K4D Newsletter
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Knowledge for Development
Observatory on Science, Technology and Innovation for ACP Agricultural and Rural Development

*"K4D lets scientists and policy makers express themselves"*



## Feature dossier and selected resources

### Dairy

Milk production in Africa is growing more slowly than elsewhere while demand for dairy products in developing countries is increasing. However, dairy productivity is limited by poor-quality feed resources, disease, poor access to markets and services and low genetic potential. Increasing efficiency and diversifying into new products have the potential to improve revenue and security within the agricultural supply chain. Entrepreneurial spirit is critical to taking on the challenges of dairy improvement. In this new dossier, priority issues are discussed such as improving dairy genetics and nutrition and adapting artificial insemination (AI) and resource management to smallholder farms.

### Technology options for small-scale processing of milk, yoghurt and cheese

*Peter Fellows, Midway Associates, Derby, UK*

In this new feature article, Peter Fellows discusses practical aspects of expanding dairy processing with particular attention to quality assurance. Fellows focuses on small-scale processing facilities and the equipment that is required to treat, transform and package milk (not just from cows) and its derived products. He details product handling and pasteurising techniques, and explains the process behind the production of cultured milks, yoghurt and cheese.

Fellows highlights the importance of implementing sound quality assurance programmes and simple tools that can help small production units fight contamination. In conclusion, he argues that food technology units of universities and research institutes as well as the bureaus of standards in many ACP countries could provide guidance to small and medium-scale dairy enterprises on the processing of milk and milk products.

## Dairy: selected resources

### Unravelling the role of innovation platforms in supporting co-evolution of innovation: Contributions and tensions in a smallholder dairy development programme

In this paper Catherine Kilelu and colleagues of Wageningen University, The Netherlands, conceptualise innovation platforms as intermediaries that connect the different actors in innovation systems in order to foster effective co-evolution. To illustrate their arguments the authors use a case study of a smallholder dairy development programme in Kenya, led by a consortium of five organisations that provide a platform for building multi-actor partnerships to enhance smallholder dairy productivity and improve livelihoods. They show that co-evolution of innovation is a highly dynamic process with various interactional tensions and unexpected effects, and that the distributed nature of intermediation is important in resolving some of these tensions emerging at different actor interfaces. However, platforms are not always able to adapt adequately to emerging issues. Mechanisms such as reflexive monitoring that strengthen feedback, learning and adaptive management in innovation processes are crucial.
(*Agricultural Systems*, 2013)

### Innovative trends in dairy and food products formulation

This lecture compendium on 'Innovative trends in dairy and food products formulation' includes topics such as functional foods, microencapsulation, advances in fermented milk products technology, enzymatic hydrolysis, technological innovations in the production of traditional Indian dairy products, preparation of symbiotic ice cream, advances in membrane processing for production of novel dairy ingredients, fortification of milk with minerals and vitamins and milk derived bioactive peptides – potential ingredients for food formulations. The compendium is published by the Centre of Advanced Faculty Training of the National Dairy Research Institute, Karnal (Haryana), India.
(National Dairy Research Institute, 2012)

### Kenya dairy value chain overview

In this publications of the Meridian Institute, key constraints in the dairy value chain are examined with a particular focus on the cattle dairy sector in Kenya. The overview highlights issues such as gender and market dynamics. The concluding section lists market inefficiencies and potential technological innovations. Technology options relate to animal health and disease (vaccine development and delivery, and curative dairy health); milk production (including genetics (artificial insemination), feed, fodder & water (dry season complications), milking machines and diversification (beyond staple dairy production), milk quality: testing & linked systems, milk preservation, sanitisation and transport (including cooling centres and linked system and packaging materials) and non-liquid dairy markets. Smallholder adoption of technology-based solutions often raises considerable challenges.
(Meridian Institute, 2012)

## International Dairy Federation

The International Dairy Federation (IDF) represents the global dairy sector and ensures the best scientific expertise is used to support high-quality milk and nutritious, safe and sustainable dairy products. The organisation is focused on furthering current knowledge on a wide range of issues, including environment and sustainable development, health and nutrition, methods of analysis, farm management, animal health and welfare, dairy science and technology, food hygiene and safety, food standards, dairy policies and economics and marketing.

## Dairy Science and Food Technology

The Dairy Science and Food Technology (DSFT) website provides scientific and technological information, cloud-based tools and consultancy services for food scientists and technologists working in industry and in colleges and universities. A discussion forum and interactive content through online calculators are also provided. Writing/citation resources including a Harvard-type reference wizard and a range of citation-wizards can also be accessed. There are sections on starter cultures, probiotics, cheese science and technology, bioactive peptides, ice cream, wine making, modelling in food technology, thermal processing and modified atmosphere packaging and labelling. Some general health information including reference to allergy and food intolerance is also presented.

# New Feature Article

## Intellectual property, traditional knowledge and food security in Pacific island countries

*By Sue Farran, Professor of Laws, University of Northumbria, UK*

The link between food security and intellectual property and innovation may not at first seem obvious says Sue Farran, Professor of Laws. In this article, Farran observes 'that food security cannot or should not be seen as an isolated concern but as integral to various other contemporary issues concerning Pacific island countries (PICs), especially trade and development, climate change and the movement of people'. According to Farran, the intellectual property regimes which impact directly on food security are shaped by the developed world and primarily serve to protect the interests of corporations. Farran argues that although UPOV, for example, is favoured by commercial plant breeders, it is particularly unsuitable for the Pacific region because food crops are not grown from seed but from plant-stock propagation. She sees the use of non-traditional intellectual property regulations as having two potentially negative consequences for food security in PICs: firstly they exclude PICs from access to essential resources and secondly the food products of traditional knowledge can be traded without appropriate acknowledgment; or the value of such knowledge for contributing to food security could be undermined. She further notes that the funding mechanisms for research into climate change resistant food crops (e.g. drought tolerant cops) seem to ignore the argument that the food resources of the world should belong to the

global commons. She concludes that until the inter-connectedness of factors which affect food security is recognised and the various stakeholders including farmers, researchers, trade and legal experts, community leaders and policymakers consult each other in a meaningful way for making informed policy decisions, there is a danger that the risks will not be adequately addressed.

## CTA and S&T policy

### International forum 'Unleashing Science, Technology and Innovation for Food and Nutrition Security'

On 15-17 October 2014 CTA convened the international forum 'Unleashing Science, Technology and Innovation for Food and Nutrition Security' in Arnhem, the Netherlands. The forum brought together leading scholars, senior scientists, researchers, policy makers, development practitioners, innovators and private sector representatives, including farmers. The international forum has initiated a discourse which will unpack the complexity of the FNS challenge and distil lessons in useful terms for influencing policy and practice so that ACP countries can make greater inroads in tackling food and nutrition insecurity through investments in science and innovation. View the profiles of some of the keynote speakers and their related presentations. The proceedings and recommendations of this international forum will soon be published on the Knowledge for development website.
(CTA, October 2014)

### Cross-learning write-shop: 'CTA Top 20 Innovations that Benefit Smallholder Farmers'

CTA organised the CTA Top 20 cross-learning write-shop from 13-17 October 2014. The meeting brought together authors and case owners of the CTA Top 20 innovations, technical experts, editors and designers to produce: (i) Fact sheets, guidebooks and posters of the CTA Top 20 innovations for widespread dissemination in print and electronic formats; (ii) a publication/manuscript consisting of the CTA Top 20 innovations as case stories and; (iii) a technical report on the CTA Top 20 as input into a policy brief on scaling up innovations. It is expected that by increasing access to existing knowledge on the CTA Top 20 innovations, this will contribute to increasing productivity and earning potential of smallholder farmers.
(CTA, October 2014)

## Developments & publications

### Climate-smart agriculture global research agenda: scientific basis for action

Researchers have identified gaps in knowledge within 'climate-smart agriculture' (CSA) at the 2013 Global Science Conference on Climate-Smart Agriculture (Davis, USA) and elaborated agendas for

interdisciplinary research and identified science-based actions. CSA addresses the challenges of meeting the growing demand for food, fibre and fuel, despite the changing climate and fewer opportunities for agricultural expansion on additional lands. Kerri Steenwerth of the Crops Pathology and Genetics Research Unit, USDA and colleagues, focussed on three themes: (i) farm and food systems, (ii) landscape and regional issues and (iii) institutional and policy aspects. The first comprises crop physiology and genetics, mitigation and adaptation for livestock and agriculture, barriers to the adoption of CSA practices, climate risk management, and energy and biofuels. The second includes modelling adaptation and uncertainty, achieving multi-functionality, food and fishery systems, forest biodiversity and ecosystem services, rural migration from climate change and metrics. The third covers designing research that bridges disciplines, integrating stakeholder inputs to link science, action and governance.
(*Agriculture & Food Security*, 26/08/2014)

## The Africa Agriculture Status Report 2014: climate change and smallholder agriculture in sub-Saharan Africa

The Africa Agriculture Status Report 2014 (AASR) presents a comprehensive overview of smallholder agriculture in Africa and provides foresight for the planning of a 'climate-smart agricultural' (CSA) sector on the continent. The first part of the report that was published by the Alliance for a Green Revolution in Africa, focuses on climate variability and change, its impacts on agriculture, the need for adaptation to improve resilience, mitigation issues, and the factors influencing the adoption of climate-smart practices. The second part maps, on the basis of new research, the regions at highest risk for more 'failed seasons' as rainfall become more erratic. This part also contains a compilation of micro- and macro-agriculture data tables from selected SSA countries that show trends in agricultural data and climate-related variables. Recommended solution-oriented actions include: (i) promote climate-smart, context-driven agro-ecological approaches and solutions; (ii) strengthen national and local institutions; (iii) build technical capacity and improve knowledge management systems; (iv) raise the level of national investments in agriculture; and (v) create innovative financing mechanisms.
(AGRA, 08/2014)

## Genome-wide patterns of adaptation to climate-mediated selective pressures in sheep

Unlike numerous studies that have looked for evidence of selection using only population genetic data, Feng-Hua Lv, Chinese Academy of Sciences, China, with an international team of researchers scanned the sheep genome for selection signals by integrating genetic and climatic data. They found that adaptations to local climates have shaped the spatial distribution of particular genetic variants and, thus, such loci are likely involved in sheep adaptation to environmental challenges. Further molecular and functional studies of candidate genes close to significant markers will help to elucidate the genetic architecture of climate-mediated adaptive traits in sheep and other farm animals.
(École Polytechnique Fédérale du Lausanne, 01/08/2014)

## Morphological, physiological and molecular characterisation of drought tolerance in cassava

In this study multiseasonal and locational field based trials were conducted in Kenya to identify drought-tolerant and drought-susceptible cassava genotypes. Cassava (*Manihot esculenta Crantz*) is inherently drought tolerant. Nevertheless, substantial genotypic variation exists for this characteristic. Field drought stress generally reduced cassava vegetative growth and productivity. In addition to other phenotypic parameters, storage root fresh weight was used as a primary criterion to discriminate between drought-tolerant and drought-susceptible genotypes. Charles Ochieng' Orek, researcher at ETHZurich, Switzerland, subsequently subjected the cassava gentoypes to further physiological and molecular categorisation under controlled water deficit assays. Categorisation of these morphological, physiological and molecular differences will establish an essential foundation for future development of drought-associated molecular markers for cassava.
(Dr.Sc. thesis, ETH-Zurich, 2014)

## Drought and food security – Improving decision-support via new technologies and innovative collaboration

The integration of three state-of-the-art technologies such that scientific findings and data are linked to actual user requirements including governments to achieve better decision-support for agricultural drought preparedness, has been proposed by Markus Enenkel, Vienna University of Technology, Austria and colleagues. Several promising approaches, ranging from the integration of satellite-derived soil moisture measurements that link atmospheric processes to anomalies on the land surface to improved long-range weather predictions and mobile applications are explored. Satellite-derived soil moisture measurements from space-based microwave sensors can help detect plant water deficiencies earlier than conventional products such as the Normalized Difference Vegetation Index (NDVI) and forecasting models can provide seasonal predictions. These models must be calibrated to regional conditions, take into account weather uncertainties and 'hindsight' data, and be combined with crop health predictions. Mobile applications can link end users to drought-relevant information and also play a vital role in validating satellite-derived drought indicators and collecting socio-economic conditions. According to the authors, the added value of these technologies should create enough political will to ensure they find their way into the decision-support toolboxes of the end users.
(*Global Food Security*, 10/09/2014)

## Global-scale associations of vegetation phenology with rainfall and temperature at high spatio-temporal resolution

Recent research shows global phenology relationships to precipitation and land surface temperature at high spatial and temporal resolution over the period 2008–2011. Nicholas Clinton, Center for Earth System Science, Tsinghua University, China, and colleagues found that the response of phenology – periodic plant and animal life cycle events – to climatic variables is a vital indicator of changes in biosphere processes related to possible climate change. Their data showed distinct phenology patterns

as a result of complex overlapping gradients of climate, ecosystem and land use/land cover. The data are consistent with broad-scale, coarse-resolution models of ecosystem limitations to moisture, temperature and irradiance. The researchers conclude that this type of data is useful as an input to the development of land use and land cover classifiers, and could also help in understanding the vulnerability of natural and anthropogenic landscapes to climate change.
(*Remote Sensing*, 06/08/2014)

## IRENA examines renewable energy deployment in Islands

Two International Renewable Energy Agency (IRENA) publications for advancing renewable energy (RE) deployment in small island developing states and increasing the competitiveness of the tourism sector are featured. The first booklet 'A Path to Prosperity: Renewable Energy Islands' includes 24 case studies from Africa, the Indian Ocean, the Mediterranean, the South China Sea, the Caribbean, and the Pacific presenting innovative RE solutions and partnerships. The second booklet 'Renewable Energy Opportunities for Island Tourism' includes an analysis of the 'Cabeolica Wind Project' in Cabo Verde, which contributed to the government's renewable energy target of a 50% generation share by 2020 by constructing 30 turbines in four wind farms that generate up to 25.5 MW of electricity.
(IISD, 02/09/2014)

## IRENA estimates Africa's renewable energy potential

The potential for renewable power generation based on resource availability in Africa is examined and a methodology presented for: (i) quantifying the power generation potential for solar and wind energy resources in Africa; (ii) estimating the bioenergy potential from first-generation biofuel crops, including sugarcane, Jatropha and soybean; and (iii) translating physical resource potential into power generation potential. The approach is based on Geographic Information System (GIS) data and can be tailored to any country, region or other geographical area. This working paper was published jointly by the International Renewable Energy Agency (IRENA) and Sweden's Royal Institute of Technology.
(IISD, 09/2014)

## Best practice innovation policy for emerging renewable energy technologies

This report presents international best practice for strategic innovation policy delivery, synthesising proven methods from around the world. It also makes new recommendations to improve the delivery of on-going policy tools, focusing on reducing risk for private sector investment earlier along the innovation chain, and pursuing an increasingly international innovation policy. By following these principles, governments could unlock renewable energy technology deployment at lowest cost and also enhance technology driven economic growth and exports. The report prepared by the Carbon Trust and supported by Element Energy, involved extensive input through workshops and interviews with leading international policymakers and industry experts.
(IEA-RETD, 09/2014)

## Governing agricultural biotechnology in Africa: building public confidence and capacity for policy-making

Norman Clark, John Mugabe, and James Smith provide an analytical context of biotechnology and biosafety in three African countries by reviewing the nature of science policy research, especially as it applies to potential developmental impacts of biotechnology. The book throws new light on biotechnology governance in Kenya, South Africa and Uganda that have been struggling with biotechnology development and related biosafety policy and pays attention to experiences in OECD countries. In addition, the authors pay close attention to the analysis of risk and how it may be managed. They discuss the flawed nature of traditional approaches to biosafety management (treating biosafety risks as reducible to probabilistic values) and argue that these approaches are not only invalid from a purely scientific point of view, but also fail to deal with attitudes of civil society. They think that it is largely for these reasons that the 'precautionary principle' has begun to be taken seriously.
(Africa Portal, 09/2014)

## Spurring innovation in food and agriculture: a review of the USDA Agriculture and Food Research Initiative (AFRI) programme

The value, relevance, quality, fairness, and flexibility of the Agriculture and Food Research Initiative (AFRI) and its success in advancing innovations and competitiveness in the U.S. food and agriculture system are assessed in this report. AFRI is one of the mechanisms the U.S. Department of Agriculture (USDA) has been funding to support research. Conclusions state that AFRI (i) has not been adequately given the resources needed to meet contemporary and future challenges; (ii) is unnecessarily complex, difficult to depict clearly, and characterised by overlapping components that do not clearly align with set priorities; and (iii) does not have clearly articulated plans to guide its priority-setting, management processes, and interagency collaboration. Finally, AFRI's complex and diffuse management structure has made it difficult to efficiently and effectively manage the programme. (Log in to MyNAP free of charge – this publication in PDF is free.)
(NAP, 08/2014)

## Cross-bred crops get fit faster

*Nature*'s Natasha Gilberts argues that genetic engineering lags behind conventional breeding in a race to develop new drought-resistant maize varieties that can withstand drought and poor soils. She refers to the Drought Tolerant Maize for Africa (DTMA) project led by the International Maize and Wheat Improvement Center (CIMMYT) that since 2006, developed 153 new maize varieties that perform well under dry weather conditions. The Improved Maize for African Soils (IMAS) project - a collaboration between CIMMYT, the Kenya Agricultural Research Institute, the South African Agricultural Research Council, and the multinational corporation DuPont Pioneer has, since 2010, developed 21 conventionally bred varieties that in field tests yielded up to 1 t/ha more in nitrogen-poor soils than did commercially available varieties. Researchers say that they are at least 10 years from developing a comparable GM variety.
(*Nature News*, 16/09/2014)

## Wheat gene discovery clears way for non-GMO breeding

The gene that prevents wheat from breeding with related ancestors was discovered by Washington State University researcher Kulvinder Gill and colleagues. The genes from related ancestors contain a vast array of traits preferred by growers. Using conventional genetic manipulations, the discovery will permit innovation in wheat variety development unhampered by the cost, regulatory hurdles and controversy of genetically modified organisms (GMOs). Silencing the gene would permit breeders to successfully pair chromosomes of related ancestors and develop wheat varieties with the disease- and pest-resistance traits of other grasses.
(WSU, 15/09/2014)

## Policy options to enhance markets for nutrient-dense foods in Tanzania

Ewan Robinson of IDS, UK and colleagues from Sokoine University of Agriculture, Tanzania analyse policies and interventions to improve the functioning of markets that deliver nutrient-dense foods. They analyse five broad strategies – voluntary fortification, mandatory fortification, promoting fresh foods, non-profit distribution, behaviour change communication – and describe what mechanisms can be used to address market constraints such as enforcement, supply quality, distribution costs, signalling, and awareness raising. No single strategy can address all constraints completely but different interventions can address some and benefit certain populations. Programme-specific recommendations are put forward; for example, the promotion of nutrient-dense fresh foods must distinguish between pre-farm-gate and post-farm-gate consumption and related policies should support the production of neglected nutrient-dense crops.
(IDS UK, 19/08/2014)

## Underutilised wild edible plants in the Chilga District, north-western Ethiopia: focus on wild woody plants

In this article, Mekuanent Tebkew, University of Gondar, and colleagues at other Ethiopian universities report on a study of the distribution, diversity, role, management conditions and associated traditional knowledge of underutilised wild edible plants in north- western Ethiopia. Despite the extraordinary number of ecological zones and plant diversity, the diversity of plants is under threat due to the lack of institutional capacity, population pressure, land degradation and deforestation. An adequate documentation of these plants also had not been conducted. The researchers found 33 wild edible plants that are used by local communities to supplement staple foods, to fill food gaps and for recreation. As these communities apply only elementary management practices to some wild edible plants, special attention is required to sustain the benefits of these plants.
(*Agriculture & Food Security*, 26/08/2014)

## Native foods scoping study under way in Australia

The New South Wales Local Land Service has commissioned a scoping study to assess whether native foods businesses could be viable, in which a team of environmental consultants is conducting a desktop study into the native foods industry. They did so because the consumption of native bush foods has grown steadily over recent years; bush tucker recipes are abound and products from lemon myrtle to quandong jam being snapped up in Australia and overseas. By narrowing down to which species that would be best suited to the region, the team will assess whether there is a business case for developing the crops for these herbs, foods and spices. The study is expected to be completed by October 2014.
(Australian Broadcasting Commission, 25/08/2014)

## Market diversification and sweet potato processing in Papua New Guinea: a pre-feasibility study

This study, commissioned by ACIAR, Australia, focused on exploring the feasibility of establishing an efficient sweet potato processing in Papua New Guinea as an engine for the development of rural areas and the industrialisation of the economy. The main finding by authors Christie Chang, Associate Professor, University of New England and Anton Mais, PNG National Institute for Agricultural Research, is that worldwide sweet potato is used mainly in fresh form for human consumption and as animal feed. Only a very small proportion (less than 1%) is processed into dried chips and flour mainly for home consumption. Per capita sweet potato consumption tends to decline with income growth and urbanisation as consumers are afforded choices in price, quality, convenience, and diversity. The current high level of sweet potato consumption in PNG will change, and has changed in urban centres. Markets for fresh roots will continue to exist in PNG in the short to medium term, but the demand for quality will increase. In the longer term, sweet potato will become less important as a staple food. The study concludes that given the current environment and levels of support and knowledge, promoting sweet potato processing into commercial enterprises would be very difficult. Limited research resources may be better spent on improving the markets for fresh roots and for feedstock.
(Australian Centre for International Agricultural Research, 31/07/2014)

*Editor's comments:* It would be interesting to know what the response of the PNG research, government officials and private sector actors including farmers is to this conclusion. UWI Jamaica should also pay attention to this report. K4D had reported in the last issue on the agreement .

## Rejected bananas: From the uses of rejected bananas to the delivery of innovative and added-value products to the market

Discarded bananas may become the raw material for new products such as low-fat fried crisps, juices and ready-to-use pastes for bakery and for new-intermediate products such as flour, starch, and high-value extracted fractions). In the paper, Olivier Gibert, of CIRAD, France, and colleagues describe the many potential innovative uses of rejected bananas. Most rejected bananas goes to local markets as animal feed and processed products. Industrial use of rejected bananas is limited because most bananas

are grown for the fresh consumption market. Moreover, low estimated supply of rejected bananas has discouraged attempts to use them in industrial food processing, such as for flours, breakfast flakes, pastes, tomato-sauce thickener, soft beverages sweetener and alcohols. However, the researchers have now estimated that 15 to 25 % of harvested bananas for export, about 4 to 5 MT/year, are discarded and might be a serious source of raw material for the food processing industry.
(*Baking Europe*, pp. 12-14, 06/2014)

*Editor's comment:* Small island states such as Jamaica have been exploring banana value added options (chips, flour and vacuum packed peeled bananas), but there are challenges. See also a recent article in the Jamaica Gleaner.

## Strategies for rehabilitation of banana fields infested with *Xanthomonas campestris* pv. *musacrearum*

This study demonstrates that it is possible to effectively control Banana wilt disease (BXW) within 12 months in previously severely infected fields in Eastern and Central Africa, using control options such as single stem removal, suspension of pruning in affected fields, male bud removal and disinfection of tools with fire or sodium hypochlorite. The study, conducted by Jerome Kubiriba, National Agricultural Research Organization, Uganda (NARO) focused at rehabilitating banana fields heavily infected with BXW disease in Uganda, Kenya and D.R. Congo. Farmer-managed trials were established in BXW disease hotspots and the control options evaluated included single stem removal, suspension of pruning in affected fields, male bud removal and disinfection of tools with fire or Sodium hypochlorite. BXW disease incidence was reduced by over 80% in 11 months in Kenya and D.R. Congo, resulting in yield recovery by up to 70% within one year. In Uganda, the proportion of farmers that effectively controlled BXW disease increased 5% to 60% within a year in some hotspots. Consequently banana sales recovered up to 30% in some hotspots. This study demonstrates that it is possible to effectively control BXW disease within 12 months in previously severely infected fields in various areas of the region.
(*Journal of Crop Protection* via ProMusa, 08/2014)

## New study charts the global invasion of crop pests

The world's most important crop-producing countries will be fully saturated with pests by the middle of the century if current trends continue. Crop pests include fungi, bacteria, viruses, insects, nematodes, viroids and oomycetes. This is the main conclusion of a recent study by Daniel Bebber and colleagues at the University of Exeter, UK, concludes. Using global databases to investigate the factors that influence the number of countries reached by pests and the number of pests in each country, the researchers identified the patterns and trends in their spread. They also identified the pests likely to be the most invasive in coming years, including three species of tropical root knot nematode whose larvae infect the roots of thousands of different plant species; *Blumeria graminis*, a fungus that causes powdery mildew on wheat and other cereals; and the *Citrus tristeza* virus which had reached 105 of 145 countries growing citrus by 2000.
(*Global Ecology and Biogeography* via University of Exeter, 27/08/2014)

## Pesticides are more toxic for soil organisms in dry soil and at enhanced temperatures

Scientists from the LOEWE Biodiversity and Climate Research Centre (BiK-F), the Goethe University and the ECT Oekotoxikologie GmbH, demonstrate that soil organisms in dry soil and at enhanced temperatures are more sensitive to pesticides. Singularly and combined, these factors lower the toxicity threshold of fungicides (*pyrimethanil*) for springtails (*Collembolas*), tiny hexapods that participate in essential soil functions, decomposing organic material and building up humus. Both conditions – drier soils and higher temperature – may occur more often in the future due to climate change and thus fungicide application under these conditions could further harm the soil biota essential for soil fertility.
(Phys.org, 11/09/2014)

## The imprint of crop choice on global nutrient needs

The choice of cultivated plant species to feed people and livestock influences not only food production but also soil nutrient withdrawals and fertiliser requirements. Esteban Jobbágy, Universidad Nacional de San Luis, Argentina, and Osvaldo Sala, Arizona State University, USA, report 3- to 15-fold differences in soil nutrient withdrawals per unit of energy or protein produced across major crops. These variations explain how food composition shifts over the last 20 years have reduced N, maintained P and increased K withdrawals from soils, while contributing to increasing dietary energy, protein and, particularly, vegetable fat outputs. The researchers show that global fertilisation rates do not relate to actual soil nutrient withdrawals, but to the monetary values of harvested products.
(*Environmental Research Letters*, 26/08/2014)

## Sustainable phosphorus use: Feed the crop not the soil

A new review into sustainable phosphorus use calls for more precise phosphorus management and suggest novel methods for its application by targeting the crop instead of the soil. The researchers, Paul Withers, at Bangor University, UK, and colleagues argue that when phosphorous is applied to the soil a large proportion is immobilised by chemical and biological processes, making it difficult for plants to access. The researchers suggest to target the crop rather than the soil and propose solutions that include targeted application methods to the root, or with seed dressing and foliage feed.
(*Environmental Science & Technology* via EC Science for Environmental Policy, 04/09/2014)

## Pacific fisheries chief warns that tuna stocks are dangerously low

Fish stocks in the Pacific are so low that some species should no longer be fished. In particular, the survival of the Pacific bluefin and the bigeye tuna are at risk. In an interview with Phys.org on 3 September 2014, Glenn Hurry, the outgoing director of the Western and Central Pacific Fisheries Commission (WCPFC) observed that fish stocks have rapidly diminished in the past four years. The situation is not yet unrecoverable, but stocks are at a dangerously low level and worsening, and it is time

for tough decisions. Japan's recent plan to propose a 50% cut on catches of young bluefin tuna in the western and central Pacific marks an historic shift aimed at safeguarding the at-risk species.
(Phys.org, 03/09/2014)

## Genetically-improved tilapia strains in Africa: potential benefits and negative impacts

Two genetically improved tilapia strains (GIFT and Akosombo) have been created with *Oreochromis niloticus* (Nile tilapia), which is native to Africa. In particular, GIFT has been shown to be significantly superior to local African tilapia strains in terms of growth rate. This study, by Yaw B. Ansah and colleagues, Virginia Polytechnic Institute and State University, USA, reviews the history of the GIFT technology, and identifies potential environmental and genetic risks of improved and farmed strains and tilapia in general. The study also estimates the potential economic gains from the introduction of genetically improved strains in Africa, using Ghana as a case country. Employing a combination of the economic-surplus model and Monte Carlo simulation, the study found the mean net present value (NPV) of the introduction of the GIFT strain in Ghana to be approximately 1% of the country's gross domestic product. It concludes that improvements in management practices and infrastructure could increase the yield and profitability of the local strains even if genetically improved strains are not introduced.
(*Sustainability*, 26/06/2014)

## Farming aquatic animals for global food system resilience

How the current interconnections between the aquaculture, crop, livestock, and fisheries sectors act as an impediment to, or an opportunity for, enhanced resilience in the global food system given increased resource scarcity and climate change are explored in this paper. The researchers, Max Troell of the Beijer Institute of Ecological Economics, Royal Swedish Academy of Sciences in Stockholm and colleagues, use an innovative framework called Portfolio theory to analyse how growth in aquaculture and diversifying food production may enhance the ability of the global food system to meet future demands under changing conditions. They found that aquaculture can potentially enhance resilience through improved resource use efficiencies and increased diversification of farmed species, locales of production, and feeding strategies. However, the reliance of aquaculture on terrestrial crops and wild fish for feeds, its dependence on freshwater and land for culture sites, and its broad array of environmental impacts diminish its ability to increase resilience. As demand for high-value fed aquaculture products grows, competition for these crops will also rise, as will the demand for wild fish as feed inputs. Although the diversification of global food production systems that includes aquaculture offers promise for enhanced resilience, such promise will not be realised if government policies fail to provide adequate incentives for resource efficiency, equity, and environmental protection.
(Stockholm Resilience Centre, 21/08/2014)

## Workshop report: 'Culture Matters: An Approach to International Research Agreements'

Culture-based gender differences, nomadic versus sedentary practices, language differences, and biodiversity – are important issues in international research agreements that involve genetic resources. This was the finding of the working group on agriculture and animal issues during the 2013 July workshop 'Culture Matters: An Approach to International Research Agreements' convened by the Government-University-Industry Research Roundtable (GUIRR, U.S.-based) when representatives from government, university, and industry from around the world – gathered to address how culture and cultural perception influence and impact the process by which research agreements are made and negotiated across international boundaries. Subjects included: 'Conducting Research in Developing Countries' and 'Intellectual Property' across four specific domains: (i) research and agreements affecting or involving people/human subjects; (ii) environmental and natural resources; (iii) science, engineering, and manufacturing; and (iv) agriculture and animal issues. This report summarises the proceedings of the workshop.

(NAP, 08/2014)

## Events

### 4th International Rice Congress (IRC2014)

Dates: 27 October - 1 November 2014

Venue: Bangkok, Thailand

### African Green Revolution Students' conference 2014: Bridging the gap between science, society and industry

Dates: 1-5 December 2014

Venue: Kenyatta University, Nairobi, Kenya

### International Technology, Education and Development Conference (INTED2015)

Dates: 2-4 March 2015

Venue: Madrid, Spain

Send abstracts before: 4 December 2014

## Calls

### Call for articles: 'Towards healthy soils - organic matter matters'

Apply by 1 December 2014.

### Louis MALASSIS International Scientific Prize 2015 and Olam Prize for Innovation in Food Security

Apply by 4 December 2014.

**Course: Linking Research to Local Rural Innovation**

Dates: 9-27 March 2015

Venue: International Centre for development oriented Research in Agriculture (ICRA), Wageningen, The Netherlands

Deadline for NFP/MENA fellowship candidates: 12 October 2014

Deadline for applicants with own funds: 15 December 2014

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