al. (eds) Sustainability Challenges in Sub-Saharan Africa II. pp 63-82. Science for Sustainable Societies. Springer, Singapore. https://doi.org/10.1007/978-981-15-5358-5_3

Climate change adversely affects agricultural production in many countries of sub-Saharan Africa (SSA) such as Kenya.

This can have important ramifications for local livelihoods and food insecurity and has often been linked to the erosion and loss of Indigenous and Local Knowledge (ILK). For instance, changes in agro-biodiversity management due to the dominance of modern agricultural practices based on a few commercial crop varieties can have important implications for food security, especially in areas that are severely affected by climate change. Many communities throughout SSA depend on (and are custodians of) such ILK practices, which are maintained through various traditional resource management systems regulated by traditional institutions, customary laws and cultural values.

This chapter identifies and documents ILK practices and innovations that can enhance agricultural productivity and food security in the face of climate change in coastal Kenya. We focus on the five Mijikenda communities of Digo, Giriama, Duruma, Rabai and Chonyi.

Household surveys, key informant interviews and focus group discussions were used to elicit the local livelihoods, as well as the prevailing patterns of climate variability, food security and ILK practices (including agrobiodiversity conservation). The study reveals that the five local communities widely use farming-related ILK practices and innovations to improve crop productivity and ensure food security in the face of climate change.

Some of the most common practices include crop diversification, early planting, and adoption of drought-tolerant and fast-growing local varieties, crop rotation, and conservation tillage, domestication of wild food and medicinal plants and use of bio-pesticides. Despite some evidence of ILK erosion, the local communities mobilize effectively their cultural values and customary resource management and governance systems to preserve and use such ILK practices. There is an urgent need to integrate such ILK practices and innovations into relevant policies and climate change adaptation strategies at the local, national and international levels, as a means of enhancing livelihoods, food security and agrobiodiversity conservation.

KEFRI and Murang'a County to rehabilitate Karua forest



From L-R: Director KEFRI Dr. Joshua Cheboiwo, Board Member Kevin Kihara, Makuyu legislator Hon. Mary Wamahua, KEFRI Board Chairman Dr. Sammy Letema, CAQA Deputy Director Dr. Jackson Mulatya with other staff members

The Chairman - KEFRI Board of Directors Dr. Sammy Letema has said KEFRI is eager to introduce valuable trees on farm in Murang'a County. The Chairman spoke during a courtesy call by Member of Parliament (MP) for Maragua Constituency in Murang'a County Hon. Mary Wamaua KEFRI on 26th August 2020.

Dr. Letema who was accompanied by the Board member Mr. Kevin Kihara and the Director Dr. Joshua Cheboiwo informed the MP that KEFRI is looking forward to working with Maragua people in rehabilitating the forests and riparian lands.

“We encourage farmers to adopt indigenous trees combined with fruit trees and bamboo since farm forestry is the main source of wood for small scale industries following the ban on logging in state forests,” the Chairman said.

The legislator, whose objective was to learn more about restoration of degraded landscapes and forests, said Muranga County government has earmarked over 500 acres of forest for rehabilitation including the degraded Karua hill forest that feeds Saba Saba River.

“My constituents would like to collaborate with KEFRI and other stakeholders in improving food security and livelihood of the communities through

nature based activities such as bee keeping, and other environmental related aspects especially in arid and semi-arid areas,” the MP said.

KEFRI through the Central Highlands Eco-Region Research programme will engage with Maragua constituents and form a working group for the implementation of the proposal which will greatly help in achieving the 10% tree cover.

The Director said, “Introducing on-farm forestry with incentives to farmers will in return motivate them to conserve the forest since studies have shown organized group can be effective in safeguarding the forests”.

KEFRI scientists have been rehabilitating Saba Saba riverine through planting bamboo. The rehabilitation will enhance the riparian areas which had been degraded due to erosion, leading to landslides.

KEFRI Choir performs at Michuki Memorial Park

KEFRI Choir entertained guests during the official launch of Michuki Memorial Park on 14th August 2020. The event was officiated by His Excellence, President Uhuru Kenyatta.

The choir jointly with KFS choir performed songs on environmental matters. The main song “Welcome to Michuki Park” elaborated on rehabilitation of the park, the stakeholders involved and the current state of the park. Other songs were “Janga la Corona, Panda Miti” among others.

Within the same quarterly period, KEFRI choir entertained guests at the same venue during the World's Bamboo Day celebrations held on 18th September 2020. The choir recited both the National and East African Anthems and performed three songs namely: Misitu Yetu Tuhifadhi, Wajibu Wetu and Panda Miti Penda Kenya.

The songs attracted the attention of the CS who joined the choir and danced enthusiastically making the performance even more entertaining and enjoyable.

KEMFRI benchmarks enterprise initiatives

KEFRI Director Dr. Joshua Cheboiwo has said KEFRI generates revenue annually from enterprise ventures which include sale of quality tree seed and seedlings. However, due to COVID-19 pandemic and its economic implications, the institution like other similar state agencies, require funding from exchequer to evade reduction in operations or total close down of the enterprise activities.



From left to right: Dr. Peter Odote, Mr. Mwachai, Dr. Jane Njuguna, Dr. Joshua Cheboiwo, Prof. Njiru, Mr. Kagwima, George Otieno and Derrick Enoda in a group photograph taken soon after participating in the consultative meeting

Dr. Cheboiwo was speaking at the headquarters during a brief meeting with Kenya Marine and Fisheries Research Institute (KEMFRI) Director Prof. James M. Njiru who was on enterprise benchmarking mission. The KEMFRI Director was accompanied by his Deputy Director Finance and Planning Mr. Abraham Kagwima and Business Development Manager Dr. Peter Odote.

Dr. Cheboiwo further stated that KEFRI through its 18 centres that include farmer's resource centres spread countrywide, provide devolved forestry research services that include capacity building, technology transfer and information sharing to support forestry development in defined ecological zones.

KEFRI operates farmer's resource centres in Turkana, Marigat, Muguga, Karura, Kitui, Taita Taveta, Lamu and proposes to reach out to Laikipia, North Eastern counties of Marsabit, Samburu, Wajir and Mandera in future.

"From our experience, implementation of enterprise venture requires a defined policy, transition period, ample skills and funding (seed capital) to ensure gradual growth," said Dr. Cheboiwo.

Prof. Njiru informed the meeting that his institution whose mandate is to undertake research in marine and freshwater fisheries, aquaculture, environmental and ecological studies, including chemical and physical oceanography to provide scientific data and information for sustainable development of the Blue Economy, wish to adopt KEFRI model of enterprise service.

"I extend my gratitude to KEFRI Director for sharing with us lessons learnt in the implementation of enterprise service. I am also very grateful to the management for the opportunity to interact with staff and experience the roles played towards smooth adoption of this venture," said Prof. Njiru.

KEFRI Senior Deputy Director for Research and Development Dr. Jane Njuguna noted that KEFRI and KEMFRI have related in several research projects particularly in development of mangroves in coast region.

"Residents looks at KEMFRI as a viable institution to capitalise on fish fingerlings and other aquatic resources that can boost food security and stimulate blue economy in the country," said Dr. Njuguna.

Ukulima SACCO donates PPEs to halt spread of COVID-19

Ukulima Sacco has donated masks, hand sanitizers and portable washing kit to KEFRI staff in a bid to fight the spread of Corona virus.

The donation was made in cognizance that KEFRI staff forms a large percentage of membership to the Sacco.

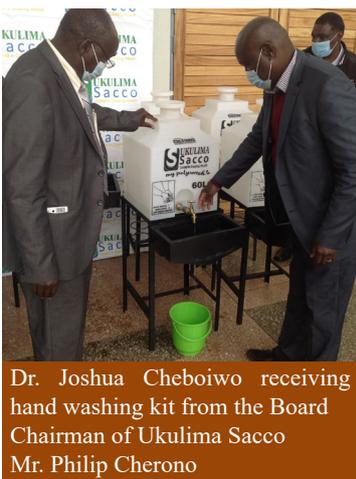
The Sacco Board Chairman Mr. Philip Cheron, stated that since Corona virus was declared in the country in March 13th 2020, the Sacco has disbursed emergency loans and donated kit and masks to enhance prevention and control measures.

“Ukulima Sacco is obligated to cater for the welfare of its members and more over it is always in the forefront to protect members from foreseeable and non-foreseeable calamities,” said Cheron.

Director KEFRI, Dr. Joshua Cheboiwo while receiving the donations on behalf of the staff said he is grateful for the gesture.

“The donations will go a long way in helping our officers especially those whose work entails perpetual engagement with stakeholders in various backgrounds,” said Dr. Cheboiwo.

KEFRI staff (below) who have diligently been saving with the Sacco were recognized and awarded certificates.



KEFRI and Acacia Export Processing Zone to uplift gum and resin sector in Kenya

KEFRI and Acacia EPZ will partner in a 2-year European funded project to re-organize gums and resins sector in Kenya.



Gum arabic, also known as acacia gum is a natural gum consisting of the hardened sap collected mainly from any of the two species of the acacia tree, *Acacia senegal* (now known as *Senegalia senegal*) and *Vachellia seyal*, formerly called *Acacia seyal*

“The project will apply multi-sectorial approach to localize gum and resin sourcing and improving trading,” said Mr. Sam Nyamboga, the EPZ CEO.

Acacia EPZ is a company that sources, processes and exports Gum Arabic through a network of collectors across Kenya. By training, organizing, equipping and then aggregating, purchasing, and processing their products, Acacia EPZ creates sustainable supply chains of Gum Arabic for global markets and sustainable livelihoods for thousands of collectors.

Acacia EPZ currently operates in Marsabit, Samburu, Turkana and Isiolo counties, with plans to expand to three new counties by 2021.

In the proposal, KEFRI will undertake capacity building and application of technologies to establish plantations for gums and resins in Isiolo, Marsabit, Samburu and Turkana counties.

Gum arabic is harvested commercially from wild trees and used primarily in the food industry and soft-drink industry as a stabilizer. It is a key ingredient in traditional lithography and in printing, paint production, glue, cosmetics, and various industrial applications, including textile industries.

Nine trees for the late Prof. Wangari Maathai anniversary

Stakeholders in Muguga forest conservation on 26th September 2020 planted 9 trees at Gachuthi natural forest block celebrating the 9th Anniversary for the late Prof Wangari Maathai.



Dr. Eston Mutitu together with community members planting a commemorative tree at Gachuthi natural forest

KEFRI scientists guided both the young and elderly volunteers through the forest nature trail and explained the essence of the various tree species endemic in Muguga forest. The seed experts also created awareness on best tree nursery establishment and management techniques.

The chief guest, the President of the Rotary club in Lavington, Mr Richard Kirundi planted Muthengera (*Podocarpus latifolius*) which is an indigenous species valued for quality timber and herbal extracts. KEFRI's Central Highland Eco-regional Research Programme Director Dr. Eston Mutitu planted Munderendu (*Teclea nobilis*), representative from Mother Earth planted Mũthiga (*Warburgia ugandensis*), KEFRI veterans led by renown taxonomist Mr. Francis Gachathi planted Mũiri (*Prunus africana*), the Assistant County Commissioner for Kikuyu planted Mũtarakwa (*Juniperus procera*), members of the Church Missionary Society planted Murangi commonly known as Bamboo (*Bambusa vulgaris*), Nderi Youth Filming Fraternity planted Mũkindũri (*Croton megalocarpus*), Nguriunditu youth group among other representatives from Karai, Kerwa planted Mũtamaiyũ (*Olea africana*) while MERCFA planted Mũhũgũ (*Brachylaena huillensis*) highly valued in wood curving industry.

"The Rotary club is committed to work with other stakeholders in sustenance of the late Prof. Maathai conservation initiative which will help us achieve the Sustainable Development Goals (SDGs)," said Kirundi.

Wangari Maathai, the first African woman to receive the Nobel Peace Prize in 2004, for her contribution to sustainable development, democracy and peace combined science, social commitment and active politics.

Maathai initiated Green Belt Movement (GBM) after realising that our Country was in a state of environmental crisis, marked by biodiversity loss-forestry and other ecosystem degradation, rapid population and climate change that aggravate poverty, inequality and hunger.

"KEFRI in its mission of research and dissemination of its findings has partnered with other stakeholders to improve Muguga forest ecosystem and livelihoods of the adjacent communities," said Dr. Mutitu.

He noted that the forest has rich biodiversity that needs to be preserved for research and utilization by the current and future generations.

Dr. Mutitu appreciated the cordial relationship between the institute and adjacent community which he said will sustain the late Professor's efforts in environmental conservation.

Mr. Gachathi echoed the regional directors sentiment highlighting Gachuthi forest as a unique biodiversity hosting endangered tree species of *Vepris glandulosa* and East Africa Sandalwood (*Osyris lanceolata*) and conservation of its flora and fauna is paramount. "The community adjacent the forest needs to pursue means of sustainably utilizing the resources, a feat that requires a delicate balance of trade-offs," further said Gachathi.

MERCFA Chairperson Mr. Simon Kamonde thanked the stakeholders for protecting Gachuthi forest which hosts the late Wangari Maathai's environmental conservation site.

"Gachũthi natural forest has supported adjacent community with forest products for over fifty years. However, due to high demands by rapid human population, the resource face looming degradation," Kamonde said.



KEFRI Choir entertaining with environmental songs during the launch of Michuki Memorial Park

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