

ROOTS AND TUBERS

Dominica makes first shipment of dasheen to United States. Dominica Government Information Service, 26 May 2017

<http://news.gov.dm/index.php/news/4369-dominica-makes-first-shipment-of-dasheen-to-united-states>

Full article

Dominica has made its first shipment of dasheen to the United States

This was confirmed by the Hon Minister for Agriculture, Johnson Drigo in Parliament on Wednesday.

Hon Drigo says this is further evidence that Government continues to invest in the agriculture sector and continues to expand its market reach.

“Today, we sent out our first trial shipment of a container of dasheen to the United States, 22,000 pounds. This is what we are doing to move the agriculture sector forward. As we speak, the synergies between agriculture and trade is improving...”

Hon Drigo made this announcement while supporting the supplementary estimates of over \$155 million presented to Parliament by the Hon Prime Minister on Tuesday.

Hon Drigo dismissed claims from opposition parliamentarians that inadequate attention is given to agriculture and advised them to encourage their constituents to take advantage of the \$10 million loan facility at the AID Bank.

Hon Drigo says over the years, millions have been invested in the sector for soft loans.

“Over \$130 million has already gone into the sector; soft loans to the farmers into production, and we are doing everything to help them in export. The packhouses are swinging, people are just calling the packhouse asking for fresh produce...the farmers have come to realise that there is money to be made, they will not be distracted by the opposition and they are trying their best...”

“What is important is that the agricultural sector is alive and its moving forward and we will not be distracted by the opposition where agriculture is concerned,” he said.

In the estimates, for the period July 2016 to April 2017, \$194,000 was allocated to agriculture.

The Cusco to host World Potato Congress in 2018. International Potato Center (CIP), 31 May 2017.
<https://cipotato.org/press-room/blog/cusco-host-world-potato-congress-2018/>

Full article

Official launch will take place during National Potato Day celebrations at CIP headquarters

Over the last 15 years, ongoing strategic action has been underway in Peru for the development of the potato sector. It's a sector on which more than 730,000 families depend. That's 11% of the national population, some 3.65 million people. The resulting dynamism that has been generated translates to increased valorization of potato, the development of a series of potato-based products, and more political decision-making toward positioning the sector, such as the celebration of National Potato Day.

This year, the event held at CIP on 31st May will take on particular significance. In addition to the traditional 'tuber celebrations', the 2018 World Potato Congress, taking place in Cusco, Peru will be officially announced at the event.

Attending the launch will be leading authorities from the Ministry of Agriculture and the Ministry of Foreign Trade and Tourism, as well as the National Institute of Agrarian Innovation and the National Agrarian University of La Molina, along with representatives from FAO-Peru and the International Potato Center (CIP), at whose headquarters the official announcement will be made.

Last year, as part of a special commission, these institutions held intensive negotiations with event organizers, who after due hearing and consideration, decided to grant the venue of the 2018 event to Peru.

Organizers took into account the great significance that potato holds for the country; its importance as part of an ancestral culture, as well as today's public and private alliances around the potato production chain which have turned the sector into the most dynamic in Latin America. Added to this was the city of Cusco's proven capacity in services, hotels and tourism to host this type of event.

The World Potato Congress is the sector's most important international event, bringing together top representatives from industry, trade and research. It has been held every three years for the last three decades, but has never yet been held in Latin America.

To draw attention to the importance of next year's event, the announcement of the Congress will take place in conjunction with a live exhibition of the scientific and technological developments of CIP and its partners in current key areas such as conservation, plant breeding, production systems, modelling climate change effects, and market promotion and development.

Programs relating to several of these issues are currently being implemented in Peru, Bolivia and Ecuador through the International Fund for Agricultural Development (IFAD-ANDES)-funded project, enabling us to work with public partners and reach a wider population.

The title of the exhibition is "The Future of Potato: Biodiversity, Food Security and Business". The title is intended to underscore an appreciation of the importance of the potato crop's biodiversity

and how this is used and valued by different actors within the production chain, satisfying the specific demands of a range of diverse markets at local, national and international level.

Peru's hosting of the 2018 World Potato Congress is a great opportunity, not only for the potato sector, but for Peruvian agriculture as a whole. The Congress provides an excellent showcase for demonstrating and enhancing the Peruvian experience in valorization and sustainable use of potato's biodiversity, especially with native varieties.

At the same time, it represents an opportunity for an appreciation of experiences in other parts of the world, where science is making an important contribution to nutrition, health, food security, and industrial development through the application of different schemes for commercial differentiation and the dissemination of potato varieties and products. In turn providing a sound basis for consolidating income-generating alternatives and improving the living standards of small-scale producers in developing countries.

From the point of view of scientific research and technological innovation, the Congress will strengthen the capacities of Peru's researchers and future agricultural professionals, giving them the opportunity to share their work and interact with top scientists from all over the world.

Date: 31 May
Time: 10 am
Place: Auditorium – International Potato Center
Av. La Universidad 1895, La Molina

WHEAT

Moving zinc-enriched wheat into the mainstream. By Mathew O'Leary. International Maize and Wheat Improvement Center (CIMMYT), 29 May 2017

<http://www.cimmyt.org/moving-zinc-enriched-wheat-into-the-mainstream/>

Full article

EL BATAN, Mexico (CIMMYT) – In an effort to stamp out hidden hunger, scientists are calling for support to make zinc-biofortification a core trait in the world's largest wheat breeding program.

At least 2 billion people around the world suffer from micronutrient deficiency, or hidden hunger, which is characterized by iron-deficiency anemia, vitamin A and zinc deficiency.

Zinc deficiency remains a crucial health issue in sub-Saharan Africa and South Asia. As a key nutrient in red meat, it is prevalent in areas of high cereal and low animal food consumption.

It is vital in times of rapid human growth such as pregnancy, infancy and puberty. Compared to adults, children, adolescents as well as pregnant and lactating women have an increased need for zinc. Deficiency harms growth and development and can cause respiratory infections, diarrheal disease and a general weakening of the immune system.

One way to tackle hidden hunger is through biofortified crops, which have been bred to contain higher amounts of minerals and vitamins. These crops help to improve health in poor communities where other nutritional options are unavailable, limited or unaffordable.

As a key staple, wheat provides 20 percent of the world's dietary energy and protein, therefore it's an ideal vehicle for biofortification, said Velu Govindan, a wheat breeder at the International Maize and Wheat Improvement Center (CIMMYT).

CIMMYT scientists are calling for funds to make increased zinc grain content a core trait in its global wheat breeding program. CIMMYT-derived wheat cultivars have contributed to more than half of the wheat varieties grown in developing countries.

“In wheat breeding, including zinc as core trait – as done with high and stable yield, drought and heat tolerance and disease resistance – would have huge health benefits in South Asia and sub-Saharan Africa,” said Ravi Singh, who leads CIMMYT's wheat improvement program. “Around 70 percent of the wheat varieties grown in these regions derive from CIMMYT breeding research.”

In the early 2000s, scientists conducted large-scale screening for high zinc content in traditional wheat and their wild relatives from CIMMYT's wheat germplasm bank. The search was successful, revealing diverse genetic resources with traits that became the building blocks for zinc-enriched wheat.

CIMMYT initiated biofortification breeding in 2006 and four biofortified wheat varieties have been released in South Asia. Promotion of zinc-biofortified wheat varieties in India and Pakistan is in the early stages and further testing and scaling out to other countries like Bangladesh, Nepal, Afghanistan and Ethiopia is underway, the scientists confirmed.

Studies in India have shown that regular consumption of zinc-enriched wheat improves the overall health of women and children, said Govindan.

Extensive global presence of CIMMYT-derived varieties means that, once the program adds enhanced grain zinc levels as a core trait, many wheat farmers and consumers throughout the developing world will automatically reap the benefits of better nutrition.

However, increased funding is needed to make the jump to full inclusion of high zinc content, according to Hans Braun, director of CIMMYT's Global Wheat Program and CGIAR's research program on wheat.

“Each added trait in a breeding program requires a significant increase in the number of breeding lines grown and evaluated, adding significant costs” Braun said.

CIMMYT's wheat breeding program is currently funded at around \$15 million per annum. In 2016, it distributed 14.5 tons of seed of experimental wheat lines in more than 500,000 small envelopes to nearly 300 partners in 83 countries. Globally, this makes CIMMYT the most important wheat germplasm provider together with the International Center for Agricultural Research in the Dry Areas (ICARDA).

For more information on zinc-biofortified wheat visit this science brief <https://www.croptrust.org/blog/biofortification-zinc-wheat/>

MAIZE

Tanzanian start-up rises to profitable maize business. By Kelah Kaimenyi. International Maize and Wheat Improvement Center (CIMMYT), 29 May, 2017

<http://www.cimmyt.org/tanzanian-start-up-rises-to-profitable-maize-business/>

Full article

MBEYA, Tanzania (CIMMYT) – To achieve its objective of sustainably increasing the availability of new drought tolerant maize varieties in eastern and southern Africa, the International Maize and Wheat Improvement Center (CIMMYT) supports seed company partners in enhancing their capacity to produce foundation and certified seed.

AgriSeed began as a small seed company in Tanzania in 2010, producing seed using donor grants to get established, and selling seed through a government subsidy program. When the program closed in 2013, collapse of the business was a real threat. However, in 2015 AgriSeed received its first grant from the CIMMYT-led Drought Tolerant Maize for Africa Seed Scaling (DTMASS) project to produce early generation seed of a new hybrid called WE2112, and are now on their way to sustainability.

“When the African Agricultural Technology Foundation announced licensing of this variety, we jumped at the opportunity,” said Ambonesigwe Mbwaga, Director of AgriSeed. “We wanted something we could call our own, since all our other products are public and can be produced by another company.”

WE2112, marketed as AgriSeed H12, is the first hybrid sold by the company, with CIMMYT supporting the transition from open pollinated varieties to improved hybrids. Profitable sales of improved maize varieties are key to sustained and scaled production by the private sector to ensure access in the long run. Being among the few seed companies producing this particular hybrid gives AgriSeed an edge in the market.

“With AgriSeed, we started from scratch: increasing the parents, increasing the inbred lines, single crosses, and so on,” said James Gethi, maize breeder and DTMASS technical lead for Tanzania. “My main excitement this year is to see the product of that support coming to fruition. They now have a certified crop, from zero, and have something to sell.”

According to Mbwaga, the product is “flying off the shelves.” While only three tons of AgriSeed H12 were produced and sold in 2016, AgriSeed expects this figure to rise to over 50 tons in 2017 due to increased production capacity, and the huge demand created from the minimal sales. Also of note is the AgriSeed H12 packaging, whose smallest pack is five kilograms, much larger than the one and two kilogram bags often sold of new products to smallholder farmers. This is a strong indicator of demand and confidence in the product, since it costs more to purchase the bigger bag.

To promote sales, the company has set up over 100 demonstration plots for 2017 with DTMASS support, most of them in the southern Tanzania towns of Mbeya, Mbozi and Mlonge. Unlike the traditional highway setups, AgriSeed is concentrating demos along roads in villages, increasing access to farmers away from major roads. This aims to boost sales but also helps the United States

Agency for International Development (USAID), the project's funder, reach its Feed the Future goals to reach remote smallholder farmers.

Through technical and financial support and capacity building initiatives, DTMASS works closely with AgriSeed and other partners in eastern and southern Africa to bring affordable, improved maize seed to 2.5 million people. With funding from the USAID, DTMASS aims to meet demand and improve access to good-quality maize through production of improved drought-tolerant, stress-resilient, and high yielding maize varieties for smallholder farmers.

New Publications: Sustainable agriculture boosts water savings in India. By Katelyn Roett. International Maize and Wheat Improvement Center (CIMMYT), 30 May 2017
<http://www.cimmyt.org/new-publications-sustainable-agriculture-boosts-water-savings-in-india/>

Full article

EL BATAN, Mexico (CIMMYT) — In northwestern India, growing maize is being advocated as an alternative to rice to address resource degradation challenges such as declining water tables and climate change induced variability in rainfall and temperature.

Sustainable agriculture practices [have proven to increase](#) farmer income, improve irrigation productivity and reduce greenhouse gas emissions in the cereal systems of the Indo-Gangetic plains (IGP), a fertile area extending over 2.5 million square kilometers across Bangladesh, India, Nepal and Pakistan.

The IGP currently abstracts [25 percent](#) of global groundwater withdrawals, sustaining agricultural productivity across the region. However, aquifers are being depleted at rates faster than they can recharge, threatening food security for more than [500 million people](#).

In response, researchers from the [International Maize and Wheat Improvement Center](#) (CIMMYT) [observed the impact](#) of sustainable conservation agriculture practices like zero-tillage (ZT) and permanent bed planting (PB) in irrigated maize-based systems integrated with legumes in the IGP of northwestern India.

ZT and PB practices reduced irrigation water requirement by up to 65 and 98 hectares per millimeter, respectively, compared to conventional tillage systems, resulting in a water productivity boost of nearly 20 percent. Net profit from maize-based systems under ZT was over 30 percent higher than conventional systems.

[The study](#) concludes that by adopting sustainable practices like ZT and PB, farmers can sustainably increase productivity throughout the IGP region.

HOT PEPPERS

Gov't to Roll out Scotch Bonnet Pepper Programme. Jamaica Information Service, 30 May 2017

<http://jis.gov.jm/govt-roll-scotch-bonnet-pepper-programme-2/>

Full article

The Government is set to roll out a Scotch bonnet pepper programme in North East Manchester in the next few weeks.

This was announced by Minister without Portfolio in the Ministry of Industry, Commerce, Agriculture and Fisheries, Hon. J.C. Hutchinson, during a meeting with Irish Potato Farmers at the Restore Pentecostal Church in Devon, Manchester, on May 17.

He explained that the pepper programme will be similar in structure to the National Irish Potato Programme in that farmers will receive seedlings and other inputs upfront, with payments being made when crops are reaped.

“I consider this area as the hub where there is good climate and it has the greenhouses that will be utilised for distribution of pepper seedlings to farmers in a similar way to what obtains for the Irish potato and onion programme,” Mr. Hutchinson said.

Minister Hutchinson said farmers will have to be a member of an organisation, under the umbrella of the Rural Agricultural Development Authority (RADA), to benefit from the initiative.

Additionally, technical support will be provided by the various stakeholders such as RADA and marketing support will be provided through the Potato and Onion Producers Association with which farmers can enter into contractual arrangements.

“All the farmers would need to find is the labour. The ministry would also help with securing markets for the produce and after reaping, all input costs would be subtracted and they would get the profits,” Mr. Hutchinson said.

Meanwhile, the Minister said the Government has some 5,000 acres of farmland in South Manchester.

“Where there are idle Government-owned lands, we will put farmers on it to work. We are dedicated to seeing that all struggling farmers get a push-start and providing the basic inputs that will (help) them (become) productive individuals,” Mr. Hutchinson said.

For his part, Member of Parliament for North East Manchester and Minister of Finance and the Public Service, Hon. Audley Shaw expressed appreciation to Newport-Fersan for its custom-designed fertiliser for Irish potato.

He encouraged the farmers to put in place the kind of agricultural techniques to ensure the greatest yields possible.

Some 1,508 farmers have been involved in the planting of 352 hectares of Irish potato in Manchester, of which 1,955 tonnes have been reaped to date. Overall, 3,431 farmers have planted 930 hectares of Irish potato across the island with 669 hectares reaped producing 10,831 tonnes of Irish potato.

BANANA

More to the bunch: Study finds large chromosomal swaps key to banana domestication. Molecular Biology and Evolution (Oxford University Press). EurekAlert American Association for the Advancement of Science (AAAS), 30 May 2017

https://eurekalert.org/pub_releases/2017-05/mbae-mtt053017.php

Full article

Bananas are one of the most important staple crops of the tropics, transported with great care over great distances to satisfy the world's appetite. And today, with more than half the world's bananas coming from a single, Cavendish variety, they may increasingly become susceptible to funguses that threaten its livelihood, such as the devastating Panama disease.

That's why scientists have been eager to understand the mysteries of its genome. Cavendish fruits have no seeds, do not sexually reproduce (and therefore are genetically identical), and have three sets of chromosomes (triploid), which made its genome very difficult to sequence.

The origins of Cavendish bananas come from several *Musa acuminata* subspecies that diverged after being geographically isolated in distinct Southeast Asian regions and islands. As with other domesticated crops, it is thought that human migrations helped lead to the emergence of subspecies and hybrids with a consequence---reduced fertility---but prized for their delectable fruits with high flesh and low seed content.

A reference genome of *M. acuminata* was completed by Angélique D'Hont's group at the CIRAD French research institute and the French National Sequencing Center in 2012. Now, with next-generation sequencing tools available, they wanted to more finely explore the banana genome with an ultimate goal of helping breeding programs produce hardier, more disease resistant bananas.

Using a variety of sequencing and bioinformatics tools, chromosomal imaging and PCR technology, for the first time, they have identified a large chromosomal swap involving two regions on chromosomes 1 and 4, and showed that it prevents the proper reshuffling of its DNA in its progeny.

When they traced the inheritance of these structures they found that the rearranged chromosome swap was preferentially transmitted to the progeny.

The significance of their findings are important for agriculture. The structure was found in half of the triploid cultivar sub-groups tested, highlighting a substantial contribution of this new chromosome structure in banana crops.

"It is noteworthy that this structure was found in the Cavendish sub-group of dessert bananas, which represents more than half of global banana production," said D'Hont.

"This must have been an important factor in reducing fertility and in the formation of triploid cultivars, and thus, in banana domestication. Indeed, triploidy is the most efficient ploidy level for the agronomic performance in banana. These characteristics have generated more vigorous plants, larger fruits and higher sterility, resulting in a complete absence of seeds in the fruits."

The new findings could be used in breeding programs for banana crops to fight the dreaded Panama disease. "This knowledge could be exploited to either foster recombination or fix allele combinations in the rearranged regions by choosing adequate parental combinations," said D'Hont. "We expect to find more of these variations in the future, which will help steer recombination among the genes that control banana traits."

The study appeared in the advanced online issue of the journal [*Molecular Biology and Evolution*](#).

Research paper: Evolution of the banana genome (*Musa acuminata*) is impacted by large chromosomal translocations. <https://academic.oup.com/mbe/article-lookup/doi/10.1093/molbev/msx164>

BIOTECHNOLOGY

Drug-delivery method holds promise for controlling crop parasites. By Case Western Reserve University, 30 May, 2017.

<http://thedaily.case.edu/drug-delivery-method-holds-promise-controlling-crop-parasites/>

Full article

Researchers at Case Western Reserve University are applying drug-delivery technology to agriculture to control parasitic roundworms more effectively and safely.

The tiny roundworms, or nematodes, cause \$157 billion in crop failures worldwide each year, other researchers estimate, largely because they're beyond the reach of pesticides. The chemicals disperse poorly into soil, while the parasites feed at plant roots well below the surface.

As a result, farmers apply large amounts of pesticides, which can increase the chemical concentrations in food or run off and damage other parts of the environment, all of which have costs.

But biomedical engineering researchers at Case Western Reserve may have found an effective solution.

"We use biological nanoparticles--a plant virus--to deliver a pesticide," said Paul Chariou, a PhD student in biomedical engineering at Case Western Reserve and author of a study on the process published in the journal ACS Nano. "Use of the nanoparticle increases soil diffusion while

decreasing the risk of leaching and runoff, reducing the amount of chemical in food crops and reducing the cost to treat crops."

Chariou worked with Nicole Steinmetz, the George J. Picha Professor in Biomaterials appointed by the Case Western Reserve School of Medicine.

Parasitic nematodes feed on a wide range of crops, including corn, wheat, coffee, soybeans, potatoes and a host of fruit trees. Damage they cause at the roots impairs the plants' ability to absorb water and nutrients, which can kill young plants and reduce yields in mature plants.

To try to deliver more pesticide to the roots, the researchers used tobacco mild green mosaic virus (TMGMV). The virus is used in Florida as a pesticide to control an invasive weed, but is benign to nematodes.

TMGMV can infect tomatoes, eggplant and other solenaceous plants, but is not a threat to nearly 3,000 other plant species that suffer nematode infections.

The virus self-assembles into a tube-like structure, 300 nanometers long by 18 nanometers wide, with a hollow channel 4 nanometers wide.

As a proof of concept for this study, the researchers tested the plant virus-derived nanoparticles with a nematicide called crystal violet, which has been used to kill nematodes on skin but not in agriculture.

The researchers capitalized on surface chemistry to load the positively charged crystal violet molecules into the negatively charged channel of the virus-nanoparticle. Each virus particle carried about 1,500 crystal violet molecules.

In lab experiments with conditions mimicking crop soils with a pH of 5, the nematicide remained attached as the virus particles were applied to and diffused through the soil. "At the root level, the nematicide diffuses out of the virus over time," Chariou said. Warmer and more acidic soils caused the chemical to be released faster.

In testing with the nematode *Caenorhabditis elegans*, in a liquid culture, the scientists confirmed that nematodes were paralyzed and killed by treatment with the drug-infused virus-nanoparticle - this is because the drug diffuses out of its carrier over time allowing it to interact with the nematodes. As a secondary killing mechanism, the researcher also noted that the roundworms were eating the nanoparticles. The crystal violet was released in the animals' stomachs, paralyzing and killing them.

Most importantly, nematicide-carrying virus particles dispersed better when applied to the soil surface and made more molecules available to kill nematodes at the root level.

Chariou and Steinmetz are now testing the delivery system using chemical pesticides approved for crops and developing a computer model to better understand and, ultimately, optimize the nanoparticle's ability to diffuse through soil.

CLIMATE CHANGE

[CIMH workshops focus on forecasting, impact of climate change](http://today.caricom.org/tag/caribbean-regional-climate-outlook-forum-caricof/). CARICOM Today, June 2, 2017
<http://today.caricom.org/tag/caribbean-regional-climate-outlook-forum-caricof/>

Full article

Representatives from across various sectors in the [Caribbean Community \(CARICOM\)](#) will on Friday 2 June, wrap up meetings in St. Vincent and the Grenadines that focused on forecasting and the impact of climate change of sectors including health, tourism, agriculture and energy.

The Caribbean Institute for Meteorology and Hydrology (CIMH) held the 2017 Wet Season Caribbean Climate Outlook Forum (CariCOF) workshops with support from the United States Agency for International Development (USAID) and the Department of Environment and Climate Change Canada. In addition to the Forum, the final two days of the week-long workshops focused on the Building Regional Climate Capacity in the Caribbean (BRCCC) Programme's Early Warning Information Systems Across Climate Timescaes (EWISACTS).

Prime Minister of St. Vincent and the Grenadines, Dr. the Hon. Ralph Gonsalves addressed participants on Wednesday morning. In his wide-ranging address, he reflected on the impact of natural disasters on the small states of the Caribbean, and the level of funding that was required to recover from them. He said that the Region had a responsibility to adapt to climate change and to continue to pursue efforts to mitigate its effects. He praised the CIMH for its work and pointed out that the certainty of climates of the past was no longer applicable, hence the science of meteorology was necessary.

Caribbean considers new climate change approaches. Government of Saint Lucia, 29 May 2017
<http://www.govt.lc/news/caribbean-considers-new-climate-change-approaches>

Full article

Commonwealth countries may soon be the benefit from a process called “regenerative development.”

Recently, Commonwealth Secretary-General Patricia Scotland welcomed high commissioners and climate change innovators to a Commonwealth-facilitated conference in London, calling on all to work together on technologies and approaches that have the potential to reverse climate change.

In her opening remarks, the Secretary-General noted that climate change can wreak havoc on ecosystems and societies. Some of the Commonwealth's small island developing states face obliteration because of rising sea levels. In other countries, climate change is causing famine, migration and desertification.

Secretary-General Scotland pointed out that time and time again in Commonwealth countries including Dominica, Fiji, and more recently Mozambique, climate-related disasters had undone decades of development gains.

“The magnitude of the threat from climate change especially to those whose endowment or stage of development renders them more vulnerable and less resilient makes it necessary to shift from mere adaptation and mitigation, towards approaches capable of transforming climate change into a window of opportunity.”

Regenerative development is one such approach.

Mary Robinson, the president of the climate justice activist group—the Mary Robinson Foundation—stated that it was time that the narrative on climate change differed.

“We do need a new narrative on climate change and it’s a narrative based on solutions. The idea of regenerative development to tackle climate change makes much sense because we need to get carbon out of the atmosphere as much as possible.”

Regenerative development seeks to reverse the degeneration of ecosystems caused by human activities.

SOIL AND WATER MANAGEMENT

Mining for answers on abandon mines. By Rossie Izlar. American Society of Agronomy. 31 May 2017
<https://www.agronomy.org/science-news/mining-answers-abandoned-mines>

Full article

Soil scientist Jim Ippolito believes in local solutions to local problems. The problem he’s working on is contaminated soils near abandoned mines.

In the western United States 160,000 abandoned mines contaminate soils in the region. Ippolito, associate professor of soil science at Colorado State University, hopes to solve this problem with biochar, a charcoal-like substance that can reduce the toxic consequences of mining for metals.

Biochar is made by burning plant material in a low-oxygen kiln. Ippolito proposes using western states plant materials such as dead lodge pole pine trees or pesky, nuisance trees—like the invasive tamarisk—as fodder for the kiln.

“I thought, why don’t we just use this stuff to make biochar?” said Ippolito. “It’s using local materials to solve a local problem.”

Abandoned mine sites are common in western states. Over the years, extracting precious metals like gold or silver left a legacy of high acidity in mining-affected soils.

“When you dig holes in the ground via mining and pull out rock that hasn’t seen the atmosphere in millions of years, the materials undergo a change,” said Ippolito. “These materials can start to acidify.”

When certain rock minerals are exposed to the atmosphere, they can form sulfuric acid. The sulfuric acid spreads like an infection, breaking down rocks around it. Some of these rocks contain heavy metals, like lead or copper, and most of the time the metals are harmless. The heavy metals turn into a problem when they become bioavailable—or when plants are able absorb them. Sulfuric acid makes metals more bioavailable to plants by releasing metals from rocks.

“A good analogy would be that the process sort of works just like the way our stomach acid works to break down food into components that are bioavailable to us,” said Ippolito.

The bioavailable heavy metals can pass into plant cell membranes and poison the plant. “You’ll find places near abandoned mines that are completely void of vegetation because of elevated bioavailable metals,” said Ippolito.

Most people cleaning up old mine sites mix lime into the soil to reduce acidity. Less acidity in the soil means less opportunity for plants to absorb heavy metals, because the metals change form from more to less bioavailable in the presence of lime.

Instead of lime, Ippolito wants to use biochar to reduce soil acidity. Biochar is typically produced by heating plant material in a sealed environment. “Basically you take wood, put it into a drum, seal it, and start a fire underneath it,” said Ippolito. “The material that’s left in the drum looks like charcoal.”

The research on the uses of biochar is extensive: it’s been tested as a water purifier, a fertilizer, a carbon sink and more. Ippolito’s biochar is special because it’s made from local trees that pose problems in western states. One of the trees is the lodge pole pine. Mountain pine beetles have decimated millions of acres of the lodge pole pine in western states and Canada. Rows and rows of trees lay like matchsticks. In dry regions, felled pines are a tinderbox for forest fires. Ippolito said making something useful from flammable, wasted trees can only be a good thing. He’s also proposing using tamarisk as a biochar feedstock. Tamarisk is an invasive species in western states. It clogs watersheds, robbing nutrients and water from native species.

The researchers made biochar from both trees and mixed it into four different soils from abandoned mine sites in Colorado and Idaho. They analyzed the bioavailability of the metals present in the soil. Both biochar types decreased soil acidity in all four soils. The biochar successfully interrupted the toxic combination of acidified soils and heavy metals, converting those metals to less bioavailable forms

Ippolito’s next step is to take his locally-sourced biochar into the field. He said he’s ready to put it to use. “I’ve spent at least a decade testing biochars in the lab and greenhouse,” he said. “It’s finally time to apply the biochar to some mine sites.” Ippolito is working with the USDA Agricultural Research Service to test the biochar on a western U.S. mine site as well as in Missouri.

Ippolito collaborated with a team of scientists from the USDA-Agricultural Research Service, the University of Idaho, and two private entities in Colorado (Confluence Energy in Kremmling, CO and Ascension Soil Co. in Evergreen, CO). Their work is published in the Journal of Environmental Quality. <https://dl.sciencesocieties.org/publications/jeq/abstracts/46/2/411>

Nitrogen Fixation Research Could Shed Light on Biological Mystery. California Institute of Technology, 25 May 2017

<http://www.caltech.edu/news/nitrogen-fixation-research-could-shed-light-biological-mystery-74187>

Full article

New Process Could Make Fertilizer Production More Sustainable

Inspired by a natural process found in certain bacteria, a team of Caltech researchers is inching closer to a new method for producing fertilizer that could some day hold benefits for farmers—particularly in the developing world—while also shedding light on a biological mystery.

Fertilizers are chemical sources of nutrients that are otherwise lacking in soil. Most commonly, fertilizers supply the element nitrogen, which is essential for all living things, as it is a fundamental building block of DNA, RNA, and proteins. Nitrogen gas is very abundant on Earth, making up 78 percent of our atmosphere. However, most organisms cannot use nitrogen in its gaseous form.

To make nitrogen usable, it must be "fixed"—turned into a form that can enter the food chain as a nutrient. There are two primary ways

Nitrogen fixation occurs naturally due to the action of microbes that live in nodules on plant roots. These organisms convert nitrogen into ammonia through specialized enzymes called nitrogenases. The ammonia these nitrogen-fixing organisms create fertilizes plants that can then be consumed by animals, including humans. In a 2008 paper appearing in the journal *Nature Geoscience*, a team of researchers estimated that naturally fixed nitrogen provides food for roughly half of the people living on the planet.

The other half of the world's food supply is sustained through artificial nitrogen fixation and the primary method for doing this is the Haber-Bosch process, an industrial-scale reaction developed in Germany over 100 years ago. In the process, hydrogen and nitrogen gases are combined in large reaction vessels, under intense pressure and heat in the presence of a solid-state iron catalyst, to form ammonia.

"The gases are pressurized up to many hundreds of atmospheres and heated up to several hundred degrees Celsius," says Caltech's Ben Matson, a graduate student in the lab of Jonas C. Peters, Bren Professor of Chemistry and director of the Resnick Sustainability Institute. "With the iron catalyst used in the industrial process, these extreme conditions are required to produce ammonia at suitable rates."

In a recent paper appearing in *ACS Central Science*, Matson, Peters, and their colleagues describe a new way of fixing nitrogen that's inspired by how microbes do it.

Nitrogenases consist of seven iron atoms surrounded by a protein skeleton. The structure of one of these nitrogenase enzymes was first solved by Caltech's Douglas Rees, the Roscoe Gilkey Dickinson Professor of Chemistry. The researchers in Peters' lab have developed something similar to a bacterial nitrogenase, albeit much simpler—a molecular scaffolding that surrounds a single iron atom.

The molecular scaffolding was first developed in 2013 and, although the initial design showed promise in fixing nitrogen, it was unstable and inefficient. The researchers have improved its efficiency and stability by tweaking the chemical bath in which the fixation reaction occurs, and by chilling it to approximately the temperature of dry ice (-78 degrees Celsius). Under these

conditions, the reaction converts 72 percent of starting material into ammonia, a big improvement over the initial method, which only converted 40 percent of the starting material into ammonia and required more energy input to do so.

Matson, Peters, and colleagues say their work holds the potential for two major benefits:

- **Ease of production:** Because the technology being developed does not require high temperatures or pressures, there is no need for the large-scale industrial infrastructure required for the Haber-Bosch process. This means it might some day be possible to fix nitrogen in smaller facilities located closer to where crops are grown.

"Our work could help to inspire new technologies for fertilizer production," says Trevor del Castillo, a Caltech graduate student and co-author of the paper. "While this type of a technology is unlikely to displace the Haber-Bosch process in the foreseeable future, it could be highly impactful in places that don't have a very stable energy grid, but have access to abundant renewable energy, such as the developing world. There's definitely room for new technology development here, some sort of 'on demand' solar-, hydroelectric-, or wind-powered process."

- **Understanding natural nitrogen fixation:** The nitrogenase enzyme is complicated and finicky, not working if the ambient conditions are not right, which makes it difficult to study. The new catalyst, on the other hand, is relatively simple. The team believes that their catalyst is performing fixation in a conceptually similar way as the enzyme, and that its relative simplicity will make it possible to study fixation reactions in the lab using modern spectroscopic techniques.

"One fascinating thing is that we really don't know, on a molecular level, how the nitrogenase enzyme in these bacteria actually turns nitrogen into ammonia. It's a large unanswered question," says graduate student Matthew Chalkley, also a co-author on the paper.

Peters says their research into this catalyst has already given them a deeper understanding of what is happening during a nitrogen-fixing reaction.

"An advantage of our synthetic iron nitrogenase system is that we can study it in great detail," he says. "Indeed, in addition to significantly improving the efficiency of this new catalyst for nitrogen fixation, we have made great progress in understanding, at the atomic level, the critical bond-breaking and making-steps that lead to ammonia synthesis from nitrogen."

If processes of this type can be further refined and their efficiency increased, Peters adds, they may have applications outside of fertilizer production as well.

"If this can be achieved, distributed solar-powered ammonia synthesis can become a reality. And not just as a fertilizer source, but also as an alternative, sustainable, and storable chemical fuel," he says.

The paper, "Catalytic N₂-to-NH₃ Conversion by Fe at Lower Driving Force: A Proposed Role for Metallocene-Mediated PCET," appears in the February issue of ACS Central Science. Caltech undergraduate Joseph P. Roddy is also a co-author. Funding for this project came from the National Institutes of Health and the Gordon and Betty Moore Foundation. Related work is also funded by the Resnick Sustainability Institute.

AGRICULTURAL DEVELOPMENT

Programme launched to deliver training to farmers. The Barbados Advocate, 30 May 2017

<https://www.barbadosadvocate.com/news/programme-launched-deliver-training-farmers>

Full article

Better managed farms, raised productivity, greater consistency and a higher quality of crops are expected to be the result of a joint partnership between the Barbados Agricultural Society (BAS) and the Technical Centre for Agricultural and Rural Cooperation (CTA).

Speaking to the media yesterday during the media launch of a farmers' training programme, Chief Executive Officer of the BAS James Paul said it was the first time that the Holland-based CTA would be joining with a private sector organization in the island in order to deliver training to farmers.

“We have 35 farms that constantly provide produce on a weekly basis to the BAS, some go to Massy, and some go into the school meals, some to Sandals properties. We are trying to expand on that because one of the limiting factors in terms of preventing the growth of it, is the fact that farmers have not been able to be consistent in the production of all commodities, right across the sphere as we would have liked. Through the training workshops, we are going to try to achieve consistency of production by addressing the constraining factors on the farm,” he outlined.

Noting that \$200,000 had been allocated to the project, which will feature some on the farm training in new technologies, he said the 12 training workshops are scheduled to begin next month and run into December, and will host mainly Barbadian experts as presenters.

“One of the objectives of this particular series of training that we are going to do is that we want to make sure that the farmer feels that the training and knowledge that have been imparted that he can also feel in touch with it,” Paul stressed.

The program specifically targets onions, sweet potatoes, cucumbers, lettuce, yams and cassavas. (JMB)

May rains cost agriculture sector \$800m. Jamaica Observer, 31 May 2017.

[http://www.jamaicaobserver.com/latestnews/May_rains_cost_agriculture_sector_\\$800m_profile=1228](http://www.jamaicaobserver.com/latestnews/May_rains_cost_agriculture_sector_$800m_profile=1228)

Full article

KINGSTON, Jamaica – Minister of Industry, Commerce, Agriculture and Fisheries, Karl Samuda is reporting that the heavy rains in mid-May resulted in close to \$800 million in damage to the agriculture sector. Samuda said over 10,000 farmers were affected, with losses amounting to an estimated \$794 million.

An estimated 8,862 farmers suffered crop losses of \$718,006,202, while over 1400 farmers suffered livestock losses of an estimated \$76,202,000.

A previous report of \$522,000,000 reflected a preliminary estimate of the damage to the sector. The ministry said teams from the Rural Agricultural Development Authority (RADA) are still on the ground conducting damage assessments as more areas become accessible.

It said logistics are also in place for agricultural inputs to be distributed to affected farmers on an equitable basis.

Information & Communication

PCAARRD launches Publication Incentives Program. Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development (PCAARRD), 2 June 2017

<http://www.pcaarrd.dost.gov.ph/home/portal/index.php/quick-information-dispatch/2943-pcaarrd-launches-publication-incentives-program>

Full article

For researchers, having their scientific articles published in a prestigious journal is a feat. This accomplishment is recognized by the Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development of the Department of Science and Technology (DOST-PCAARRD) as essential to the promotion of new ideas leading to more innovations, advancement of science, and generation of technology.

It is therefore, not surprising that DOST-PCAARRD is providing incentives for scientists and researchers who have published their research studies in reputable local and international scientific journals. The Council does this through its 'Publication Incentives Program.'

Eligible for this program, according to the Institution and Development Division of DOST-PCAARRD, are the principal researchers of on-going and completed PCAARRD-or DOST-funded or coordinated programs; PCAARRD or Accelerated Science and Technology Human Resource Development Program (ASTHRDP) scholars; PCAARRD staff; and other researchers from the National Agriculture, Aquatic and Natural Resources Research and Development Network (NAARRDN).

Accredited local and international journals are those listed by the Commission on Higher Education, indexed by Thomson Reuters and Scopus.

For articles to be eligible to the program, they must be aligned with DOST-PCAARRD priority programs and should have been submitted to DOST-PCAARRD within six months from its publication. Journal articles which have already received monetary incentives from other similar institutions are no longer qualified.

Starting this year, the program will accept submission of co-authors or corresponding authors, as long as they also submit a statement detailing their contributions to the research paper as acknowledged by the lead author.

Scientists and researchers are entitled to monetary incentives from Php25,000 to Php75,000 depending on the journal where their articles have been published.

Interested parties can download application guidelines and requirements through www.pcaarrd.dost.gov.ph under the services menu.

UPCOMING EVENTS

June

Information and Communication Technologies for Evaluation - International Conference

Date: Tuesday, 6 June 2017, 8:00 - 18:00 and Wednesday, 7 June 2017, 9:00 - 17:30

Location: IFAD headquarters, Via Paolo di Dono, 44, Rome, Italy

Description: The conference will review the latest advances in using Information and Communication Technologies to evaluate the results of development projects. It will share global best practices and key findings from development organizations and the private sector. Data collection, data analysis and data dissemination will be the three topics guiding the discussion.

Follow us via webcast: https://webcasting.ifad.org/it_evaluation

Website: https://www.ifad.org/en/newsroom/press_release/tags/alert9/y2017/43337919

Animal Quantitative Genetics and Genomics annual training workshop

Date: 19–30 June 2017

Location: Biosciences eastern and central Africa-International Livestock Research Institute (BecA-ILRI) Hub

Description: The training is strengthening the capacity of researchers in Africa to apply an in-depth understanding of livestock genetics to the design of livestock breeding programmes.

Website: <http://hub.afribiosciences.org/blog/scientists-applying-genomic-intelligence-to-sustainable-livestock-development-in-africa-at-the-beca-ilri-hub/>

July

Caribbean Food Crops Society (CFCS) Annual Meeting

Date: July 16-22, 2017

Location: Puerto Rico

Description: The theme for the meeting is: The Role of the Caribbean as a Research Hub to Advance Global Agriculture and Food Security.

Website: <http://cfcs.eea.uprm.edu/article/annual-meeting-cfcs-puerto-rico-july-16-22-2017-call-submission-presentations-deadline-extend>

August

32nd West Indies Agricultural Economics Conference 2017

Date: 6-11 August 2017

Location: Georgetown, Guyana

Description: Theme: Food & Nutrition Security: the pathway to sustainable agricultural development in the Caribbean. Organised by Caribbean Agro-Economic Society

Website: <http://www.caestt.com/home/32nd%20W.I.A.EConference.php>