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PLANT BREEDING and BIODIVERSITY

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Emile Frison,
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Sustainable food systems: a comprehensive approach from farm to fork

The challenges we are facing today and will be facing for the decades to come require a rethinking of the current paradigm of food production and consumption. These challenges are now well recognized: climate change, environmental degradation, the triple burden of malnutrition, the loss of cultural identity and a lack of equity.

But discussions about how to address these challenges have so far essentially taken place in isolation, on a sectorial basis. The climate change debate has only recently included agriculture and this still in a very partial manner.

The issue of environmental degradation has mainly been limited to environmentalists blaming agriculture for encroaching on forests and polluting soil and water, and focused on setting aside protected areas to save what can be saved, but without engaging with the agricultural sector to find mutually satisfying solutions. Malnutrition has been essentially addressed through a medical approach of supplementation and fortification of food, rather than by attempting to provide a diverse nutritious diet that is produced by a diversified agriculture. While equity and socio-cultural issues have been either ignored or been largely confined to actions by civil society organizations.

In fact, all these challenges are intertwined and therefore they must be addressed in an integrated, multi-sectorial and multidisciplinary fashion. Only this approach will allow us to find comprehensive and durable solutions and move towards sustainable food systems.

The need for a comprehensive, integrated approach to achieving sustainable food systems

The sectorial approaches that have dominated so far are not able to bring about the necessary changes to address all challenges at the same time. Indeed, solutions that address one challenge can have a negative impact on other ones or be incompatible with solutions to other challenges. We need to seek comprehensive, integrated approaches that minimize the trade-offs and maximize win-win or win-win-win solutions. This can only be achieved by breaking down the barriers between the silos in which these issues have been confined. This means that inter-ministerial collaboration at the national level and collaboration between different International, United Nations and other, Organizations at the global level are imperative, as is the active involvement of all stakeholders.

The way forward

The purpose of this article is not to just point at the problems and complain about the lack of satisfactory solutions, to the contrary, it is to show that things are starting to move in the right direction.

One important common dimension to solutions that address all the challenges is a greater use of agricultural biodiversity. Indeed, more diverse production systems can improve the resilience of these systems, they can produce more diverse, nutritious food, and can as well improve the management of soil and take cultural preferences into consideration.

In addition, initiatives are emerging that aim at tackling the problems in their complexity and in a multi-sectorial, multi-disciplinary and multi-stakeholder manner. I will cite five recent initiatives that show promise and that contribute to finding satisfactory and sustainable solutions.

The first is the **Landscapes for People, Food and Nature Initiative** (http://landscapes.ecoagriculture.org) co-organized by Ecoagriculture Partners, Bioversity International and seven other Organizations and including more than 40 further strategic partners. This Initiative seeks to address the barriers between the different interests and stakeholders and to support the effective widespread practice of "ecoagriculture" - an approach to rural landscape management that seeks to integrate food production, biodiversity and ecosystem conservation, and rural livelihoods within supportive institutional and policy contexts.

The second one is the **Bridging Agriculture and Conservation Initiative** (http://www.bioversityinternational.org/about-us/news/bridging-agriculture-conservation), coordinated by Bioversity International and which combines science, policy and advocacy to influence global policy agendas through evidence. It aims to provide evidence-based solutions to feed a growing population, while ensuring long-term conservation of agricultural biodiversity.

A third one is the **Food Tank** (http://foodtank.com), a Food Think Tank that aims at creating a network of connections and information for farmers and producers, policy makers and government leaders, researchers and scientists, academics and journalists, and the funding and donor communities to collaborate on providing sustainable solutions for our most pressing environmental and social problems: alleviating hunger, obesity, and poverty in an environmentally sustainable way.

The fourth initiative is the **International Panel of Experts on Sustainable Food Systems (IPES-Food)**, initiated by the Daniel and Nina Carasso Foundation (http://www.fondationcarasso.org/en), and which aims to influence policy makers, scientific communities, food chain actors, civil society and the public at large in order to improve food policies and practices at the global level by encouraging and guiding research on sustainable food systems and diets, to influence stakeholders by providing policy briefs and summary analyses of existing evidence about integrated solutions and raising awareness of all actors about opportunities for reshaping our food systems towards sustainable food systems.

The fifth is the **EAT Initiative** which was launched at the first EAT Stockholm Food Forum (http://www.eatforum.org) and is initiated and owned by the Stordalen Foundation with the Stockholm Resilience Centre as main academic partner. It is a forum that incorporates the fields of nutrition, health and sustainability in a globally effective way. The EAT – Stockholm Food Forum is an arena where science, politics and business will be able to share insight and ideas, which in turn can help us reach our common goal of sustainably feeding a healthy world population.

Both the IPES-Food and the EAT Initiatives have decided to join forces in a strong, mutually reinforcing partnership (http://www.fondationcarasso.org/en/content/eat-and-daniel-and-nina-carasso-foundation-join-efforts-promote-sustainable-food-systems-and).

These recent developments are very encouraging, but they need to be considerably strengthened by further broadening the involvement of stakeholders. Farmers and their organizations have a key role to play and must be given a greater voice in rethinking and re-shaping our food systems in a way that will not only address the challenges of today, but will ensure that our children and their children will be able to live fulfilling lives.

PROTECTING SEED DIVERSITY ON FARM

James Mills,
Combinable Crops Adviser,
National Farmers Union, UK

The need to double food production by 2030 in the face of a global population destined to hit 9 billion has been a statistic used with increasing regularity in both public and political spheres since its first airing in Sir John Beddington's Perfect Storm.
When placed in the context of the necessity to improve our use of resources and the dramatic impacts climate change can already be seen to be having on our global agricultural system, the scale of the challenge we face is heightened even further.

Yet, as much as we love food, we take its production for granted. Within the European Union we are awaiting the implementation of draconian policies such as the Ecological Focus Areas which will remove land from production and the three crop rule, reducing market orientated production on farm. This is not just a Western phenomenon. In The early 90's a virulent wheat disease spread across Uganda into the Near East and the wheat growing region of South Asia largely unchecked.

Simply assuming declining production in one region can be absorbed by another is no longer a viable option. Politically we have sat on our hands while investments in plant breeding and the diversity of our breeding programmes have languished or even declined while the number of hungry has climbed to over 1 billion. There is a connection.

To help deliver the necessary global increases in production the industry requires increased public and private investment alongside the maintenance and improvement of access to biological and genetic diversity.

It is widely understood that it is both costly and time-consuming to develop new improved varieties and it is concerning that a 'lag time' created by chronic under investment may exacerbate the current productive lull in areas such as Europe. However arguably more worrying was the FAO's concern around plant diversity which suggested that the diversity of cultivated crops declined by 75 % during the 20th century and that a third of today's diversity could disappear by 2050.

In order to ensure long-term food security for a growing world population and resilience in food production systems, it is of crucial importance that we protect and preserve global biological and genetic diversity. This includes preserving the vast majority of local and regional varieties in situ and on-farm, in order to maintain and increase genetic and cultural diversity both within strains and breeds and in terms of their absolute number. These resources should then be available for the benefit of all.

However as farming representatives we understand the need for breeders to recoup the costs of their work and make profit to reinvest in future development. We should not be frightened of this. Within the UK, farming organisations have worked hard with plant breeders to ensure that the reasons for royalty collection are understood on farm. We can now boast levels of compliance at 95% on winter wheat farm saved seed royalty collection. It is vital that we as seed users play our part in supporting breeding programmes from large scale double haploid breeding such as that done by Syngenta, to more traditional programmes creating heterogeneous material for use in the organic sector. It is not just the diversity of the material available to breeders that is important but also the diversity of their end product for farmers.

In England we have a traditional phrase 'a seed well sown, is a seed half grown'. To ensure the minds of the public and our policy makers are truly focussed perhaps we should consider adapting the phrase to 'a seed well-bred will keep us fed'.

MALAYSIA BIODIVERSITY

Hamid Sulaiman,
National Farmers Organization (NAFAS),Malaysia.

The term biodiversity was coined only in the late 1980s. It is an abbreviation for "biological diversity". Biodiversity combines the concepts of plants and animal as genetic resources, the diversity of species and the habitats which they live, in one term. The present usage of the term is that biodiversity is the totality and variety of living organisms on earth.

This encompassing definition is accepted in the Convention on Biological Diversity (CBD) and is also used in the country's Assessment of Biological Diversity in Malaysia in 1997. Hence, biodiversity includes diversity at the gene, species and ecosystem levels. The diversity of the species and the habitats and ecosystems within which they live, such as the terrestrial rainforests, the freshwater lakes and river systems, the coral reefs and marine ecosystems, all form the background to discussions on biodiversity in Malaysia. According to the World Development Indicators, while Malaysia has only 0.2% of the world's land mass, its diversity of flora and fauna species makes it one of the richest countries in the world in terms of biodiversity per unit area, second only to Indonesia in South East Asia. The 2001 Global Diversity Outlook recognised Malaysia as one of the 12 mega- diversity countries in the world.

Malaysia is rich in biological diversity. It harbors some 185,000 species of fauna, more than 15,000 species of flowering plants. Of about 1,500 genera to be found are over 2,500 tree species, 3,000 species of orchids, 500 species of fern, 60 species of grasses and bamboos, and many others. However, only a handful of the 15,000 species have been utilized for food production. It has been reported that only about 300 species native to the country have been exploited and utilized. The focus of genetic diversity has traditionally been on agricultural biodiversity. Farmers had been selecting varieties of plants and animals for thousands of years, ever since origins of agriculture. Plants and animals selected were those that are suited to human needs and adapted to local environmental conditions.

Apart from rubber, oil palm and cocoa, other crops of importance are rice, fruits such as papaya, pineapple, banana and starfruit, and some vegetable crops like chilli pepper and eggplant.

Much of the plant genetic resources for food and agriculture (PGRFA) used in rice breeding are from IRRI in the form of advanced breeding lines or accessions which contain certain desirable traits for use in breeding for disease resistance or eating quality. In vegetable crops, much of the improvement was made through selecting superior plants out of local land races. Several open pollinated varieties of chilli pepper, long bean, luffa and several others have been developed using this methods.

Similarly, noticeable progress has been made in improving durian (Durio zibethinus) and rambutan (Nephellium lappaceum), again through selecting superior genotypes from the existing indigenous land races. Some introduced PGRFA were used to improve mango (Mangifera indica), and starfruit (Averrhoa carambola). Both local and foreign PGRFA were used to improve the current cultivated banana (Musa spp).

Available information on animal genetic resources relate to livestock or farm animals. Malaysian jungle fowls, wild pigs, swamp buffaloes, Kedah-Kelantan cattle and local goats are considered true indigeneous animals of Malaysia. Non-indigenous animals are mainly breeding chickens, pigs, cattle and goats which have been imported into this country from all over the world. Importation of these animals has enriched the gene pool of the different species considerably.

INTELLECTUAL PROPERTY: Securing the future for innovation in horticulture

IP protection for plant innovations. Where it all began.

Andrea Mansuino,
President of CIOPORA,
President of Confagricoltura Liguria

I don't think that many people realize to which extent their lives nowadays are influenced by horticulture. While the flower shops with their abundant offerings embellish the countless street corners and squares, while the rapidly developing urban gardening keeps raising the demand for space-saving and robust plants, while fresh fruits and vegetables are increasingly becoming essential for both health-conscious and gourmet diets, the daily practices of an average consumer are inevitably affected by the availability and quality of horticultural products.
However, even less prominent is the fact that the ornamental, vegetable and fruit varieties, along with many other consumer products, are the results of elaborate and time-consuming innovative process – the bounties of specialized labor and intellectual activity – ergo the objects of protection under the specific Intellectual Property (IP) regime.

The cornerstone of a worldwide system for Plant Variety Protection (PVP) was laid in 1961 when the International Union for the Protection of New Varieties of Plants (UPOV) was established by the International Convention for the Protection of New Varieties of Plants in Paris. Apart from the foundation of UPOV, the Convention 1961 contained a set of norms for regulation of the sui generis IP system, Plant Breeders' Rights (PBR), whose potential holders yet in the same year organized themselves in CIOPORA – the International Community of Breeders of Asexually Reproduced Ornamental and Fruit Varieties. Today, more than half a century later and after three revisions of the UPOV Convention, CIOPORA remains the only international association representing the interests of horticultural breeders solely in regard of their IP rights.

Challenges and success stories

There is much more to the PBR than the basic requirements of distinctness, uniformity, stability and novelty of a variety, for which a Plant Breeders' Right can be granted. The increasingly versatile market and high density of competing products, the major production and supply chain shifts due to the globalization processes, the growing demand for innovative, disease and climate resistant, resource-saving plant varieties, and the increasing cost of the high-tech innovation are constantly challenging the existing PVP system.
For breeders and other players of the business all these processes result in a growing need for clarification of such key issues of the UPOV system as Minimum Distance between the varieties, Essentially Derived Variety (EDV), scope of right, breeders' exemption, etc. CIOPORA focuses its activities on clarification of these matters. The latest development is the adoption of four CIOPORA Position Papers on IP by the Annual General Meeting of its members in The Hague in March 2014 – the result of an elaborate democratic discussion within the association, the first phase of which took over 18 month to conclude and which will continue till the CIOPORA's AGM in Tel-Aviv in March 2015. The main purpose of the Position Papers on IP is to embody the vision of breeders' community for the IP

protection for the future. CIOPORA is undertaking steps towards bringing this vision into reality by engaging with UPOV, Community Plant Variety Office and national governments (see also: www.ciopora.org) While regulation and rules may look fine on paper, enforcement remains the major challenge of the industry.

The lack of specialized courts and PVP expertize among judges often complicate the matters. Nevertheless, there are many success stories to be reported in the area of enforcement, including ornamentals, fruits and other crops. For instance, a recent report by Mr. Nicola Novaro, an IP lawyer from Italy, tells the story of the successful actions against the illegal propagators of tomato and lettuce in Italy (CIOPORA Chronicle 2014, Novaro, N.,42-44). According to the Italian laws several options are available to PBR holders in their fight against piracy:

in addition to the civil action, criminal charges can be brought against the PBR infringers (ibid.) Successful enforcement actions are also reported from other parts of the world, e.g. from Brazil, where the illegal propagation of the rose variety Nirpeter registered under the trademark Versília™ was detected in 2006. Although the court in first instance had condemned the grower to pay damages for the unauthorized use of trademark only, the appeal in the second instance was successful – not only the damages for the unauthorized use of trademark were doubled, but also the unauthorized propagation of the plant variety Nirpeter was admitted which resulted in an additional damage payment . Looking back at the Nirpeter case it is worth emphasizing that not only PBR, but also trademarks and patents present strong instruments for IP rights enforcement in plants. The key element is the availability of a balanced IP portfolio and its smart management.

Even if the road to protection and enforcement of IP rights in plants seems long and rocky now - in the end the benefiters of the successful enforcement actions include not only the plaintiffs (e.g. breeders), but also many honest propagators, growers, traders whose competitiveness is put into jeopardy by the pirates.

Science & Prejudice

Awareness towards Intellectual Property for plants, in contrast to many other consumer products, still presents a major challenge on all levels of supply chain as well as within the general public. For instance, a prejudice exists that IP rights only serve large companies. On the contrary – many breeding companies in the sector of horticulture are small to medium enterprises with abundance of knowledge, but often lacking the resources to enforce their rights or even track the illegal propagation of their varieties. These SMEs are major innovation hubs and employment generators, who can only survive by being fairly reimbursed for their innovative product development.

Another preconception which is often on the tongues and minds is that the breeders' royalties are sky-high. To address this issue CIOPORA calculated that the portion of royalties in percentage on incomes of apple growers varies from 0.33% at low level to 1,5% at high level production per year. In contrast to this relatively small numbers, the development of one successful commercial apple variety might take up to 20 years. The balance is clear – as plant breeding activities are highly beneficial for the society, the protection of its products by PBR, trademarks and patents is of highest importance for all the players of the value chain. In order to raise awareness for IP rights in plants CIOPORA organizes seminars and conferences as well as sends representatives to various external educational events, such as e.g. CPVO annual enforcement seminars.

IP & economic development: two sides of one coin

Without any doubt, effective IP protection, be it by means of PBR, patent or trademark, is the one of essential preconditions of the continuous economic development.

As a general statement, we can say that here can be no progress without innovation and no innovation without IP and fairplay within the value chain.

IP and economic development appear to be two sides of one coin.

BIODIVERSITY AND PLANT BREEDING

Dominique Dejonckheere,
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Maintaining access to safe and affordable food of a high quality and securing sustainable agricultural production are challenges that have to be faced in light of increasing demand for agricultural products, the scarcity of natural resources and the efficient use thereof, climate change, and increased market volatility.
In order to meet the future expectations of society and contribute to the development of sustainable agriculture, high quality seeds and propagating materials must deliver the genetic progress that is the basis of creating value throughout the subsequent agri-food chain.

Plant genetic resources provide a link between biodiversity and plant breeding. Plant breeding is strongly dependant on tapping the genetic variability of plant species, as this is the starting point for crossing and selection work. Plant breeding can only continue if new genetic material is available with which to breed new varieties. There can be no new varieties without genetic resources. The criteria of distinctness, uniformity and stability that commercial varieties need to fulfil are necessary in order to ensure high quality seed and provide a guarantee to farmers. Therefore, it cannot be argued that meeting these criteria would lead to a loss of biodiversity. As an example, in the EU more than 300 commercial varieties of sugar beet are cultivated in a whole range of soil and climatic conditions. Conserving biodiversity, promoting access to these genetic resources and sharing the benefits of their utilisation in a fair and equitable manner are thus the key factors needed in order to achieve these policy goals.
They are governed by two international treaties: the ITPGRFA and the CBD .

As early as 1983, access to genetic resources was considered essential for food security. For this reason, agreements were made within the FAO in 2001 concerning access to genetic resources, which resulted in the creation of the ITPGRFA. The ITPGRFA came into force in 2004, in line with the general objectives of the CBD. Within the framework of this treaty, the genetic material of 64 food and forage crops can be exchanged in the form of a standard contract (Standard Material Transfer Agreement – SMTA). The ITPGRFA is a very good instrument, which constitutes an implementable access system with clear and reasonable conditions. However, many vegetables and ornamental crops do not fall within the scope of this scheme, although some gene banks also make such crops available under the same conditions.

Adopted at the Earth Summit in Rio de Janeiro in 1992, the cornerstone principle of the CBD stipulates that countries have state sovereignty over the genetic resources developed by natural processes found on their territory. Other aspects regulated by the CBD include obtaining prior permission from the local authorities before propagating material is collected. The CBD was completed in 2010 under the Nagoya Protocol, an international agreement that aims to share the benefits arising from the utilisation of genetic resources in a fair and equitable manner. Implementing the CBD has proven extremely difficult in many countries. Due to the implementation of the Nagoya Protocol, access to plant genetic resources may be very complex. Retroactive implementation and mandatory external data storage will create unacceptable barriers to plant breeding. Therefore, there may be a reduction in the use of new genetic resources, which could in turn hamper progress in plant breeding, decrease innovation and diminish genetic

diversity. Workable rules are necessary.
The importance of access and benefit sharing is endorsed in the Plant Breeders' Rights (PBR) through the breeders' exemption. The breeders' exemption specifies that protected varieties may be used in breeding programmes to produce new varieties without any obligation to the party holding the PBR of the initial variety. The breeders' exemption is recognised under the ITPGRFA. It is important not to undermine the breeders' exemption when implementing the Nagoya Protocol and to continue enforcing the breeders' exemption without any supplementary obligations.
Furthermore, Article 9 of the ITPGRFA recognises the "farmers' rights". This consists of the contribution that farmers in the centre of origin have made and will continue to make to conserve and develop Plant Genetic Resources for Food and Agriculture (PGRFA), to protect traditional knowledge relevant to PGRFA, their right to share equally in the benefits of utilising PGRFA, and their right to participate in making decisions at national level on matters related to the conservation and sustainable use of PGRFA. The ITPGRFA strives to play a facilitating role in this respect, as the national authorities shoulder the responsibility of detailing and implementing farmers' rights. It is of paramount importance that farmers' rights do not confuse the issue of farm-saved seed, which allows farmers to save seeds from their harvest to sow the following year.

Although new genetic material for conventional breeders is mainly derived from modern varieties in private collections and from other breeders' registered varieties, the farm's previous varieties or wild relatives would be used in 5% of all cases. The diversity and availability of plant genetic resources is imperative when unexpected challenges need to be overcome for a particular crop Conserving plant genetic resources can be carried out in situ and ex situ and provides an important array of potentially useful traits from which plant breeders can select new and improved varieties. Farmers create biodiversity and are partners in plant genetic resource conservation in situ. Crop species are maintained in their natural milieu on farms by farmers who adopt unconventional farming practices. Seeing as productivity is often considerably lower than conventional farming, financial support is necessary to secure the incomes of those farmers who dedicate part of their arable land to these purposes. In the EU, agri-environment measures include the possibility to compensate farmers for additional costs and foregone income resulting from conservation activities aimed at preserving endangered crops (and breeds) under threat of genetic erosion. Member States are encouraged to place a greater emphasis on these matters in future Rural Development Programmes.

The Community Programme (Council Regulation (EC) 870/2004) on the conservation of genetic resources in agriculture provided co-funding for 17 conservation activities both in situ and ex situ with a budget of EUR 8.9 million. Those activities were implemented by 180 partners in 25 Member States and 12 non-EU countries. Financial support is also granted to these matters under the EU's Horizon 2020 research and innovation policy and under the European Innovation Partnership.

Conserving old varieties is also conducted ex situ by storing them in dedicated gene banks, mainly belonging to breeding companies or in public/private collections. There are around 1,400 gene banks worldwide containing more than 5.4 million samples, of which 88% are cultivars or breeding lines. It is also crucial to oversee the gene banks and collections and the information they conserve.

In September 2013, the Governing Body of the ITPGRFA adopted Resolution 8/2013 in Mascate (Oman) on the implementation of Article 9: farmers' rights. Contracting Parties are therefore invited to involve farmers' organisations and send any relevant information to the ITPGRFA Secretariat (PGRFA-Treaty@fao.org) before 15th October 2014. A report will be prepared by the sixth session of the Governing Body in 2015.

PLANT BREEDING AND BIODIVERSITY IN GHANA

Perspectives and reflections on benefits and challenges to small holder farmers in the face of climate change and food/ nutrition security

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Ghana Cooperative Agricultural Producers and Marketing Association-AGRIC COOP

What I share here is my perspectives and impressions as a farmer and farmer-leader on what I think are the benefits and challenges of making biodiversity in plant breeding to be of maximum use for small holder farmers in developing Countries like Ghana.

Purposes of Plant breeding

Plant breeding is generally done for several purposes, in this case to have varieties of crops that thrive under different conditions. For example breeding for crops that are drought resistant, pest resistant, high yielding, more nutritious, flood and excess water resistant, early yielding, unique taste and so on.

Plant breeding for biodiversity

To assure equilibrium in the eco-system plants need to be bred in such a manner as to provide plant variety and diversity in the eco-system in such a manner as the eco-system mutually support and balance itself for stability in sustenance of life forms. Plants should not be bred to eliminate other necessary and vital members of the life systems on the planet. This has several benefits especially in this era of climate change.

Environmental and Climatic relevance of bio diverse plant breeding options

Environmental challenges and Climate variability underscore the need to breed plants that are diverse in such a manner as to make up for the loss of plant varieties for eco-balance. For depletion of certain bio-forms have as a result of irresponsible use of the natural environment, further resulted in more environmental problems including climate variability and associated effects. Bio diversity thus enables the environment self-regulate. Different plants have their contributions to make in achieving eco-equilibrium. Carbon sequestration for example is contributed to immensely by biodiversity. Plants should therefore be bred to achieve more biodiversity in Ghana. This will help mitigate climate variability.

Climate adaptation will also be enhanced if we breed plants in order for farmers to be resilient to climate change negative effects. In parts of northern Ghana where there exist longer droughts, drought resistant varieties are needed to enable farmers to produce even in extended dry seasons due to climate change. All over Ghana drought resistant varieties are also helpful because of sporadic changes in the climate and weather cycles. Flood and excessive water resistant varieties of Crops help farmers in flood prone areas all over Ghana but especially parts of the North and coastal wetlands and low land areas.

Food and Nutrition security challenges and benefits

Food security is enhanced by high yielding crops and pest-resistant food crops, especially as we seek to maximise yield per hector, more so for sustainable intensification of production as an environmental measure. Ghana's landmass is under production due to wasteful use of large spans of lands for smaller yields. Plant breeding assists smallholder farmers in Ghana who already face land governance challenges to make maximum use of limited land accessible to them by increasing yield per hector and also increasing availability of food.

Early yielding crop varieties also help not only in food availability but also reducing the long periods of poverty cycles that small holder farmers undergo by making sure some crops are harvested early and sold; or that early yielding varieties make up for unavailable incomes due to

late yielding crops, striking a balance in livelihoods and income management both at the personal, family and community levels for small holder family farmers.

Personal nutrition security is a critical challenge facing small holder farmers in Ghana. It is a paradox that those who produce the food, and in fact who are expected to contribute to the food and bio-energy needs of the 9 billion+ population increase by 2050 do not have enough to eat let alone for their families, including especially children and Women in Ghana. In view of Hunger in parts of Ghana, it is a laughing stock for many citizenry when Ghana is said to be lower middle income Country merely for statistical reasons and not in realities of peoples' lives. High yielding and early yielding food crop varieties come in handy for this. Cereals are especially important if they can be made more nutritious with micro nutrients which are vital for nutrition security of the basic family unit; especially to avert exacerbated child malnutrition and maternal nutrition requirements of Women. Nutritious cereal food varieties-Corn, sorghum, millet, rice and Tubers-Yams, Potatoes Cassava and Legumes-beans of different sorts and nuts- embedded with micro-nutrients are a must.

Marketing and Processing Relevance of bio diverse plant breeding in Ghana

Natural and traditional taste is a cultural trait of Ghanaians. Therefore for Local marketing of farm produce/or processed foods to thrive the maintenance of food taste similar to the original natural taste is critical. This has resulted in several food varieties in which the taste has changed in the breeding processes or in the period of processing has led to glut in the marketing because citizens ignore them for natural ones. This has also occurred for processed foods that do not take cognizance of this in the processing technologies chosen.

Challenges of Plant Breeding for bio diversity in Ghana

In spite of these great benefits of bio-diverse plant breeding for small holder farmers there are real challenges, which stem mainly from the scientific and research communities old-age and lingering inability to reach out to smallholder farmers with research results. There are several reasons for this, but for purposes of space, I will quickly mention a few. Smallholder farmers cannot be effectively reached unless through their Organizations, but these Cooperatives and Farmer-based Organizations are ignored in efforts to reach farmers. Also the scientific community are yet to come to terms with real involvement of stakeholders in the research and scientific processes as if the stakeholders of research mainly smallholder farmers cannot contribute meaningfully to the research process except to answer questionnaires and to passively wait for research reports, which at best are shelved, due to a conservative school in the research community that a researcher's work is completed once a beautiful report is produced. Appropriate dissemination of research results/reports is weak.

Advocacy for policy influence is nearly non-existent. But the same researchers take on huge consultancies if they are called upon to develop policy and programmes or train based on the reports they produce. In essence the reports are produced for research funders and to some extent government agencies and not the real users, the small holder farmers. There is urgent need for radical paradigmatic shift in scientific thinking in this area, if at all beneficial research, policy-making and programme development will meaningfully involve and benefit smallholder farmers bottom-up.

This situation however is not tally hopeless in Ghana for there are novel bottom-up collaborative approaches involving Farmer Organizations and Universities for meaningful mutually beneficial partnerships involving farmers and academics. One such collaboration is developing between Ghana Cooperative Agricultural Producers and Marketing Association-AGRIC COOP (The National Farmers' Cooperative Federation in Ghana with 2 million+ members Nationwide) and The University of Energy and Natural Resources-UENR in Ghana.

It started with AGRIC COOP appointing an Academic to be Co-Chair of its Africa Interdisciplinary Centre for Climate Smart Agriculture and Adaptation-AICCA, leading to series of meetings and consultations resulting in AGRIC COOP drafting an MOU which the University is studying for possible signing for a formal relationship that will lead to joint-research(involving farmers in the choice of research topics, proposal development and design and other processes making the farmers own the research processes and outputs thereby assuring, to the highest degree, usage of findings of research in farmer activities at the practical level), capacity building, training and Fieldwork involving academics, students and farmers on both sides.

The University is also expected to Partner AGRIC COOP in running its Farmer-Field School.

BIODIVERSITY AND FLORA'S STATUS IN THE DEMOCRATIC REPUBLIC OF CONGO

Flavien Ingumba,
General Secretary, OPICA

The Democratic Republic of Congo is considered one of the most important African countries when it comes to biodiversity (Doumenge 1990, McNelly and al. 1990).
Thanks to his geographic location next to the Equator, this country has a large climate zone (equatorial climate, tropical and humid climate, tropical climate during dry seasons etc.) which, together with the different conditions of the mountains and the land, leads to different biomes, ecosystems and habitats.

Generally speaking, in this country there are four floristic regions which change according to the presence of mountains and the proximity to the Cuvette Centrale (large area which covers the centre of the country and both sides of the Equator):

- A narrow strip of wooded and grassy savannah in the north (Soudanienne region) located on the northern part of the Centrale Cuvette;
- A large strip of wooded and grassy savannah with different kinds of forests (Miombo and Mujulu) on the southern part of the region, that is to say the Zambezienne region;
- Guineo-Congalian rain forests in the Centrale Cuvette (Guineo-Congalian region);
- Afromontane forests located on the eastern part of the country, on the African graben characterised by many lakes.

In this area it is possible to recognise some efaphoclimatic varieties on the forest's southern surface: mangrove (located on the western part of the rain forest's south surface in the Guineo- Congolian region, on the mouth of the river Congo) and periodically flooded papyrus (dembos).

General evaluation of the elements characterising biodiversity (flora and fauna)
The data collected in the national monograph are often uncompleted or non-updated. A taxonomic hierarchy changing according to the different situations taken into account is essential to provide data concerning biodiversity.

As a consequence, it is pivotal to carry out further investigations concerning recent works, together with land maintenance in order to realise systematic studies and collecting statistic data related to the ethnobotany and the ethnozoology of national biological resources.

The data related to micro organisms (algae, bacteria, fungi and lichens) are still hard to collect. They do not cover the entire country and they are often unclear and contradictory.

During the colonial area, the National Institute for Agronomy in Belgian Congo (INEAC) carried out many studies concerning the spermophyte flora. Starting from 1948, the INEAC published ten volumes of documents describing up to 3.000 species.
After the proclamation of the independence, the enterprises working for the Botanic Garden of Meise (Brussels) continued to carry out a study called "Central Africa's Flora" which will be able to develop a better knowledge concerning the pteridophyte.

Fauna and flora's general overview
The Democratic Republic of Congo has roughly 145 millions hectares of natural forests which represent about 10% of the total amount of rain forests throughout the world and more than 47% of Africa forests. Forests play an important role when it comes to preserve biodiversity.

The Democratic Republic of Congo, among other African countries, presents the highest number of biodiversity. It hosts endemic species such as the okapi, the white rhinoceros, the Grauer gorilla, the bonobo and the Congolese peacock.

Preserving biodiversity and flora

- The forest Code of the Democratic Republic of Congo, issued by law n°011/2002, aims at organising forests and their exploitation. Forests are divided into three categories: classified forests, protected forests and forests with a continuous production.

Flora of the Democratic Republic of Congo is divided into different protected areas, that is to say 8 national parks and 63 reserves, hunting areas and forests with a continuous production. The 8 national parks, including the Salonga Park located on the Equador, are considered to be the biggest forest reserves of the planet managed by the Congolese Institute for Nature Conservation. Forests are also fundamental from a socio- economic point of view for the local population and natives whose lives depend on them.

Armed conflicts' impacts on biodiversity

In theory, the Democratic Republic of Congo is an intact country where nature has always been respected not only thanks to a natural protection but also thanks to legal measures for promoting security. However, after the war in Congo, natural parks were victims of poaching and other abuses caused by the war. For instance, the weakness of troops, the local populations upraise, the existence of a double administration and the lack of equipments.

Today, a monument made of stone built at the entrance of the Virunga national park represents the sacrifice of the twenty-three guards who died while protecting the animals from the poachers. They must be an example for the guards of the entire world. However, this sense of loyalty is disappearing because of the increasing demotivation and insecurity.
Despite the war, there are also other phenomena such as poverty. The income of the majority of the population comes from forests which are essential for growing Encephalactos septentrionalis, Diospyros grex, Eremospatha haullevilleana, Pericopsis elata, Sclerosperma mannii, Gnetum africanum, Milletia laurentii, Juniperus procera, mushrooms and fruits. Furthermore, the slash-and-burn technique used in agriculture jeopardises the life of some species such as rats and games.

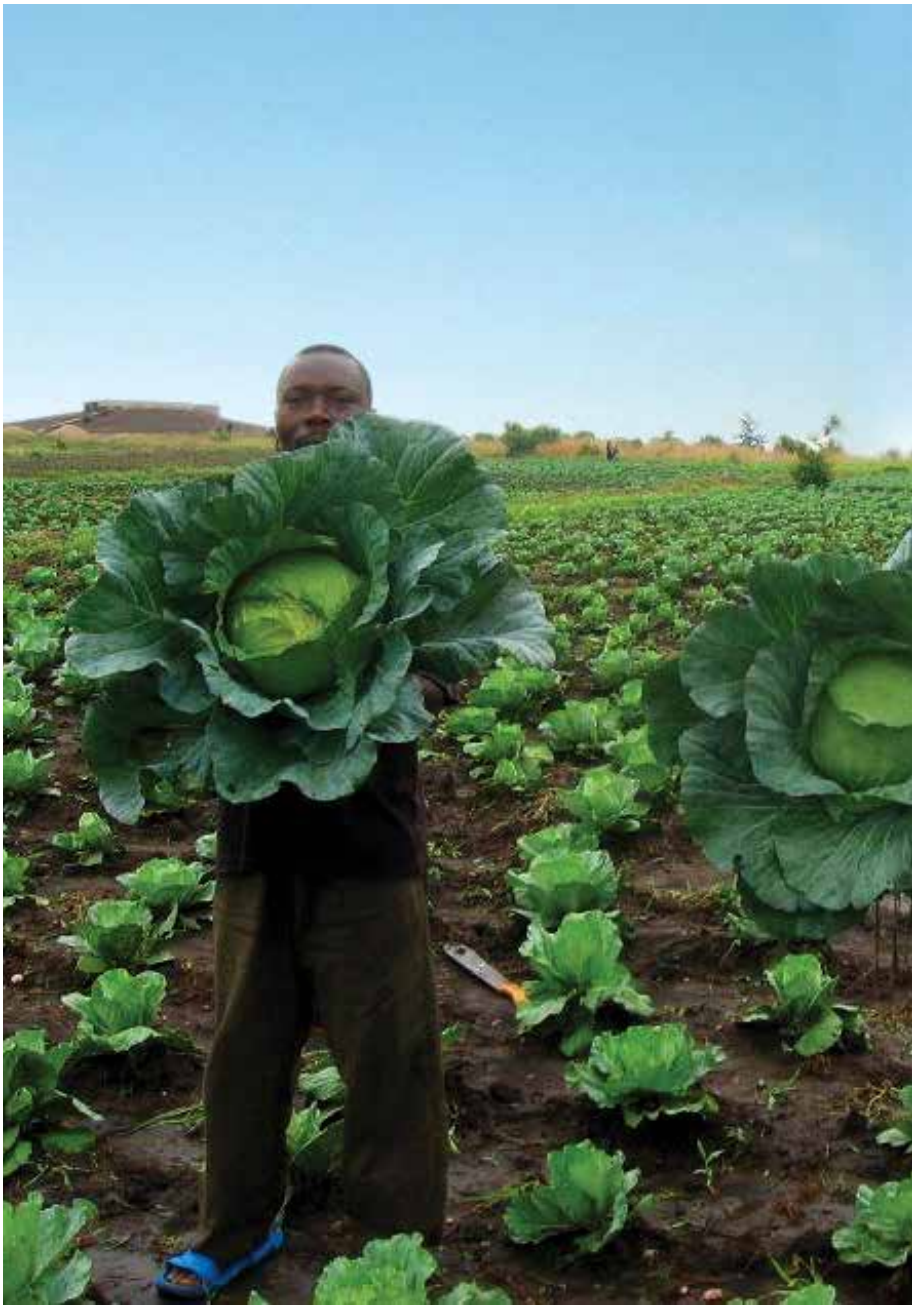
Protection strategies

Updating data concerning flora and biodiversity; carrying out actions for raising populations awareness; developing activities to help the population reducing pressures on biodiversity; taking stock of the endogenous knowledge regarding the protection of the ecosystems.

The international community must punish those who are pursuing the war.

Conclusion

Considering what written so far, it is clear that we need to establish policies in order to safeguard and increase the value of biodiversity. The Congolese country and the international community must join their forces to ensure that future generation will benefit from a rich and healthy nature. As a consequence, the government, together with the international community, must safeguard biodiversity, an important heritage which includes the most unique species in world.
Safeguarding flora and biodiversity, educating the population and establishing efficient strategies in order to fight against poverty are other three top priorities.



YOUTH INTEGRATION IN BIOLOGICAL DIVERSITY IN ZIMBABWE

Raymond Erick Zvavanyange, *Young Professionals for Agricultural Development (YPARD), Zimbabwe Representative & Science Practitioner and Critic*

The major efforts that recognize the potential of the youth workforce in Africa's development hinge on the premise of human, social, and economic progress. Because of the agrarian emphasis within the continent, the agriculture sector becomes the default focus area for efforts and funding. This step is important but often this is at the expense of other important pillars of African economies such as the environment and natural resources (biodiversity). In Africa, natural resources management is important because of the unique role of rural management systems which sometimes and often unintentionally conflict with modern methods of conservation and management. An interdisciplinary lens is essential to pinpoint policy actions and implementation in natural resources management especially for Zimbabwe. The country has a robust policy framework for biodiversity which is in conformity to regional and international requirements. The integration of the youth workforce is a challenge given the fact that the country is slow to capitalize on basic society fundamentals from its local talent and intelligence found in politics, social and economic development, and indigenous knowledge in a progressive manner. There is good news however; Zimbabwean youths have structures and organs that are mandated to represent their voice and interests.

Opportunities for Youths in Biodiversity in Zimbabwe

Biodiversity is the degree of variation of life. It is a niche profession with a high demand for quality and demonstration of results on a practical scale. Currently, the country is on a socio-economic and political recovery path which offers opportunities for youth integration in biodiversity on many fronts. The following suggestions are a start:

– Youths can create new partnerships and institutions to affect biodiversity at local level.

– Youths can initiate need-based community actions in natural resources management that identify and maintain autonomy at local level for sustainability purposes.

– Youths can collaborate and network on business and professional platforms (e.g. Zimbabwe Farmers Union Young Farmers Clubs, Young Professionals for Agricultural Development, and Local Authority bodies – Environmental Management Agency, Parks and Wildlife Management Authority, Ministry of Youth, and Zimbabwe Youth Council).

– Integration of biodiversity operational areas (forestry, terrestrial wildlife, aquatic flora and fauna, and agriculture) with climate compatible development (see the Table).

PRIORITIZED NEEDS FOR CLIMATE COMPATIBLE DEVELOPMENT IN ZIMBABWE

Prioritized Needs for Climate Compatible Development in Zimbabwe	Knowledge Gaps	Research Gaps	Individual Capacity Gaps	Institutional Capacity Gaps
Biodiversity Management	a) What still exists in the forests? For example, the disappearing species e.g. Blumia decurens including species mix b) Information update of the flora and fauna of Zimbabwe. A starting point is Herbarium and Botanical Institute of Zimbabwe c) Limited knowledge of climate sensitive flora and fauna e.g. disappearance of Mopane worms and unsure whether it's due to harvesting or other reasons	d) Surveys of flora and fauna biodiversity needs updated e) Database creation f) Appropriate research methodology for data collection and models for use g) Socio-economic aspects	h) Lack of expertise with biodiversity management systems (BMS) i) Lack of Zoology and botany specialists; statistical modellers; biodiversity management specialists j) Training as practitioners "brain-under-the drain k) Reward and remuneration systems i) Interest and motivation	m) Lack of expertise to train next generation of biodiversity specialists n) Lack of coordination o) Collaboration among institutions p) Systems and structures e.g. missing links, interface and connections to properly house climate change, biodiversity issues being shadowed in some organisations
Forest Management and Conservation • Re-greening • Matching of site to plant species • Development of climate resilient plants • Natural Woodland Management • Integrated Management of Invasive Alien Species	a) Lack of knowledge on the ecology and management on Indigenous trees a) Lack of knowledge on how to improve their adaptability and productivity b) Lack of accessibility (cost) and awareness of alternative energy sources c) Lack of linkages with other stakeholders such as energy, infrastructural development on alternative sources	d) Lack of research methods/ knowledge on Indigenous trees e) Lack of knowledge on germinating / propagation and improving growth of indigenous trees f) Lack of use of indigenous knowledge systems in scientific research g) Integrated pest and invasive management systems	a) Lack of Foresters (Silviculturists, Breeders and Forest Entomology) b) Training as practitioners "brain-under-the drain c) Reward and remuneration systems to retain expertise	d) University curriculum to mainstream issues to do with forestry in all courses and the development of forest science

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LET US UNDERSTAND AND CONSERVE LESSER KNOWN WILD EDIBLE DIVERSITY

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CSIR-National Environmental Engineering Research Institute (NEERI), Nehru Marg, Nagpur, Maharashtra, India - YPARD Member

We all will agree that present world is presently over-dependent on a few plant species though; our current scientific knowledge is more or less related to at least 3,000 edible plant species, with merely 30 crops contributing to more than 90 % of the world calorie intake. It has been not only been read widely but has also been well accepted fact that use of wild edible part as supplement holds promise for all of us. Though, diet surveys most of the times tend to ignore wild plants in comparison to cultivated ones, and this is a methodological deficiency. In recent years, underutilized plants have come out of the shadows and are moving fast into the limelight of not only rural development but are also trying to explore their niche in urban markets.

Himalayas are known to be accretion of numerous lesser known and underutilized wildly growing plants having immense support towards regional and local food system. Villages in the area significantly depend on the forests for their various subsistence demands. Many such lesser known wild edibles are used by locals in Himalayan states of India. Local inhabitants in Himalayan region, dwelling in remote and inaccessible valleys, have been depending on a variety of lesser known underutilized wild edibles for their nutritional support. These are frequently consumed throughout various months and seasons of the year and gathered by the local inhabitants from low as well as high altitudinal zones. My journey back to my home in mountain state of Uttarakhand in India has always brought new surprises in terms of lesser known wild fruits and underutilized biodiversity of the state. My knowledge has enhanced in last few years on lesser known biodiversity of the country after being an avid explorer of these wild edibles in rural markets. It tempts me to discover and taste delicious lesser known underutilized wild edible fruits and vegetables, learn food recipe related to them and document related indigenous knowledge. I have been writing about the dying wisdom and related food pages for quite a while. In areas, where market supplies are not organized, locals use these wild fruits and vegetables as a major source of nutrition and medicine. "During our old days hill locals and communities were dependent on these wild edibles for their nutritional and medicinal needs" informs Basanti Devi an old resident of Kandadhar village in Deoprayag. In addition to fresh consumption in season, they are processed, fermented for storage and used off-seasonally.

Increased urbanization coupled with migration is leading to erosion of traditional and indigenous knowledge linked with them. It was observed that indigenous knowledge is eroding due to changing social values and non participation of younger generation in collection and processing of such lesser known underutilized but nutritionally potential wild edibles. Improper utilization also sometimes leads to wastage. This neglect has led to the genetic erosion of their diversity in Central Himalayas.

Dr. Deepak Dhyani a mid career science professional and enthusiast is spreading awareness and building capacity among indigenous Garhwalese and Indo-Mongoloid Bhotiya tribal community for conserving the lesser known underutilized biodiversity of wild edibles of trans Himalayas. For last ten years after working on conserving one of the significant wild edibles of trans Himalays he is trying to enhance the understanding about value added products and how they can be developed by sustainable utilization and conservation. His project is on developing an understanding to ensure local mapping of lesser known wild edibles present in the region, their consumption pattern and extent of usage. He is helping local youth and children to explore their own forests, having eco-clubs with diverse interesting efforts for having a clear understanding of wild edible diversity and how they can ensure in-situ as well as ex-situ conservation of these species by their own small efforts. Other than his awareness programme his major research involvement is in developing seed bank of these lesser known wild edibles of region. Innovative approach he is using for the purpose is by involving locals, developing literary material in local language for school going children and others. This project at large is trying to communicate the value of food security by utilizing cost effective local resources and linking conservation with livelihood enhancement approaches.

He has his considerable emphasis to undertake research for providing economic benefit to the local communities. The value addition of the product that can increase the cash return from the wild edible plants multifold by processing it into pickle, dry storing, spices etc is also one of the major objectives of his work in all these years. Larger goal of his project is to generate awareness about utilization of local nutritious easily available and low cost food products so, that food miles can be reduced and help in establishing and aiming for a better and sustainable tomorrow.

Disclaimer:
"Views expressed by her are her own and not necessarily that of Government"

New EU Initiative to Protect Biodiversity and Fight Wildlife Crime

On Thursday, May 22nd, the International Day for Biological Diversity, the European Commission launched a new initiative aimed at protecting biodiversity and reducing poverty in developing countries.

The EU Biodiversity for Life (B4Life) initiative is designed to help the trgeted countries protecting their ecosystems, fighting wildlife crime and developing green economies. B4Life will be financed jointly by the EU Global Public Goods and Challenges (GPGC) programme and regional and national development cooperation funds, with an estimated budget of up to €800 million for 2014-2020.

In line with the EU's Agenda for Change, B4Life will focus on Least Developed Countries and also those countries in which ecosystems most threatened.

http://europa.eu/rapid/press-release_IP-14-593_en.htm

Move over Rice, Baobab and Spider Plant Could be the New Staple Crops

In Africa a huge variety of edible plants other than the traditional maize, wheat and rice are grown. These other crops – including baobab, amaranth, breadfruit and the spider plant – are known as 'orphan crops', but with the recent launch of a new African Plant Breeding Academy, improved varieties of these crops may soon play a critical role in achieving household food security for millions of people.
The Academy, opened in late 2013 and is being hosted by the World Agroforestry Centre (ICRAF) in Nairobi, where about 250 scientists from around Africa will receive training over the next five years in the latest biotechnological techniques to sequence, assemble and annotate the genomes of 100 traditional African food crops.
The aim is to produce more robust and nutritionally improved varieties of these crops, and to make them available to smallholders everywhere.

http://www.theguardian.com/global-development-professionals-network/2014/may/16/food-crops-africa-plant-breeding-academy

Capacity-building workshop for Central, South and East Asia on ecosystem conservation and restoration to support achievement of the Aichi Biodiversity Targets

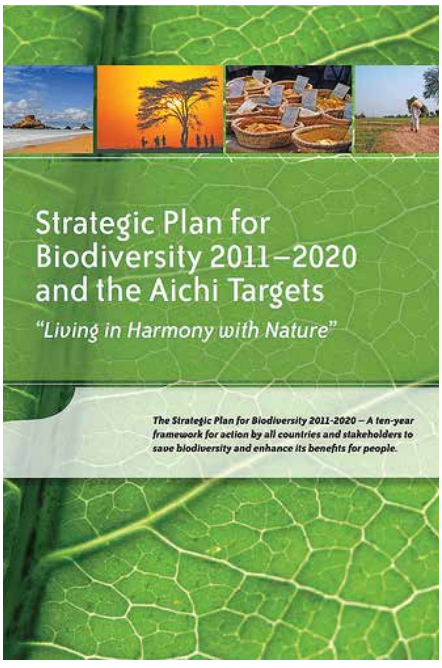
The Capacity-building workshop for Central, South and East Asia on ecosystem conservation and restoration to support achievement of the Aichi Biodiversity Targets will be held in Jeju, Republic of Korea, from 14 to 18 July, 2014.

https://www.cbd.int/doc/?meeting=CBWECR-2014-07

12th Meeting of the Conference of the Parties to the Convention on Biological Diversity

The 12th Meeting of the Conference of the Parties to the Convention on Biological Diversity will be held on 6 - 17 October, 2014 in Pyeongchang, Republic of Korea. Its goal is to mainstream biodiversity at different levels. Throughout the Conference of the Parties, governments are encouraged to develop, implement and communicate the results of national strategies for implementation of the Strategic Plan for Biodiversity.

http://www.cbd.int/doc/?meeting=cop-12

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