Agriculture *for* Development

Tropical Agriculture Association

Special Issue on Innovation Systems

Ralph Melville Memorial Lecture – Shaping the future together
Development and application of Innovation Systems
Linking innovations systems with participatory research and extension
Incorporating gender into Innovation Systems research
Biogas innovation among pig farmers in the Philippines
Plantwise: Putting Innovations Systems principles into practice

Rural-urban linkages in Guatemala
Genetically modified crops: Time for a reasoned stance

No. 18 Spring 2013

Guidelines for Authors
Agriculture for Development

The editors welcome the submission of articles for publication that are directly related to the aims and objectives of the Association. These may be short communications relating to recent developments and other newsworthy items, letters to the editor, especially those relating to previous publications in the journal, and longer papers. It is also our policy to publish papers, or summaries, of the talks given at our meetings.

Only papers written in English are accepted. They must not have been submitted or accepted for publication elsewhere. Where there is more than one author, each author must have approved the final version of the submitted manuscript. Authors must have permission from colleagues to include their work as a personal communication.

Papers should be written in a concise, direct style and should not normally exceed 2000 words using Times New Roman font, 12-point size for the text body, with lines double-spaced and pages numbered. Tables, graphs, and photographs may take a further 1 page plus, but we try to keep the total length of each paper to 3-4 pages of the Journal. Good quality photographs are particularly welcomed, as they add considerably to the appearance of the contents of the Journal. We prefer high resolution digital images.

Format

- An informative title not exceeding 10 words.
- Authors listed, usually with first name and surname.
- A short biographical note about the author(s) is included, preferably with a photograph of the author(s). If still working, indicate your position and email address. If retired, your previous job (*eg formerly Professor of Agriculture, ABC University*).
- For papers longer than 1500 words, a short abstract (summary) of 150-200 words.
- A short introductory paragraph is useful describing, succinctly, the current state of work in the relevant field.
- Système International (SI) units should be used. Others should be related to SI units at the first mention.
- No full stops should be used with abbreviations such as Dr or Prof, or eg, ie, *status quo*, *viz*, and *inter alia*. Acronyms such as GFAR, FAO, IFPRI, and GDP do not have full stops or spaces between the letters. Acronyms should be presented in full at their first mention.
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- State any statistical methods used eg analysis of variance (ANOVA) and ensure that the analysis method chosen is appropriate for the data. Data tables presenting, for example, mean values should include the appropriate standard errors (SE) and degrees of freedom (DF).
- Results should be presented in an orderly fashion and make use of tables and figures where necessary.
- Discussion should focus on the work presented and its relationship with other relevant published work.
- Sources of funding should be listed in the acknowledgements.

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- At the end of the paper, give full details of references as per the examples below.
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Journal (article): Uphoff N, Kassam AH, 2009. System of Rice Intensification. *Agriculture for Development* **6**, 10-14.

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Book: Brammer H, 2012. *The physical geography of Bangladesh.* Dhaka, Bangladesh: University Press Ltd.

Book (edited): Fuglie KO, Sun Ling Wang, Ball E, eds, 2012. Productivity Growth in Agriculture: An International Perspective.Wallingford. UK: CAB International.

Book (chapter): Warner K, 1997. Patterns of tree growing by farmers in eastern Africa. In: Arnold JEM, Dewees PA, eds. *Farms, trees & farmers: Responses to Agricultural Intensification.* London: Earthscan Publications, 90-137.

Conference proceedings (published): McIntosh RA, 1992. Catalogues of gene symbols for wheat. In: Miller TE, Koebner RM, eds. *Proceedings of the Seventh International Wheat Genetics Symposium*, 1987. Cambridge, UK: IPSR, 1225–323.

Agency publication: Grace D, Jones B, eds, 2011. *Zoonoses (Project 1) Wildlife/domestic livestock interactions*. A final report to the Department for International Development, UK.

Dissertation or thesis: Lenné JM, 1978. *Studies of the biology and taxonomy of Colletotrichum species*. Melbourne, Australia: University of Melbourne, PhD thesis.

Online material: Lu HJ, Kottke R, Martin J, Bai G, Haley S, Rudd J, 2011. Identification and validation of molecular markers for marker assisted selection of Wsm2 in wheat. In: Plant and Animal Genomes XIX Conference, abstract W433. [http://www.intl-pag.org/19/abstracts/W68_PAGXIX_433.html] . Accessed 20 April 2012.

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- Self-explanatory with an appropriate legend above the table, without abbreviations.
- Number with arabic numerals, eg Table 2.
- Refer to tables in the sequence in which they are presented.
- Use lower-case letters, eg a, b and c, for footnotes.

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- Self-explanatory with an appropriate legend below the figure, without abbreviations
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- Use arabic numerals in the text, eg Figure 2.
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Your paper should be submitted ready for editing and publication.
Accepted text file types: Word (.DOC or .DOCX), Rich Text Format (.RTF) or Postscript (.PS) only.
Accepted figure file types: .TIF, .EPS or .PDF.
No lecture notes or PowerPoint presentations, please. If the paper is a presentation from a TAA meeting, please let us have this or as soon as possible afterwards so that there is no last minute rush in trying to meet the next publication deadline.

Send submissions via e-mail to coordinator_ag4dev@taa.org.uk preferably in an attached file.

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Cover photograph: Farmers visiting plant clinics with sick plant samples in a busy market of Ngoma district, Eastern zone, Rwanda (Negussie Efa)

Contents

The TAA is a professional association of individuals and corporate bodies concerned with the role of agriculture for development throughout the world. TAA brings together individuals and organisations from both developed and less-developed countries to enable them to contribute to international policies and actions aimed at reducing poverty and improving livelihoods. Its mission is to encourage the efficient and sustainable use of local resources and technologies, to arrest and reverse the degradation of the natural resources base on which agriculture depends and, by raising the productivity of both agriculture and related enterprises, to increase family incomes and commercial investment in the rural sector. Particular emphasis is given to rural areas in the tropics and subtropics and to countries with less-developed economies in temperate areas. TAA recognizes the interrelated roles of farmers and other stakeholders living in rural areas, scientists (agriculturists, economists, sociologists, etc.), government and the private sector in achieving a convergent approach to rural development. This includes recognition of the importance of the role of women, the effect of AIDS and other social and cultural issues on the rural economy and livelihoods.

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Guest Editorial

Innovation Systems

Chris Garforth is Professor of Agricultural Extension and Rural Development in the School of Agriculture, Policy and Development at the University of Reading. His main research interest is in understanding how farmers access, use and respond to information; and more generally on the role of communication in rural development. He is currently leading a two year study of the factors influencing farmer innovation and the impact of that innovation on agricultural growth and livelihoods, together with colleagues in Kenya, Sudan and Uganda.

We are used to thinking of agriculture in terms of 'systems'. Many readers will be familiar with the late Professor Sir Colin Spedding's 1979 book (and perhaps his lectures at the University of Reading) introducing the topic of 'agricultural systems', and with the academic journal of the same name. The idea of a system as a set of components, with resources or energy flowing between them, and inputs to the system being transformed through those interactions into a range of outputs, is a useful way of representing the real world processes that we grapple with in our attempts to understand, manage and improve agriculture. Crop and livestock production systems, the System of Rice Intensification, weather systems, land tenure systems, information systems – it is difficult to talk about agriculture for development without the language of systems.

Within the field of research and extension, too, systems have never been far away: Farming Systems Research and Extension (FSRE), agricultural knowledge systems and the associated RAAKS methodology (Salomon & Engel, 1999), the Training and Visit system of agricultural extension, the AKIS/RD of FAO and the World Bank which 'integrates farmers, agricultural educators, researchers and extensionists to harness knowledge and information from various sources for better farming and improved livelihoods' (FAO, 2000), all have had their influence on how we think about the ways in which information and knowledge are created and harnessed.

Agricultural innovation systems (AIS) is one of the more recent 'system' terms to take hold. And it is proving strikingly influential. Several international organisations and bilateral development partners have re-framed their support for the agricultural sector in terms of innovation systems language and concepts.

In the case of DFID, the concept underpinned the design and implementation of the Research into Use (RiU) programme. The programme was, in part, a response to the perception that a lot of the knowledge generated from the ten year Renewable Natural Resources Research Strategy had yet to be taken up widely within agricultural and food systems. And in the course of implementation, one of the main lessons that emerged from RiU was that it is institutional rather than technical factors that limit the uptake and impact of new ideas in agriculture. This led to the idea of building 'innovation platforms' for key commodities; the idea initially was that these platforms would help to spread and encourage uptake of the outputs of previous agricultural research, but they came into their own as a trouble-shooting forum in which constraints and opportunities for positive change could be identified and acted on (Shields *et al*, 2012).

The new global architecture for agricultural research and advisory services has taken agricultural innovation systems to their hearts. The first objective of the Global Forum for Rural Advisory Services (GFRAS)'s third annual meeting in September 2012 was to 'Understand and agree on the role of rural advisory services in agricultural innovation systems'. GFAR and the CGIAR Consortium frequently use the language of innovation systems in their pronouncements on how science can

contribute to the continuing challenge of securing food for a growing world population. GFAR's Executive Secretary, Mark Holderness, in his 2012 Ralph Melville Memorial Lecture in this issue, puts the need to understand and strengthen innovation systems at the heart of the challenge facing agriculture in a near future of rising populations, environmental constraints and the persistence of poverty. ASARECA's current ten year strategy embodies an 'innovation systems perspective'; and as Geoff Hawtin's update on International Agricultural Research News in this issue shows, CGIAR centres are increasingly adopting an innovation systems perspective in their research programmes and playing an active role in innovation platforms. Geoff gives two specific examples of initiatives based on an AIS perspective and suggests that AIS thinking will continue to influence CGIAR research programmes for some time.

Systems have conventionally been thought of as 'hard' systems; a fixed set of components, with relatively fixed relationships between them. This view suggests that systems can be designed, re-engineered, new components added to make them more efficient and productive. 'Soft systems' thinking enriched our understanding of human and social systems: systems are seen as socially constructed understandings of how things work; they have emergent rather than fixed properties; while we can tinker with them, we cannot determine how they will perform.

Agricultural innovation systems incorporate elements of both 'hard' and 'soft' views. On the one hand, we can picture the building blocks of a system and we can describe their different functions and interactions. On the other hand, we can recognise that a system is continually changing, that no-one has the mandate or the power to control it, that it will be described differently by different people, each looking at it through their particular lens of experience and expectations, and that the institutions or 'rules of the game' that govern interactions within the system are themselves flexible and contingent on context and on power relations among the people involved.

We see this mix of 'hard' and 'soft' views in the way agricultural innovation systems are written about. To the World Bank, an innovation system is a 'network of organizations, enterprises, and individuals focused on bringing new products, new processes, and new forms of organization into economic use, together with the institutions and policies that affect their behaviour and performance' (World Bank, 2012). It is something that can be designed, created, invested in. Visual representation of an AIS (*ibid* p4) shows its origins in the Agricultural Knowledge and Information System (AKIS). It is AKIS plus: the triangle of research, extension and education interacting with farmers is now supported by 'bridging and coordination organisations' and operates within a regulatory and market environment with many different 'actors'.

Jon Daane, in contrast, takes a 'soft systems' view, defining innovation systems as 'complex, open and dynamic human activity systems in which actors (individuals, groups, organisations) apply their minds, energies and resources to innovation in a particular domain of human activity'. They have no objective existence in the real world: they exist only 'in the minds of those who define them, ie as social construct, or as a heuristic device for analytical purposes' (Daane, 2009). Making innovation systems more effective, from this perspective, can be achieved by enhancing the ability of the 'actors' to function and interact effectively. But even this is not enough: action is also needed to ensure people within the system have incentives to look beyond their individual and organisational interests to spend time and be effective in working towards collective goals.

The papers in this issue reflect this range of views on innovation systems. Taking Jon Daane's view of innovation systems as human activity systems that are socially constructed, we should expect them to reflect the gendered nature of the society in which they are embedded. Sarah Cardey and Chris Garforth reflect on what this means for the study of innovation systems. Men and women farmers engage with innovation systems differently, experiencing different levels of access to resources and to the formal and informal institutions that support smallholder agriculture; they are therefore likely to describe the systems in different terms. These differences are linked to gender dynamics and power relations within households and communities. Research designs and methods often fail to reveal these dynamics and relations because they are biased towards sampling male heads of households. Methods must be adapted so that gender differences and dynamics do not remain hidden.

This will enable a more helpful diagnosis of the performance of innovation systems and the design of more appropriate interventions.

Jim Ellis-Jones and Therese Gondwe's paper describes a project that was built on an innovation systems framework. The MIRACLE project brings a diverse set of actors together in an 'innovation platform' that analyses the constraints and opportunities for improvements in a particular commodity and context, with a view to contributing towards nutritional and livelihoods improvements. Through a participatory extension approach, farmers are actively involved in identifying, testing and adapting innovations. Local and scientific knowledge are brought together to enrich production systems. Lessons learned so far include the importance of building and supporting partnerships, strengthening farmer organisations to participate in research, and having specific activities and processes to foster learning. The key role of markets, and of a private agri-business sector that can link farmers efficiently and equitably to markets, is also highlighted.

CABI's 'Plantwise' is an initiative that has been given the space to grow organically in response to farmer demand and an inherent understanding of how innovation systems work. The accurate and early diagnosis of plant health problems not only helps farmers take appropriate action in good time; plant clinics are a forum for individual and collective learning about plant health and disease. They are a place where farmers and a range of specialist services can interact. Dannie Romney and her CABI co-authors describe 'Plantwise' in terms of eight features of innovation systems approaches, including systems diagnosis, building networks and linkages, balancing supply push with demand pull, strengthening the role of intermediaries, experimenting and learning. They show that the sharing of lessons among stakeholders is having a positive overall effect on national plant health systems.

Joan Gervacio's analysis of the spread of biogas technology among small-scale pig farmers in an area of the southern Philippines highlights the contingent, emergent nature of innovation systems as experienced by farmers. What she found was a system that emerged as farmers sought solutions to a complex problem, contacting those they felt might be able to help, stimulating action by organisations with a mandate to do so; a system in which farmers helping and learning from each other in the face of a shared threat to their livelihoods played a significant part. The role of formal research and extension organisations can only be understood in the context of these initiatives by farmers.

Chris Garforth's paper explores how our views on the way innovation in agriculture happens affect decisions on the design of research and extension programmes. AIS thinking offers a picture that is more complex but also more in keeping with the real world of farmers than simplistic, linear formulations of a process of research generating knowledge and technologies that advisers can then 'transfer' to farmers. He ends on a cautionary note: while AIS has emerged as a counter to previously dominant top-down, transfer-of-technology models of thinking and practice, there is already evidence of the co-option of the language of AIS by those who still see the promotion of technological fixes as the way ahead to pursue agriculture for development.

The academic and practitioner literature on agricultural innovation systems is growing. In *Bookstack*, two recent contributions are reviewed, both of which demonstrate that the conceptual thinking about innovation systems is being fed by practical experience in the field. And perhaps this is the most encouraging sign for the future: that we will develop research and advisory services built on a better understanding of how things work in the real world.

Chris Garforth

Guest Editor

References

Benor D, Baxter MWP, Harrison JQ, 1984. *Agricultural Extension: The Training and Visit System.* Washington DC: The World Bank.

Daane J, 2009. Building Capacity for Agricultural Research and Innovation. Section 3 of Chapter 8 "Food security and sustainable agriculture: Making science work for innovation". In: Molenaar, H, Box L, Engelhard R, eds. (2009): *Knowledge on the Move*. Leiden: International Development Publications.

Shields D, Wyeth J, Gill G, 2012. *Research-into-use*. An Independent Review. [http://r4d.dfid.gov.uk/output/191980/default.aspx]. Accessed 22 March 2013

FAO, 2000. Agricultural Knowledge and Information Systems for Rural Development (AKIS/RD) [http://www.fao.org/sd/EXdirect/EXre0027.htm]. Accessed 22 March 2013.

Salomon ML, Engel PGH, 1997. *Networking for innovation: windows and tools*. Amsterdam: Royal Tropical Institute.

World Bank, 2012. *Agricultural Innovation Systems: An Investment Sourcebook*. Washington DC: The World Bank.

30th Annual Ralph Melville Memorial Lecture

Shaping the future together: transforming agricultural research *for* development

Mark Holderness

A plant pathologist by training, Mark is the Executive Secretary of the Global Forum on Agricultural Research (GFAR), based at FAO, Rome. GFAR is a unique multi-stakeholder forum, bringing together all those concerned with the future of agriculture and rural development, to help strengthen the roles played by agricultural knowledge, research and innovation in meeting key food security and development needs. Before moving to Rome, Mark worked for fifteen years, in a variety of roles, at CABI.

Introduction

The Global Forum on Agricultural Research (GFAR) was established to provide an open and inclusive space among all those involved in agricultural research for development (AR4D), to enable free dialogue around key issues for agricultural research and innovation processes, and to enable their transformation to create more effective systems, engaged directly with the needs of those they serve. To do this requires re-thinking our systems of agricultural innovation so that, rather than seeing research as a pipeline delivering new products to farmers who may or may not wish to adopt them, we consider the multiple interactions in complex innovation pathways to impact and focus on the particular needs of smallholder farmers.

It is essential that we strengthen and transform our currently fragmented systems of agricultural innovation and knowledge use if agricultural research is to deliver effectively towards the current and future challenges such as changing climates, diminishing natural resources, changing consumption, etc, particularly if smallholder farmers are to have a viable future and not become the disaffected urban slum dwellers of tomorrow.

Agricultural research has delivered great change in feeding a growing population, but the challenges remain, particularly in sub-Saharan Africa (SSA) and South Asia, which together account for the majority of the world's 870 million hungry people. This is no longer a question of production alone, but of poverty alleviation and access to adequate nutrition.

The challenges

The global trend shows that SSA, the Caribbean and the Pacific lag behind in total factor productivity growth. South Asia has performed better as a result of the green revolution, but this is offset by population growth and there are concerns now that yield increases of some crops such as wheat are reaching a plateau (Figure 1).

A number of major challenges remain if agricultural research for development systems are to achieve what is required of them. We must address the reasons why apparently effective technologies have not been adopted by the poor and yield gaps remain so large. We also need to explore how knowledge and innovation can more directly target the poor, and improve the linkage between international public goods, meeting national demands and strengthening national capabilities. To achieve real change, we need to better value and embed agricultural innovation within wider rural development processes that too often ignore its importance or treat it as a separate function, and we must build more collective actions towards large-scale development impacts. Put together, these indicate a very strong need to move towards innovation systems aimed at achieving agreed and desired development outcomes in poverty reduction, eliminating hunger, sustaining the environment, etc.

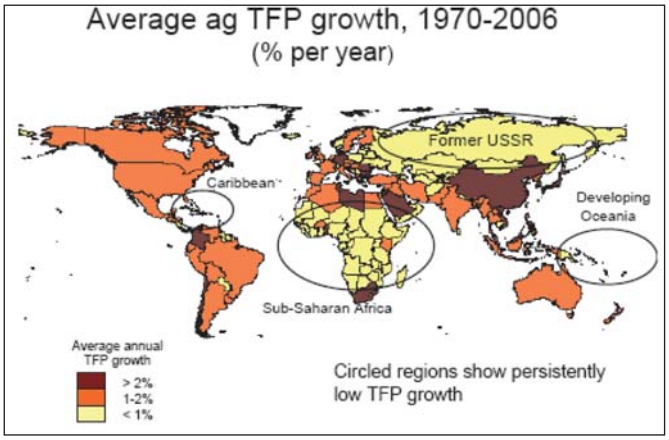

Figure 1. Long-term average agricultural total factor productivity (TFP) growth 1971-2008 (% per year). Source: Keith Fuglie, 2010.

There are a number of clear areas in which the need for a major rethink of agricultural research for development can already be seen.

- Nearly half of all smallholder farmers are now women - yet often they are not even recognized as farmers.
- Hundreds of millions of smallholder farmers themselves form a very large proportion of the world's poor.
- Rural youth see little future in farming – leading to massive urban drift and resultant social problems.
- Research has traditionally focused on yield gain potential without recognizing that poor farmers are the last to benefit from most interventions. Our ability to measure yields also skews thinking and focus compared to the challenges of measuring environmental and social change.

- Seventeen countries are now in protracted crises in SSA, resulting in agricultural research, extension and education systems that are weak or collapsed.
- Only 4 out of 24 African Poverty Reduction Strategy Plans mention agricultural research.
- The emergence of the BRICs and other fast growing economies is rapidly changing the old pathways that assumed that countries of the North were the prime source of agricultural innovations.
- The main benefits of the green revolution have already been achieved. Now innovation pathways require us to build the jigsaws of associated actions that are needed to deliver change in an increasingly complex world.

So, in putting the smallholder farmer at the centre of innovation, 'business as usual' is clearly not an option. We need to thoroughly re-examine how we can:

- increase food and nutrition security and farmer incomes while
- ensuring that the needs of resource-poor smallholders and householders are met, and
- sustainably manage natural resources and the environment.

And we also need to understand what kind of innovation systems and policies we need to meet these challenges.

To reach desired development outcomes, it is no longer good enough to think of a technology pipeline where it is 'someone else's job' to turn innovations into field impacts that can often only be taken up by those with the best advantages. We must consider how the complex actions and interactions that enable innovations to be generated, accessed and used can be brought together with the enabling environments, inputs required (credit, crop inputs etc) and with policies that promote agricultural development for smallholders.

A fundamental need is to break down the institutional divides, the walls that prevent effective collaboration and partnership towards shared goals. Doing so will require:

- development-centred thinking with the needs of poor farmers and consumers at the centre of the process;
- innovative knowledge access and transformation systems;
- stakeholders learning and innovating together, managing benefits and risks;
- institutional reorientation and changed attitudes/values;
- convergence of R&D, education, business policies and resources.

The need for these changes is also recognized in the reform of the CGIAR. The international agricultural research system has made a tremendous contribution over the years, most notably in the green revolution. However, decades of global complacency about agriculture, stagnant funding and perceived problems in the system's fragmented operation and reporting, together with the emergence of new providers, notably in the private sector and BRIC countries, have brought into question the continuing value of the CGIAR mechanism. The resultant reform process over recent years aims to bring coherent work towards achieving identified large-scale outcomes.

The Global Conference on Agricultural Research for Development (GCARD)

This process, organized jointly by the Global Forum on Agricultural Research and the CGIAR, sets out to combine the processes of GFAR in catalyzing programmes and partnerships for action, and the reform of the CGIAR towards an outcome-focused basis that requires partnership, consultation and shared accountability for outcomes. The GCARD establishes an outcome-focused process and milestone conferences for transforming and strengthening agricultural research for development around the world.

The GCARD conference events provide a regular means of public awareness and accountability for establishing how the changes are working in practice. Cycles of learning, reported publicly through the GCARD conferences, allow stakeholders from all sectors to mobilize and bring together their own commitments to progressive change.

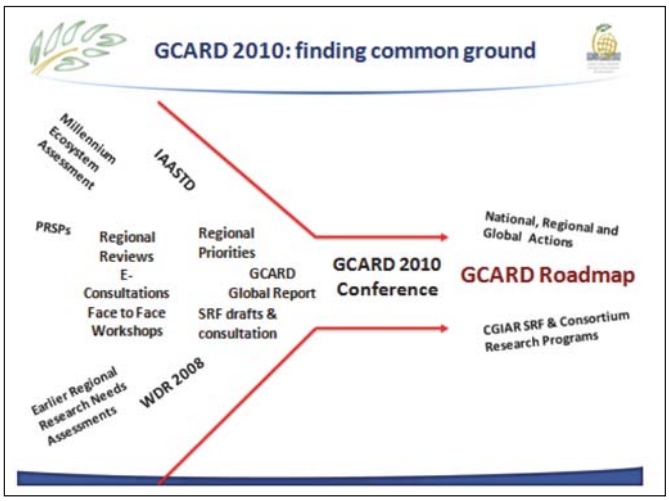

Figure 2. The GCARD process

The GCARD process (Figure 2) began with extensive regional consultations on what the stakeholders in each region regard as priorities in agricultural research for development systems. These analyses, together with those of other key reports, including the WDR (World Development Report), IAASTD (International Assessment of Agricultural Knowledge, Science and Technology for Development - a directly commissioned review of the global state of agricultural research for development systems) and the strategy and results framework (SRF) of the CGIAR, identified key needs in transforming and strengthening these systems to help them achieve their required impact in development terms on poverty, food and nutrition security, environmental sustainability and system resilience.

GCARD participants identified six key measures required for transforming agricultural research for development systems around the world. These were expressed in the GCARD Roadmap and then agreed among all sectors involved, and are as follows:

- Inclusively define priorities and actions, driven by development needs.
- Develop equitable partnerships among all stakeholders.
- Achieve increased investments to meet development needs.

- Develop required human and institutional capacities.
- Embed innovation in development programmes and policies.
- Involve stakeholders, in particular smallholder farmers, in the accountability and value systems used.

The theory of change established in the Road Map laid the path for collective actions to deliver these changes into practice. Actions to-date were recently (2012) summarized and discussed at the GCARD2 in Punta del Este, Uruguay, a meeting attracting strong participation both in Uruguay and, through the internet, around the world.

Some Road Map implementation elements are already now moving rapidly ahead, including that of *foresight*, where diverse models, forecasts and scenario projections are bringing a range of lenses to bear on some of the key questions facing the future of agriculture and of smallholder farming.

The Global Foresight Hub

This collective foresight approach already includes over 40 different approaches and has now been endorsed by the G20 Agriculture Ministers. It recognizes that different assumptions underlie different projections and scenarios, and asks some key questions of how to achieve sustainable production via sustainable consumption, and the implications of land use changes for small farmers recognizing that smallholders must have a say in envisioning their own futures. The diversity of the rationales considered brings new thinking that seeks to envision the agricultural futures we wish to see, and the implications of alternatives, so that research works towards delivering our desired aims and informs policy choices at any level.

Partnership has now become a key mantra of the changes underway in agricultural research for development systems. The international research system's new focus on how its work contributes to development outcomes requires effective partnership and complementary actions from partners of all kinds if research outputs are to be transformed into innovation products and impacts, in particular for resource-poor smallholders. The new CGIAR Research Programmes (CRPs) are large-scale partnership initiatives covering the span of areas in which CGIAR Centres are active (Figure 3). They seek to bring new forms of integrated action between the Centres and, in turn, with their partners, geared around achieving not just research outputs but establishing these in effective innovation pathways towards development outcomes.

The underlying assumption is that the CGIAR is responsible for international research outputs but has a shared responsibility with national partners for ensuring that these are translated into products that can impact in development terms. This means in practice a flow of actions from planning with partners, to research with partners, to the actions of multiple actors beyond the immediate role of the CGIAR, working to deliver the development impacts sought. An example is that of climate change, where international research is partnering with other centres of expertise across a range of contexts in Africa and Asia. Here GFAR is working to foster wider connection and regional coordination with national, regional and international partners.

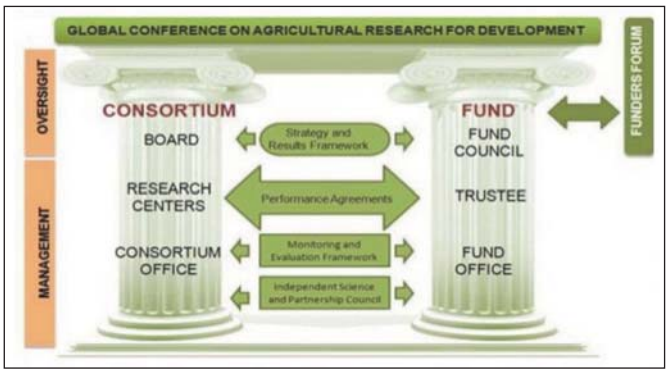

Figure 3. The new CGIAR structure

Another example is that of agrobiodiversity, where GFAR has catalyzed and brought together a wide range of practical actions around the issues of sustainable use of plant genetic resources and associated issues of reconciling farmers' rights and plant variety rights. This has involved cross linkages with the International Treaty on Plant Genetic Resources in Food and Agriculture, the CGIAR, Regional Fora and many other bodies from civil society, public and private institutions involved in these issues.

GCARD2 also brought together food security and nutritional needs — including the diverse approaches to supplement feeding, biofortification and diet diversity, each of which has advocates, but for the first time GCARD2 brought together those aims towards developing a common research agenda with room for *all* dimensions involved.

The GCARD process has had marked impact in shaping the direction of the international research system and its links with national systems. Some 80% of participants recognized that they would change the design or implementation of their work as a result of the GCARD processes. This leads towards a coherent alignment of international research priorities with national and regional priorities and investment plans.

Investment

Strengthening agricultural research and development requires increased investment – the International Food Policy Research Institute (IFPRI) estimate a tripling of investment is required by 2025. Over the last decade, some countries such as China and India have increased their national investments considerably. However, the poorest countries, such as those in SSA, have failed to match this growth and in some cases have reduced their investments, resulting in them falling further behind in the development and use of agricultural innovations (Figure 4). It is important to increase advocacy in this regard. GCARD 2 showed that investments in Uruguayan research have given a return on investment of $17-20 per dollar invested.

The reform of the CGIAR has progressively increased donor confidence and investment in the system and funding has doubled over the last six years. However, despite a move towards central collective funding through the CGIAR Fund, much of this increase is still down to increased investment in specific projects and programmes, rather than through the collective Trust Fund basis, which will require longer term confidence to become established before funders are likely to transfer to a truly collective basis.

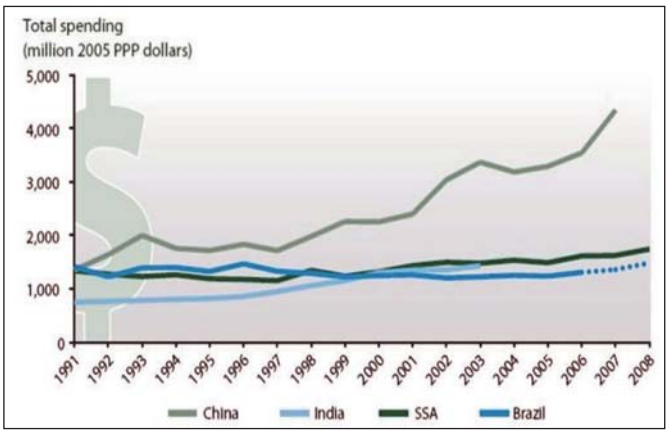

Figure 4. Public Agricultural R & D spending

It is also essential to link research priorities with the wider development commitments of governments, so that research is embedded within a wider enabling environment of policies, credit access, advisory support etc. This is particularly seen in Africa, where a series of steps, catalysed through the GCARD discussions, have now led to the CGIAR aligning its work with the Comprehensive African Agricultural Development Plan (CAADP) and the country compacts developed through CAADP, the research elements of which are mobilized through FARA (the Forum for Agricultural Research in Africa).

Capacity needs

It is not enough just to strengthen and create new forms of partnerships; the scale of the challenges we face also requires the development of capacities throughout the AR4D system, from farmers to researchers, recognizing that we are combining two forms of knowledge and innovation – that from science which is reductionist, trusted and validated by its method, and that of farmers' own innovations and take-up of new ideas, which are holistic and trusted and validated by experience. To succeed in reaching the poor, we need to value both approaches; linking and reconciling these knowledge and trust bases.

There are many barriers constraining information from becoming transformed into innovation. It is clear that research itself is highly fragmented, with very little cross referencing in practice between agricultural researchers and social science. There is now a wealth of information available, yet farmers are starved of knowledge. There are many new forms of advisory services yet the sector is grossly under-resourced. However, the use of information and communications technology (ICT) is opening up entirely new ways of sharing knowledge to reach farmers in usable forms. This requires new ways of making data inter-operable betweens different forms and accessible at farm level, and it requires much greater attention to the role of those who broker agricultural knowledge and technologies into development realities. Among other initiatives, GFAR has played a key role in creating the Global Forum on Rural Advisory Services, to help re-think and rebuild capabilities that advisory services require in today's contexts, through collective actions, cross-learning, greater cross-linkage with other providers and the use of an array of new communication tools.

One major need is to rethink the central premise of agricultural research in terms of the farmers of today. Smallholder farmers now include a high proportion of women farmers, in some countries they are the majority. Yet despite this, research is still focused on needs articulated by men, such as input provision and productivity, rather than those voiced by women, such as labour-saving measures, post-harvest value addition or child nutrition.

The Global Conference on Women in Agriculture, organized by ICAR (Indian Council for Agricultural Research) and APAARI (Asia-Pacific Association of Agricultural Research Institutions) with GFAR, brought together a major collective voice for women and leveraged further commitments from a number of governments, including that of India. This has led to a major collective action fostered through GFAR, the Gender in Agriculture Partnership (GAP). The GAP now brings together all the major agencies involved in agricultural development, working together to foster gender equity in agriculture. In research terms, the GAP is reframing agricultural research and innovation needs to address issues that women farmers care most about – often a very different view from that of men even from the same households.

Gender is a social construct and we have to think right down to the gender dynamics in households. A study in 2000 of developing countries by IFPRI[1] found that as much as 55 percent of the reduction in hunger from 1970 to 1995 could be attributed to improvements in women's status in society. Progress in women's education alone (which explained 43 percent of gains in food security) was nearly as significant as increased food availability (26 percent) and health advances (19 percent) put together.

A further key dimension in improving the livelihoods of smallholder producers is their ability to access markets and grow their incomes. GFAR has been actively working through programmes led by farmer organizations to mobilize actions around a range of farmer-driven models – cooperatives, producer companies etc. – that can open up market chains and enable more equitable access. This also requires attention to career opportunities related to value chains and the need to draw young people back into agricultural activities and professions, so that attention is being strongly focused now on curriculum reform and creating attractive opportunities for young people in agriculture.

It is also very important to consider agricultural knowledge and innovation in the realities of development. There are now 22 states in protracted crises, of which 17 are in Africa. Agriculture provides an invaluable means of resilience for such communities and for enabling growth out of crises. To this end GFAR in 2012 fostered the Kigali Movement, joint actions setting out lessons learned from previous crises, towards a more collective ability to avoid earlier mistakes and support farmers in need.

[1] http://www.ifpri.org/publication/overcoming-child-malnutrition-developing-countries

Conclusions

Over the last few years, GFAR has catalysed many actions shaping and then delivering to the GCARD Roadmap principles. The

CGIAR reform has provided a change-enabling environment for collaboration and wider reform. One key recognition in these processes is that ***research is essential, but not itself sufficient to deliver impact***. Achieving impacts requires our continued efforts together and commitment to practical actions. This means fostering greater coordination among and within sectors – farmer organizations, Civil Society Organizations (CSOs), small enterprises, cooperatives etc. The GCARD process has set out and agreed commitments from all concerned: the time for action is NOW.

References

Fuglie K, 2010. Productivity growth in the global agricultural economy. http://www.farmfoundation.org/news/articlefiles/1725 Fuglie_Global%20Ag%20Productivity.pdf.

Agricultural Innovation Systems - a way of thinking about Agriculture for Development

Chris Garforth

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Summary

Theories of agricultural innovation influence how we conduct agricultural research and extension. Agricultural innovation systems (AIS) is a way of thinking about the influences and interactions that support and constrain positive change on farms and in the agricultural value chain. It is more in tune with how farmers deal with the opportunities and challenges they face than linear models based on 'adoption and diffusion of innovations'. It understands innovation not as 'new technology' that must be 'transferred' to farmers but as the process by which new ideas emerge, are evaluated, adapted, taken up, and integrated into agricultural enterprises. In the past 10 years, AIS has been applied in CGIAR research programmes, in academic research, in the implementation of extension reform, and in the creation of 'innovation platforms'. Care must be taken to avoid the language and concepts of AIS being co-opted by those who persist in seeing the development and promotion of technological fixes as the way forward for agriculture for development.

Introduction

The way we think about innovation in agriculture matters. It affects how money is spent, and how energies are focused, by governments, research institutes, biotech companies, NGOs, and international donors, from the World Bank to charitable foundations. It is 51 years since the first edition of Everett Rogers' influential book, 'Diffusion of Innovations' (Rogers, 1962), enshrined a vision of innovation that has informed investment in agricultural research and extension for much of the time since. His analysis of how and why individuals 'adopt' new ideas, technologies and practices, and how communication and social dynamics lead to the 'diffusion' of an innovation through a 'social system' has been taken as a paradigm of how planned change in agriculture (and in other sectors) works and therefore how it can be enhanced. It has underpinned an essentially linear view of the process by which outputs from research institutes, whether in the public or private domains, are 'transferred' by 'change agents' to farmers, who then go through a set of stages from 'awareness' to 'confirmation'. This framing has underpinned linear models of extension, culminating in the Training and Visit system which the World Bank promoted and lent large amounts of money to governments in Asia and Africa to implement before recognizing its flaws and abandoning it in the 1990s. But the idea persists, that what we mostly need to secure food production for the future is new technology backed by programmes to 'transfer' it to farmers and farming systems. We still hear researchers and policy makers lamenting that 'proven' new technologies are not being adopted by farmers because of ineffective technology transfer.

Innovation systems

It seems odd that framing innovation as 'transfer of technology'(ToT) has held such sway given what we have always known about the inherent innovativeness of farmers and farming systems, and the frequent failure of attempts to transfer technology. From large scale schemes such as the ill-fated, post-World War II, groundnut scheme in East Africa, where the technology transferred was simply inappropriate to the local soils, climate, infrastructure, and social and economic context, to farmers' frequent reluctance to grow promoted crops or varieties for which they cannot find markets, we know that focusing on the development and transfer of technological fixes is an inadequate approach to supporting development and innovation in agriculture.

The 19th century spread of cocoa in West Africa is illustrative (Hill, 1963). Using an 'adoption and diffusion' lens, we could try to portray this as an innovation (cocoa farming) that was

first adopted by a few 'innovators' and 'early adopters', and then spread to other farmers and to other parts of Ghana and Nigeria through a Rogerian process of communication, observation and persuasion. A more helpful framing, though, and one that gives useful insights into how the development, adaptation and uptake of new farming technologies can be promoted, is one that takes a more holistic view of the various processes that were at work. There were many players involved: international companies with a demand for raw cocoa; land tenure institutions that, on the face of it, were inimical to individuals acquiring rights in trees, but in fact turned out to be flexible and open to negotiation; tensions between younger and older farmers, and between local land users and migrants in search of land and economic opportunity. As cocoa took hold, institutions emerged to support its further spread. Innovation was and still is a dynamic process, one that changes the context in which it happens, creating further opportunities and challenges to which farmers respond.

This is where an 'innovation systems' perspective differs radically from 'adoption of innovations'. First, it recognises that new ideas come from many sources, as Stephen Biggs (1990) reminded us in his 'multiple sources of innovation' model. Farmers have experimented, adapted and absorbed ideas from elsewhere for centuries as they strive to meet new challenges and respond to new opportunities. Second, it understands innovation not as 'new technology' but as the *process* by which new ideas emerge, are evaluated, adapted, taken up and integrated into agricultural enterprises. 'Agricultural innovation systems' (AIS) also differs, therefore, from some other common 'system' concepts in the agriculture-for-development field such as the 'agricultural knowledge and information system' (AKIS). AIS is more than a collection of interconnected actors (research, extension, financial services, education, traders, and so on); it is a construct, a way of thinking about innovation processes. Andy Hall has usefully summarised the 'defining features' of AIS and shows how these have evolved from the earlier notions of ToT and AKIS (Hall, 2009).

Use of AIS constructs

AIS constructs have been widely used over the past 10 years. They are having an influence on national extension policy and reform; on how research institutes think about and conduct research programmes; on research into farmers' innovation; and on programmes to stimulate innovation and change, not just on the farm but along the whole agricultural value chain.

Extension reform in many developing countries has followed the path of decentralising public sector extension to local governments, creating institutional structures that enable more private sector extension activity and putting in place processes that make extension and advisory services more responsive to the needs and views of farmers. This has been the thinking behind Malawi's extension reform which included the setting up of committees and stakeholder panels at village and district levels to encourage interaction and joint decision-making among farmers and the other players within the innovation system (Chowa *et al*, 2013).

CGIAR centres are increasingly using the language and thinking of AIS to frame their research programmes and their engagement with others in the agricultural value chain. CIP has conducted appraisals of 'potato innovation systems' in Bolivia, Ethiopia, Peru and Uganda to identify possible points for intervention, not only those involving new scientific research but also the potential for strengthening the role of commercial seed potato suppliers and of farmer organisations (Ortiz *et al*, 2012).

Beyond the CGIAR centres, research with an AIS perspective is being used to identify bottlenecks in agricultural development at both local and national levels (eg in Ethiopia: Spielman *et al*, 2011). However, descriptions of national innovation systems in much of the AIS literature present what those outside the smallholder farmers' context think should or does happen (eg in the World Bank's (2012) 680-page volume on investing in AIS), rather than the reality experienced by farmers. In smallholder agriculture, farmers (as individuals, households or groups of varying degrees of formality) are the key innovators, and their options are often constrained by failures in the systems that are supposed to support them. If we want to understand how innovation at farm level happens and the influences on that process, we need to build a picture of the AIS based on what farmers have to say. This is the idea behind a research project being conducted by University of Reading with partners in Kenya, Sudan and Uganda (Innovation systems, agricultural growth, and rural livelihoods in East Africa, see http://www.reading.ac.uk/apd/research/apd-resess-ISAGRLEA.aspx). The picture that farmers paint is often very different from that envisaged by outsiders, with much more emphasis on the role played by farmers themselves in innovation processes and detailed analysis of reasons why many new ideas fail or under-perform in practice – a common complaint being poor access to markets.

Similar thinking underlies the CoS-SIS project (Convergence of Sciences: Strengthening Agricultural Innovation Systems) in Benin, Ghana and Mali, coordinated by Wageningen University (http://www.cos-sis.org/), which is currently experimenting with various ways of overcoming obstacles to innovation at farmer level. Their earlier research on farmer innovation showed that development at the local level is often held back by institutional failures; 'labour arrangements, land tenure issues, exploitive networks, cheating, and deficient contractual arrangements' conspire to limit the benefits that can be derived from new technology.

Building on the ideas of AIS, the concept of 'innovation platforms' has also taken hold. IITA has helped set up innovation platforms in Katsina State, Nigeria, to tackle 'agricultural production constraints such as drought, *Striga* parasitism, poor soil fertility, and difficulty faced by farmers in accessing input and output markets' (IITA Bulletin 1961, 20-24 April 2009). CIMMYT is trying out 'Innovation Learning Platforms' (ILeP), in which a range of people and organisations are brought together to address specific challenges relating to a crop or commodity (Kassie *et al*, 2012). An EU-funded project, ABACO (Agroecology-based Aggradation-Conservation Agriculture) is using 'co-innovation platforms' to integrate local knowledge and expertise with that of scientists and others to adapt principles of Conservation Agriculture to local agro-ecological and socio-economic realities in semi-arid regions of Africa (http://abaco.act-africa.org/). FARA – the Forum for Agricultural Research in Africa – has been promoting the use of innovation

platforms for the past 10 years (FARA, 2010): their experience echoes that of the CoS-SIS team that institutional innovations can be just as crucial as technological ones in facilitating local agricultural development. Lessons from innovation platforms in sub-Saharan Africa are brought together in an analysis of 12 case studies written during a write-shop hosted by the Royal Tropical Institute (Nederlof *et al*, 2011).

AIS thinking can also be a useful framework for evaluating interventions in agricultural extension. Linear ToT frameworks suggest evaluation criteria built around uptake of promoted technology; AIS by contrast suggests a focus on change that has and has not happened and then asking questions about what part the intervention played in supporting or constraining the changes, and the mutual influences of the intervention and the innovation system as a whole. When Joan Gervacio decided to use an AIS framework to explore the impact of 'farmer scientists' on innovation in The Philippines, she unlocked a whole new understanding of how these key players in a particular extension intervention interact with others, and how the functioning of the rest of the system affects the nature and extent of their impact on farm level change (Gervacio, 2012).

Conclusion

New approaches based on AIS require people and organisations with the attitudes and orientation to apply them. AIS ideas and language can all too easily be co-opted by those who see them as simply a new way to describe what they have always been doing. CIMMYT's report on their ILeP for Drought Tolerant Maize Varieties (DTMV) in Malawi concludes: 'As an institutional innovation, ILeP has been less successful – particularly when compared to the original conceptual model. Instead of providing a platform for increasing inclusive stakeholder learning and participation, it has evolved into an increasingly narrow operational platform for implementing DTMV demonstration trials within the MoAFS [Ministry of Agriculture and Food Security] and their frontline staff' (Kassie *et al*, 2012). Similarly, national extension structures designed along AIS lines can all too easily become new ways of promoting the transfer of technologies to farmers (Chowa *et al*, 2013).

We are right to be cautious about new ways of thinking about and supporting agricultural development. New is not necessarily better. But there is plenty of evidence from the past 10 years or so that AIS thinking can have a positive influence on how we go about 'doing' agriculture-for-development, specifically in those areas where we know previous ways of thinking have been limiting or downright unhelpful. The other articles in this edition of *Agriculture for Development* explore real-world examples of AIS thinking in practice.

References

Biggs S, 1990. A multiple source of innovation model of agricultural research and technology promotion. World Development **18** (11), 1481–1499

Chowa C, Garforth C, Cardey S, 2013. Farmer experience of pluralistic agricultural extension, Malawi. *Journal of Agricultural Education and Extension* (in press). "http://www.tandfonline.com/doi/abs/10.1080/1389224X.2012.735620

FARA, 2010.Unlocking the potential of partnerships: Sub-Saharan Africa Challenge Program Experience with Innovation Platforms. Forum for Agricultural Research in Africa: http://www.fara-africa.org/media/uploads/library/docs/ssacp/unlocking_the_potentials_for_partnerships_youdowei.pdf

Gervacio J, 2012. *Agricultural innovation processes and innovation systems in rural Davao Region, Philippines* Reading, UK: University of Reading, PhD thesis.

Hall A, 2009. Challenges to strengthening agricultural innovation systems: where do we go from here? In Scoones, I and Thompson, J eds, *Farmer First Revisited: Innovation for Agricultural Research and Development*. Rugby: Practical Action [also available as a UN University Working Paper at http://arno.unimaas.nl/show.cgi?fid=9401]

Hill P, 1963. *The migrant cocoa-farmers of southern Ghana: a study in rural capitalism*. Cambridge: Cambridge University Press

Kassie GT, Erenstein O, Mwangi, W, Setimela, P, Langyintuo A, Kaonga KK, 2012. *An Innovation Learning Platform for Drought Tolerant Maize in Malawi: Lessons Learned and the Way Forward*. Harare: CIMMYT.

Nederlof S, Wongtschowski M, van der Lee F, eds, 2011. *Putting heads together. Agricultural innovation platforms in practice*. KIT Development and Practice Bulletin 396. Amsterdam: KIT.

Ortiz O, Orrero R, Pradel W, Gildemacher P, Castillo R, Otiniano R, Gabrield J, Vellejo J, Torres O, Woldegirogis G, Demeneg B, Kahuhenzire R, Kasahija I, Kahiu I, 2013. Insights into potato innovation systems in Bolivia, Ethiopia, Peru and Uganda. *Agricultural Systems* **114**, 73-83.

Rogers, E, 1962. *Diffusion of Innovations*. Glencoe: Free Press.

Spielman D, Davis K, Negash M, Ayele G, 2011. Rural innovation systems and networks: findings from a study of Ethiopian smallholders. *Agriculture and Human Values* **28** (2), 195-212. The IFPRI working paper on which the paper is based is available at http://www.ifpri.org/sites/default/files/pubs/pubs/dp/ifpridp00759.pdf

World Bank, 2012. *Agricultural Innovation Systems: An Investment Sourcebook*. Washington DC: The World Bank.

News from the Field

Biochar in Innovative Agricultural Systems

Thayer Tomlinson, Communications Director, International Biochar Initiative

An innovative method to improve soils that has re-emerged in the past decade is biochar, a fine-grained, highly porous charcoal obtained by heating biomass (including crop, wood and yard wastes, and manures) in an oxygen-limited environment. In addition to its use for beneficial soil enhancement, biochar can also be used for remediation and/or protection against particular environmental pollution and as an avenue for greenhouse gas (GHG) mitigation.

Biochar systems are modeled after a process thousands of years old from the Amazon Basin, where islands of rich, fertile soils called *terra preta* ("dark earth") were created by indigenous peoples. These soils formed from accumulated charcoal and other fire residues (from cooking fires), and also nutrient-rich waste such as animal and fish bones, in waste piles near dwellings. These *terra preta* soils continue to "hold" carbon today and remain extremely nutrient rich compared to the surrounding soils, and they are currently some of the most productive in the Amazon. In addition to the Amazonian *terra preta*, biochar can be found in soils around the world as a result of indigenous soil management practices and natural vegetation fires.

Biochar is a spectrum of materials that has important impacts both on agriculture by its nutrient and water retention capabilities, and on climate by providing a stable carbon sink in soils. Looking at biochar's role in agriculture, pot, plot and field trials with biochar have shown large yield improvements on very poor soils, especially in acidic tropical soils, in some cases multiplying yields by factors of two or more. In more fertile soils, biochar trials have shown more modest improvements. Biochar is not a fertilizer, but a soil amendment that should be used along with appropriate sources of nutrients, like green manures, animal manures, composts and/or fertilizers.

How does biochar improve soils? In short, biochar has the potential to provide benefits for soil quality both in the short and long term. In the short term, biochar tends to have a high pH which can have a liming effect for acidic soils. Since acidity can be a main constraint in tropical, nutrient-poor soils, the pH increase can have a dramatic effect. Additionally, the ash portion of biochar often contains nutrients such as nitrogen, phosphorus, and potassium which will provide initial benefits. The long-term benefits of biochar are unique to this soil amendment, since other organic amendments decompose rapidly in the years after they are applied. These include nutrient and water retention in soils, decreased nutrient leaching, the potential improvement of soil physical properties (due to the material's high porosity) such as soil compaction reduction, and the improvement of conditions for beneficial soil microbes.

With this potential soil amendment, new questions arise. How much biochar should be used in soils? How should biochar be applied? What types of biochar fit specific types of soils? How do we know if a particular biochar actually helps a particular soil retain nutrients and water? How do we know what is in the biochar? The answers can vary, depending on the feedstock and production parameters. Additionally, there are questions of sustainability - how is the biochar produced and what is the feedstock? Ideally, biochar is produced from agricultural and forestry wastes in a manner which fully utilizes the feedstocks and the resulting heat from the production process. On the smaller scale, the heat is used for cooking and other applications such as space heating or drying. On the larger scale, it is used for power generation.

The International Biochar Initiative (IBI) is a non-profit organization working to answer many of these questions by providing clear, non-biased, credible information on all aspects of biochar, and by providing a global information and communications platform for collaboration and cross-fertilization. IBI supports a growing biochar industry through the provision of material and quality standards, sustainability guidelines, and certification programmes for assurance in this emerging industry. IBI has recently completed a full standards process to provide the tools needed to define universally and consistently what biochar is, and to confirm that a product intended for sale or use as biochar possesses the necessary characteristics for safe use. IBI encourages and seeks to foster good industry practices to ensure public and regulatory confidence that the organizations involved in biochar research, production and marketing adhere to high ethical standards and the products they produce are safe and appropriate for use as intended. For more information on biochar standards, specific research on biochar in soils, profiles on biochar projects around the world, and guidelines for using biochar, please see our website at: www.biochar-international.org.

Linking innovations systems with participatory research and extension: MIRACLE experiences from southern Africa

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Summary

MIRACLE ("Making innovations work for smallholder farmers affected by HIV and AIDS in southern Africa") brings together key stakeholders in operational and strategic level innovation platforms. This paper outlines MIRACLE's strategy for improving livelihoods through improved production, processing, consumption and marketing of nutritionally-enhanced crops. Operating in Malawi, Mozambique, Swaziland and Zambia, MIRACLE brings together researchers, NGOs, public extension, local leaders, community based organisations (CBOs), farmers and the private sector. MIRACLE's four-stage Participatory Research and Extension Approach (PREA) involves community engagement and social mobilization, action planning, experimentation, learning and sharing experiences.

The paper highlights early achievements and challenges and identifies key lessons. These include the need for building and supporting partnerships, strengthening farmer organisations to participate in research, accessing existing knowledge and fostering learning. A well organised private agri-business sector is essential for developing market opportunities, capacity building and engaging with the public and NGO sectors. Sustainability will be built on local ownership with effective back-up from R&D organisations in both private and public sectors. Scaling up successful pilot initiatives can be supported by strategic level innovation platforms (IPs) linked to and interacting with local operational IPs.

Background

Sub-Saharan Africa (SSA) faces critical challenges, with more than 40 percent of its population living on less than US$1 per day, high incidence of HIV/AIDS and one out of three people undernourished. Agriculture, which underpins the livelihoods of over two thirds of Africa's poor, has seen a fall in *per capita* agricultural production over the last four decades. Although agricultural research has generated many technologies with potential to address this serious situation, the impact on productivity, livelihoods and quality of life has been disappointing. A key reason is the way research has been conducted. Development in rural communities has often entailed extension agents advising or teaching farmers about "best practices" developed by researchers, with little community participation in their identification or development (Adekunle *et al*, 2012).

The MIRACLE project's integrated agricultural research for development (IAR4D) strategy targets sustainable intensification of cereal/legume farming systems. Funded by the Swedish Agency for International Development (SIDA) and coordinated by the International Institute of Tropical Agriculture (IITA), MIRACLE aims to contribute to sustainable improvements in the livelihoods of people living with HIV/AIDS in Southern Africa by addressing agriculture, nutrition and health. It brings together key public (research and extension institutes), civil society (NGOs and CBOs) and private sector (agro-processors, seed and fertilizer companies and financial institutions) actors in innovation platforms (IPs) using participatory and value chain approaches. This paper describes MIRACLE's innovations systems and participatory approaches highlighting early achievements, challenges experienced and lessons being learnt.

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Innovation systems approaches

It is increasingly being realised that the involvement of many stakeholders is needed to speed the development and use of knowledge for livelihoods improvement and income generation (Hawkins *et al*, 2009). An innovation systems approach embraces the totality of interactions between stakeholders required to identify and encourage the use of research products for innovation that will benefit a wide range of actors (World Bank, 2007). An IP provides a useful forum to encourage stakeholders to interact and play a role in the innovation process allowing them to realise their respective objectives (FARA, 2009). Stakeholders can participate in identification and diagnosis of problems, joint exploration of opportunities and investigation of solutions leading to the promotion of innovation along the targeted value chain. Typically, IPs comprise public, private and NGO stakeholders working together as partners: researchers, extension agents, agricultural-input suppliers and marketing agents as well as CBOs and local leaders. To be functional and effective, IPs must unite stakeholders along the value chain and ideally address all participants' interests.

IPs can operate at both strategic and operational levels (Adekunle *et al*, 2010). Strategic IPs are established at a higher level of governance and management hierarchies, where strategies are determined for agricultural development at national or subnational levels covering regions, districts, or local government. Comprising senior managers of stakeholder organisations they discuss strategies to promote innovation. They also facilitate the operations of local IPs operating at implementation levels which source membership from the same stakeholder groups, but targeting front-line staff with the mandate of their different organisations. Participation in IP activities relates to their expertise to address specific questions.

There are three major phases in the innovation systems framework that MIRACLE has used in establishing IPs:

1) engaging with stakeholders and bringing partners together;
2) planning, learning and assessing: including community-level action planning; implementation and trying out new ideas through farmer experimentation; monitoring through sharing experiences; and
3) ensuring sustainability, which is dependent on the approach taken during Phases 1 and 2.

In phase one, R&D organisations are likely to take the lead, with local participants and the private sector taking increasing interest. Their role needs to become one of facilitation and partnership building during phase two as collaboration between partners increases. The final phase is one of ensuring sustainability as innovations are put in place and local participants increasingly own and lead the process. The role of R&D organisations should reduce to one of backstopping with the private sector benefiting from commercial opportunity and providing farmer support.

Participatory research and extension approach (PREA)

For development activities to be owned by the community, two key conditions are needed: real motivation and enthusiasm; and effective community organisations which can support and take forward the process. Fundamental principles of PREA include: acceptance that farmers are both "experimenters" and "practitioners" using local knowledge and farming practices; that local communities should "own" experiments or testing processes; and that R&D agents are "facilitators" of change.

PREA (Ellis-Jones *et al*, 2005; Hagmann *et al*, 1999) involves facilitation for community engagement in planning and action for agricultural and rural development; developing equal partnerships between farmers, researchers, extension agents and the private sector enabling each to learn from the others and to contribute their knowledge and skills; strengthening farmers' problem-solving, planning and management abilities; promoting farmers' capacity to adapt and develop new and appropriate technologies and management practices; and encouraging farmers to learn through experimentation, blending their own experiences, knowledge and ideas with new ideas. It is important to recognise that farmers are not homogenous but comprise various social groups often with different interests, powers and capabilities. PREA needs to ensure that the poor and marginalised participate in the process.

MIRACLE's use of PREA complements the three-phase Innovation Systems framework and encompasses a four stage learning cycle (Figure 1):

- Stage 1: Community engagement and social mobilisation – facilitating a community's own analysis of their situation, identifying and prioritising problems and challenges.
- Stage 2: Community level action planning based on the opportunities identified.
- Stage 3: Implementation through trying out new ideas through farmer experimentation.
- Stage 4: Sharing experiences, learning lessons and assessing the process allowing modification in the second and subsequent learning cycles.

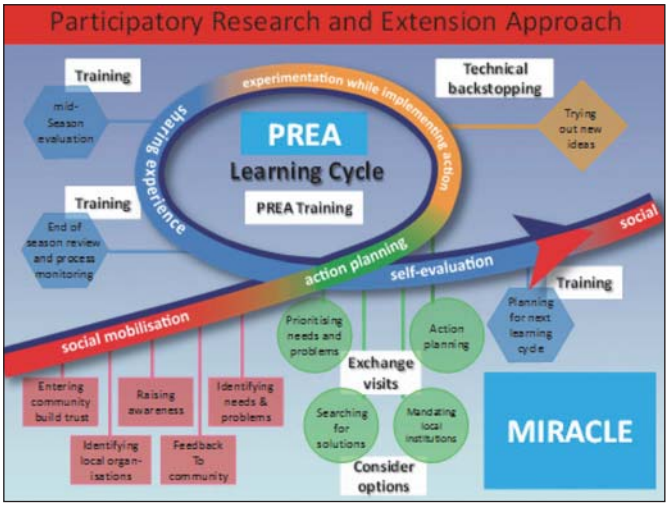

Figure 1. PREA learning cycle
Source: Adapted from Hagmann *et al*, 1999

PREA requires the building of strong links between stakeholders, with local communities, extension agents, researchers and the private sector working as partners, and encouraging farmer-to-farmer extension of appropriate technologies and new

knowledge. These partnerships are fundamental to the effectiveness of IPs established through MIRACLE.

MIRACLE's achievements and challenges

MIRACLE is presently working in Malawi, Mozambique, Swaziland and Zambia. Table 1 summarises achievements, challenges and the ways these are being addressed.

During community engagement, each community identified and prioritised a wide range of natural resource (NR), production and marketing problems. Typical were low yields due to declining soil fertility, land degradation, erratic rainfall, crop pests and diseases compounded by inadequate weed control. Production problems included lack of input availability, particularly legume seed and fertiliser, lack of funds to purchase inputs; a lack of draught animals and suitable implements; as well as inadequate knowledge on alternative crops, production and processing methods. Marketing problems included low prices, lack of markets, inadequate storage and other marketing infrastructure, particularly for legumes (notably cowpeas and soya beans) which farmers have been increasingly encouraged to grow.

A range of opportunities were identified and implemented for addressing these problems. Some key ones involved improving

TABLE 1. Achievements, challenges and some key lessons

Phases & activities in the Innovation System approach	Achievements	Challenges	Some key lessons
Phase 1: Engaging with stakeholders			
Identifying stakeholders, building partnerships and assessing capacity	Research, extension, NGO, and private sector stakeholders identified	Ensuring private sector participation and ongoing commitment	The need for building and supporting reliable partnerships including the private sector, at local and strategic levels.
Identifying areas	Pilot areas in four target countries agreed	-	
Creating common vision and trust, awareness raising, capacity building	Social mobilisation in identified communities, involvement of local leadership and CBOs Partner involvement in problem identification and capacity building	Limited budgets of partners Need to strengthen capacities of CBOs	The need for strengthening farmer organisations to engage with other stakeholders
Understanding challenges and opportunities	A range of NR, production, utilisation and marketing problems and opportunities identified	Considerable awareness raising and learning required	
Phase 2: Planning, learning and assessing			
Agreeing plans for systems improvement, value addition and market opportunity	Building on the opportunities identified, in particular the introduction of legumes and associated utilisation	NGO and local communities expectations of hand-outs Need for ongoing stakeholder coordination	The need to address priority problems through realistic opportunities creating local ownership
Agreeing partner roles and building capacity	Involvement of existing local structures in operational IPs		
Assessing input and output markets	Value chain analysis of legume crops undertaken	High cost and non-availability of some inputs particularly seed Lack of credit Lack of output markets	The need to involve a well organised private agri-business sector not only in the supply of inputs and purchasing outputs but developing market opportunities
Innovation research and development	Mother-daughter-granddaughter trials established	Some research failures, need for more reliable on-farm data	The need to improve access to information as a means of creating an effective demand for research products.
Learning and assessing performance (M&E)	Crops assessed during mid and end of season evaluations Partnership and IP process assessed Appropriate modification for next learning cycle	Ensuring wide community participation	
Phase 3: Ensuring sustainability			
Setting in place new innovations (products, technologies, management practices, institutions, marketing and policies)	Nutrition and crop processing capacity development Adoption of suitable legumes beginning to occur	Need for stakeholder coordination	The need for capacity strengthening to ensure local people and organisations assume ownership and leadership.
Ensuring ownership by local participants	Active participation by CBOs, lead farmers and community seed producers Operational IP functioning	Ensuring ongoing backstopping	

linkages between private, public and NGO sectors, and farmers; action plans for farmer-testing of new crops or varieties including incorporation of Conservation Agriculture production methods; encouraging community seed production and linking farmers to markets. Lesson learning and knowledge sharing formed a key activity during mid and end of season evaluations of the crops tested.

Local IPs have been established, building on and supporting existing institutions: Village Development Committees in Malawi; Local Consultative Committees in Mozambique; Chiefdom Inner Councils in Swaziland; and Camp Agricultural Committees in Zambia. These IPs have become entry points for many interventions and making decisions about agricultural development initiatives. This has included training on post-harvest utilisation and processing of legumes for both domestic and marketed products. Simultaneously, strategic level IPs are being encouraged at District level to address issues of scaling up, in particular input and output marketing and processing, as well as sharing knowledge and capacity building more widely.

A number of challenges have had to be addressed. These include the need for ongoing facilitation to ensure stakeholder interaction and coordination, awareness raising and capacity building of CBOs to increasingly take a leadership role.

Since MIRACLE has been targeting households affected by HIV and AIDS, it has included NGO and CBO partners with appropriate mandates in areas with high incidence of HIV/AIDS. In reality, few households are unaffected by HIV/AIDS, and targeting a wider community avoids stigmatisation. In Swaziland, close association with CBOs associated with National Care Points for orphaned children is leading to wider community interest in legume production. In Malawi and Zambia, CBOs established to support those affected by HIV/AIDS have also led to wider involvement of other farmer groups in the community.

Limited budgets and sometimes conflicting priorities of partners for travel and subsistence funds can act as a brake on regular commitment, especially for the private sector. The need to provide a vision for commercial opportunity is important both for selling inputs and buying produce. In this case, group buying and selling by farmers is likely to be attractive to the private sector. Past initiatives emphasising relief rather than sustainable development have led to both NGO and local community expectations of hand-outs rather than self-help activities. This has often been the case where agricultural-input costs are unaffordable or unavailable, leading to the private sector targeting Government or NGOs rather than farmers for sales. Change requires capacity building for agricultural CBOs for agricultural-input acquisition, product marketing and value addition. Examples that are proving successful include community-based seed production linked to contracts between commercial seed producers and farmer groups through whom agricultural-inputs can be distributed or products marketed. The private sector has established similar mechanisms for cotton and tobacco, and it should be possible to repeat this with legumes including cowpeas, groundnuts and soya beans. Each crop provides opportunity for value addition through agro-processing. Lack of credit, especially where output markets are limited, poses a challenge, reinforcing the need to ensure that markets are identified early in the innovation process. Where the private sector is involved in promoting crops, input supply on credit and marketing arrangements experience fewer problems, indicating the need to ensure private sector involvement.

MIRACLE is now in its second season of community involvement and farmer testing of new crops and new varieties. This falls within the second phase of the innovation process and mid way through a second PREA learning cycle (Figure 1). R&D institutions are increasingly becoming facilitators of the process. This has required change from well-intended but sometimes well-entrenched top-down research and extension approaches. Researchers, extension agents and farmers are learning from each other, not only agronomic parameters such as best agro-environments for each crop or variety and improved production methods, but also greater appreciation of post-harvest attributes including taste, food preparation methods, nutritional enhancement and marketing opportunities.

The result has been increased collaboration with local communities and involvement of local leadership through CBOs and IPs, with increased numbers of households wanting to become involved to benefit from the lesson learning taking place. Clearly this requires ongoing backstopping from R&D organisations, but it also requires increased private sector involvement in ensuring appropriate inputs are affordable and available at the right time and that crops can be marketed at fair prices.

Key Lessons

MIRACLE is demonstrating that innovation based on an innovation system framework using PREA is dependent on a wide range of facilitating factors. Although interventions depend on the initial context, they should be developed from the beginning in a way that encourages interaction between public, private, NGO and civil society organisations. Key elements include:

- Building and supporting partnerships requires engagement and collaboration between stakeholders involving awareness raising, the development of trust, a willingness to work together, and the creation of a shared vision for the future. This requires support and capacity development for brokering relationships between different organisations and negotiating between different stakeholders, brokering access to inputs, credit and technology, helping to articulate demand for research, information and technology, and if necessary brokering wider institutional and policy changes (Hall, 2011). Facilitating such alliances requires “champions”, either individuals or institutions, who understand the often complex institutional and regulatory structures that underpin, encourage and support the building of networks.
- Farmer organisations able to speak with an informed and unified voice and to engage with other stakeholders at all levels have a critical role to play. This requires the participation of effective and representative farmer–based CBOs able and willing to communicate with members.
- New knowledge from research is only one component required to encourage innovation. Improving access to information can create an effective demand for research products. If this involves suppliers, technical experts, farmers, government and NGOs, this in itself will help to build

partnerships and networks.

- A well organised private agri-business sector needs to be involved not only in the supply of inputs and purchasing outputs but also in developing market opportunities, capacity building and engaging with the public and NGO sectors.
- Ultimately, sustainability will be built on local ownership with effective back-up from R&D organisations in both the private and public sectors. This requires capacity strengthening throughout the process to ensure local people and organisations assume ownership and leadership. This should be continuous and requires a long-term funding commitment.

The complexity of scaling up successful pilot initiatives can be supported by strategic-level IPs linked to and interacting with local operational IPs. MIRACLE is providing a functioning model of strategic and operational IPs that fit with local priorities which can be a useful model for the implementation of a wider agricultural programme at District level.

References

Adekunle AA, Ellis-Jones J, Ajibefun I, Nyikal RA, Bangali S, Fatunbi O, Ange A, 2012. *Agricultural innovation in sub-Saharan Africa: experiences from multiple-stakeholder approaches*. Forum for Agricultural Research in Africa (FARA), Accra, Ghana.

Adekunle AA, Fatunbi AO, Jones MP, 2010. How to set up an Innovation Platform. A concept guide for the Sub-Saharan African Challenge Program (SSA CP). Forum for Agricultural Research in Africa. http://www.fara-africa.org/media/uploads/library/docs/ssacp/How_to_set_up_an_innovation_platform.pdf

Ellis-Jones J, Shultz S, Chikoye D, de Haan N, Kormawa P, Adedzwa D, 2005. *Participatory research and extension approaches. A guide for researchers and extension workers for involving farmers in research and development*. Ibadan, Nigeria: IITTA.

FARA, 2009. *Sub-Saharan Africa Challenge Programme: Research Plan and Programme for Impact Assessment*. Accra, Ghana: Forum for Agricultural Research in Africa.

Hagmann J, Chuma E, Murwira K, Connelly M, 1999. Putting process into practice; operationalising participatory extension. In: ODI Agricultural Research and Extension (AGREN) Network Paper No. 94. London: Overseas Development Institute. http://www.odi.org.uk/agren/papers/agrenpaper_94.pdf

Hall A, 2011. Putting agricultural research into use: lessons from contested visions of innovation. Working Paper 76. United Nations University Maastricht Economic and Social Research Institute on Innovation and Technology (UNU-MERIT). Maastricht, The Netherlands: UNU-MERIT. http://www.merit.unu.edu/publications/wppdf/2011/wp2011-076.pdf

Hawkins R, Heemskerk W, Booth R, Daane J, Maatman A, Adekunle AA, 2009. *Integrated Agricultural Research for Development (IAR4D)*. A Concept Paper for the Forum for Agricultural Research in Africa Sub-Saharan Africa Challenge Programme. FARA, Accra, Ghana. 92 pp.

World Bank, 2007 *Enhancing agricultural innovation. How to go beyond strengthening of research systems*. Washington DC, USA: The World Bank.

News from the Field

Cadmium in rice

Hugh Brammer

Several hundred water, soil and rice samples from Bangladesh, analysed for their arsenic content, have also been analysed for their cadmium contents. Cadmium levels in soil and rice samples from several different parts of the country are high, both in arsenic-affected as well as in low-arsenic areas. The source of the excessive levels is not yet apparent. Atmospheric and effluent water pollution from heavy metal mining is not the cause, as it is in China, and the low cadmium levels in irrigation water samples indicate that groundwater is not implicated, as it is with arsenic. Possibilities include soil parent materials and phosphatic fertilisers.

Cadmium levels in soils and rice vary widely within physiographic regions, and even within 4-ha tubewell irrigation command areas, and there seems to be little relationship between levels in topsoils and in rice grain. Interpretation is made difficult because, as with arsenic, different varieties take up the element in different amounts. Cadmium is toxic to humans at even lower levels than is arsenic and, like arsenic, it also attacks the kidneys, so it may be aggravating health problems in arsenic-affected areas of Bangladesh (and potentially in other countries where rice is the staple cereal in human diets). Already, it is estimated that 20 million people in Bangladesh suffer from kidney diseases.

Further studies are planned in Bangladesh during the 2013 *boro* and *aman* rice seasons to try to determine what is causing the excessive cadmium levels in soils and rice, which might suggest practical mitigation measures. Already, however, mitigation possibilities are known to be complicated by the fact that, while arsenic is more available to plants in wetland soil conditions, cadmium is more available in aerated soils. Therefore, rice can pick up arsenic during wetland growth stages, then pick up cadmium in the grain-filling stage when soils are normally allowed to dry out; and rice grown under SRI conditions could take up more cadmium than under wetland conditions. There is much still to be researched, including the extent to which irrigated wheat and vegetables are affected, as well as non-irrigated cereals, pulses and oilseeds.

Incorporating gender in innovation systems research in sub-Saharan Africa

Sarah Cardey and Chris Garforth

Sarah is a Lecturer in International Development in the School of Agriculture, Policy and Development at the University of Reading. Her primary work is in development communication and gender in development contexts. She is particularly interested in the gendered dynamics of development communication, and maintains interests in the governance processes involved in each of these research areas. Sarah has active research programmes relevant to food security, livelihoods, poverty alleviation, gender inequalities and vulnerabilities in development, and has collaborated within and beyond Europe, including all regions of sub-Saharan Africa, India, Haiti and Canada.

Summary

Both men and women play an active part in agricultural innovation, but typically they engage with innovation systems differently. They may have different levels of access to agricultural resources and to the formal and informal institutions that support smallholder agriculture, differences which are linked to gender dynamics and power relations within households and communities. A gendered understanding of innovation systems can inform a more effective set of interventions and support that addresses both women's and men's needs and aspirations. Research designs and methods can be adjusted so that gender differences and dynamics are revealed rather than hidden, which is the first step to designing more appropriate interventions.

Introduction

It is well established that men and women face different sets of opportunities and constraints within the agricultural sector in developing countries. This is often referred to in terms of 'inequalities' faced by women. However, gender is not just about women; it is about how 'female' and 'male' are defined, how those definitions are sustained and change over time, and how they affect men's and women's opportunities. With women in sub-Saharan Africa contributing 80% of agricultural labour, improvements in productivity and the overall performance of the sector can only come if both men and women are able to play a full part in agricultural innovation and change (World Bank *et al*, 2009).

Women and men do not receive similar levels of benefits from agriculture or support for the development of their enterprises. This arises partly because of the way in which institutions deal with gender (eg customary land tenure systems where, in many cultures, men have more rights in land than women), partly from attitudes towards the respective roles of women and men which themselves may have their origins in culture (eg 'women produce food for the family, men invest in cash crops'), and partly from government policies which do not do enough to create an institutional environment in which women and men have equal access to opportunities to improve their farming.

As a recent FAO report notes, women make crucial contributions to small-scale farming but are constantly constrained by lack of access to land, resources, finance, labour, education and extension, making it difficult for women to remove themselves and their households from poverty (FAO, 2011). These constraints can also prevent women from adopting and adapting new technologies. The gender imbalance in smallholder agriculture is a problem for productivity, food security and nutrition; as large proportions of small farmers are women, they are responsible for a considerable proportion of smallholder production, an amount that could be greatly increased by correcting gender imbalances Yet many policy and project documents regarding agriculture still fail to consider the differences in resources available to men and women and their relevance to proposed interventions. Giving conscious thought to gender perspectives when considering interventions, be they inputs, extension, markets or cooperatives, will have a positive impact for women and for society as a whole (see The Montpellier Panel, 2012).

It is not simply that women are more constrained in their opportunities to innovate than men. As Cheryl Doss's review of research on women farmers in Africa noted (Doss, 1999), gender dynamics within the household may make it difficult for men to take up a new agricultural enterprise or technology that increases the requirement for household labour unless gender roles can be renegotiated to give women a share in the benefit from the innovation.

However, as Doss also noted, gender relations within households are complex and heterogeneous. Thelma Akongo's research in northern Uganda showed how differences in men's attitudes affected women's ability to embark on and sustain agricultural enterprises (Akongo, 2009). There are also big differences in land tenure and inheritance arrangements between, for example, matrilineal and patrilineal societies. Culture and social attitudes are themselves dynamic, changing under the influence of new economic circumstances. This makes it important, in researching innovation behaviour and innovation systems, to understand gender relations and gender roles, and how they affect innovation, in different times and contexts. Without this understanding, it is impossible to predict what the trajectory of innovation and response to any particular set of opportunities will be within households and communities (Doss, 1999).

Gender analysis in innovation systems research

We know that gender of the household head is a factor in technology adoption (eg Isabirye *et al*, 2010; Quisumbing & Pandolfelli, 2010) and men and women's gender roles can constrain both from making choices that could be positive in their agricultural enterprises and for the household as a whole. We also know that support systems for smallholder agriculture built on a 'diffusion of innovations' model have been of more benefit to men than to women. In the T&V system, information was largely disseminated to male farmers; and it was evident by the 1990s that centralized extension systems benefitted farmers with more education and assets, which included benefitting male more than female farmers. The more holistic Agricultural Knowledge and Innovation System (AKIS) and innovation systems thinking addressed the linking of individuals, groups and organisations through mutual learning and social knowledge, and the generation of collective knowledge from research, farmers and extension, but concern remained over the challenge of 'increasing the benefits of agricultural development for women and indigenous peoples in the face of an increasingly globalized food system' (World Bank *et al*, 2009, p.257).

If policies are not designed to engage with how women and men innovate, women tend to be in a poorer position as they generally have worse access to technologies, information and communication services, which are essential for rural innovation. Esther Boserup, an agricultural economist whose pioneering work first demonstrated the economic contribution of women in rural economies, found that new technologies and innovations introduced through modernization in Africa often displaced women's labour (Boserup, 1970). More recently, Quisumbing & Pandolfelli (2008) found that new technologies tend to benefit men more than women because they lessen the workload of men and increase the activities linked to women's roles (such as weeding, harvesting or processing). It is important to understand how men and women innovate in order not to undermine women's livelihood options. Technologies and innovation processes are not gender neutral, and not available to both women and men in equal measure. If we do not understand how women and men use technology and how they relate to an innovation system, technologies and innovative practice will not make it into women's hands, risking the further reinforcement of gender inequalities and the weakening of responses to food security and agricultural production concerns around the world.

Gender analysis can help us understand what these constraints are, why they happen and what their impact is, and provide evidence for interventions to mitigate them. Gender analysis is done using sets of tools, which can be established frameworks from the academic literature (eg Harvard Analytical Framework, Social Relations Approach) or tools created by individuals and groups, to probe questions about inequalities.

Research, whether on technical or socio-economic aspects of agriculture and rural development, that takes gender into account will be more thorough and relevant, and therefore likely to contribute to more effective sustainable development policies and programmes. Given the important role that women play in agriculture, and the global challenges in food security, research that addresses gender dynamics is essential in creating evidence-driven, relevant agricultural practice. In the past, research on innovation and adoption has often used research designs, methods and processes that are gender biased. Taking the sampling unit as a household, for example, and then interviewing the head of household, completely misses intra-household differences, including gender differences as well as between older and younger members, in perspectives, experience, constraints and knowledge. Using extension officers as informants to draw up sampling frames biases towards farmers who are in more frequent contact with extension – which again privileges men.

Why is gender important in analysing innovation systems?

Innovation systems thinking resonates broadly with gender thinking in terms of its approach to understanding the broader social contexts of development. Gendered development thinking understands that inequalities are embedded in social structures and localized contexts. Development is unlikely to happen if equity between the genders is not taken into consideration and addressed. Innovation systems scholarship looks at the context of innovation, taking a more holistic approach to agricultural systems, thereby exploring not just technological innovations themselves, but innovation as a social activity, involving different capacities to innovate and engage in learning. A gender perspective further asserts that power relations are core to how inequalities function, and so need to be explicitly explored and understood for development interventions to succeed. Unfortunately, gender inequalities constrain women more than men in areas of competitiveness and entrepreneurship, particularly in sub-Saharan Africa (Kingiri, 2010).

Innovation systems thinking understands that institutional structures that support innovation are essential, just as gender thinking understands that equitable participation in agriculture by women and men requires structures that support their participation. Combined, this thinking posits that formal and informal institutions need to both enable innovation and address gender inequalities for innovation so as to not reinforce inequalities and undermine the effectiveness of agricultural interventions.

Gendered thinking on innovation systems also helps us to explore who is innovating and who has access to innovations. It is important to consider how innovation takes place. For instance, technologies may be created based on stereotypes of men and women's needs rather than reflect an evidence-based understanding of male and female farmer's distinct needs (Kingiri, 2010). Or there may be an assumption that if the head of a household (usually male) is targeted, the household will experience prosperity. Unfortunately, unequal distribution of assets within the household means that this expected sharing of technology and its benefits does not take place (Quisumbing & McClafferty, 2006). Women are often excluded from innovation processes because technologies and innovation may be seen as 'unsuitable' for women's capacities, because their use challenges women's 'natural' social roles, because women do not have access to education to engage with innovation, or

because women are less confident in engaging with innovations and new technologies (Kingiri, 2010).

Innovation systems interventions target farmers and agricultural enterprises based on farmers' understanding of the innovation system at hand. However, these systems are highly gendered. How the systems are perceived by farmers is also gendered: men and women interpret the systems differently, based on gender lenses. Further, the construction of the innovation system is gendered: they are social systems in which gender inequalities are embedded. Because they are social systems, they are laden with the social values of the particular context (Kingiri, 2010). Unfortunately, there is a paucity of specific research into how, conceptually and practically, to integrate gender into innovation systems research and practice. What literature exists is often unpublished and focuses on individual resources (eg land, access to advisory services, finance) rather than understanding the larger social and agricultural system of which those resources are elements (Quisumbing & Pandolfelli, 2010).

What does this mean for practice in innovation systems research?

To take a gendered perspective, innovation systems research needs to embrace questions that probe the social construction of gender, and how that affects innovation. This means understanding that men and women will have different perceptions of innovation processes and different roles in these processes. It may also be that 'innovation' means something very different for men and women, so that the nature of the process itself differs depending on which women and which men are involved. As such, to do research from a gendered innovation systems perspective means being open to different systems arrangements than may be expected, as well as explicitly uncovering how gender affects the innovation systems in a particular context. Research also needs to understand the gendered nature of technology and take the perspective that both men and women are capable of engaging with technology. Both are active users and creators of innovations, but operate in the context of unequal circumstances. So, how do systems inhibit or support innovation differently by men and women? This needs to be taken a step further, when looking at the institutional environment of innovation for men and women, by analysing the institutions, behaviours and social relations that shape how men and women participate in agricultural systems and economies, including how these systems construct or do not construct inequality. What does this indicate about creating an institutional environment that enables innovation for both genders? How can innovation systems thinking challenge the power structures that prevent the full participation of men and women? Appropriate policies that support agricultural innovation need to be based on evidence-driven, gendered research that engages with male and female farmers. It needs to understand the heterogeneous nature of male and female farmers, how they innovate and their differing capacities (World Bank, 2006).

Innovation systems research should also consider the gendered nature of non-farm innovation, and how that affects agricultural innovation (Kingiri, 2010). The gender and development literature has established that women and men have productive, reproductive and community roles. The specific nature of these roles differs between men and women, but women are more likely to have a larger proportion of the reproductive roles in the household than men (Moser, 1994). These need to be understood for two reasons. One, they need to be explored if innovation is not to add burden to women's workloads, exclude them from innovation processes and deepen gender inequalities. Secondly, innovation in all three roles must be valued, as innovations in reproductive and community roles may affect innovations in people's reproductive activities. From an innovation systems perspective, this is likely to have an impact on their agricultural activities. A gendered exploration of these roles means investigating household gender dynamics, along with community, national and policy level roles. In practical terms, this means analysing men and women's different roles – which can be facilitated by gender analysis tools such as the Harvard Analytical Framework – when designing innovation systems based research and interventions. It means using methods and research designs that allow gender differences and the gendered nature of systems to be seen. At the very least, it calls for methods and data to be disaggregated by gender, for participatory methods that allow men and women to articulate their perspectives and interpretations rather than asking them to respond to pre-coded survey questions and for research to include as participants people who are not heads of households.

Conclusions

A gendered perspective on innovation systems can help us to better understand the social dynamics of innovation, particularly the power structures in which innovation takes place. It can also help us to understand how to create more equitable innovation systems interventions – be they institutional reform, individual projects, or policies – ensuring that both male and female farmers are supported in pursuing their livelihoods strategies. Given women's role as key agents in food security, it is a matter of some urgency that we develop a gendered understanding of innovation systems. Further, gender inequalities affect both men and women; when options are constrained because of gender roles, neither male nor female farmers may be free to diversify their livelihoods and pursue the most effective livelihood strategy. This puts resource-poor farmers at a disadvantage, and can undermine their ability to seek food security and livelihood security. Thus a gendered perspective which explores these dynamics is essential if we are to address gender inequalities in agriculture. It improves innovation systems research and practice by adding further nuance and complexity to our understanding of agricultural systems, and can generate further insights into how men and women in agriculture innovate.

References

Akongo T, 2009. *Agro-enterprise development and gender equity in northern Uganda*. Reading: University of Reading, PhD thesis.

Boserup E, 1970 (reprinted 1997). *Women's Role in Economic Development*. London: Earthscan

Doss CR, 1999. *Twenty-five years of research on women farmers in Africa: Lessons and implications for agricultural research institutions; with an annotated bibliography.* CIMMYT Economics Program Paper No 99-02. Mexico DF: CIMMYT

FAO, 2011. *The State of Food and Agriculture: Women in agriculture. Closing the gender gap for development*. Rome: Food and Agriculture Organization of the United Nations.

Isabirye BE, Isabirye M, Akol AM, 2010. Picturing adoption of below-ground biodiversity technologies among smallholder farmers around Mabira Forest, Uganda. *Tropicultura* **28** (1), 24-30.

Kingiri A, 2010. *Gender and agricultural innovation: revisiting the debate through an innovation systems perspective*. DFID/Research Into Use: London.

The Montpellier Panel, 2012. *Women in Agriculture: farmers, mothers, innovators and educators*. London: Agriculture for Impact.

Moser C, 1994. Toward gender planning: A new planning tradition and planning methodology. In: Moser C, ed, *Gender planning and development*. London: Routledge.

Quisumbing A, McClafferty B, 2006. *Gender and Development. Bridging the gap between research and action*. Washington, DC: IFPRI

Quisumbing A, Pandolfelli L, 2008. *Promising approaches to addressing the needs of poor female farmers*. Washington, DC: IFPRI

Quisumbing A, Pandolfelli L, 2010. Promising approaches to address the needs of poor female farmers: Resources, constraints and interventions. *World Development* **38**(4), 581-591.

World Bank, 2006. *Enhancing agricultural innovation: How to go beyond the strengthening of research systems. Economic Sector Report*. Washington, DC: The World Bank

World Bank, FAO, IFAD, 2009. *Gender in Agriculture Sourcebook*. Washington, DC: The World Bank.

Newsflash

The future of agricultural development research in the UK

Report of a meeting of the All-Party Parliamentary Group on Agriculture and Food for Development, House of Commons, 13 February, 2013

Speakers: Dr Frank Rijsberman, Chief Executive, CGIAR Consortium; Professor Ian Crute, Chief Scientist, Agriculture and Horticulture Development Board. Chair: Lord Cameron of Dillington.

The meeting focused on the potential contribution UK science can make to international agricultural development research. The two speakers made six main points.

- Food security is one of the biggest challenges of the 21st century. FAO estimates that the world needs to produce 70% more food by 2050 for the growing population (up from 7 billion now to 9 billion) and to meet the changing food habits of burgeoning urban communities.
- Since the 1960s, food production in Asia tripled due to the green revolution based on high-yielding varieties, fertilisers and irrigation. But yields are now stagnating. The success also created widespread environmental degradation and has not had similar impact in the rainfed areas of Asia or in Africa. A new more sustainable approach is needed.
- The international agricultural research system was a victim of its own success. Because of the success on the green revolution, the last two decades has seen a marked decline in support to the sector by donors and developing country governments. The UK has a proud tradition in this area and a strong scientific capacity but has lost it research base since the 1980s.
- The food price hikes in 2007-08 were a wake-up call to the international community. With donor support, the CGIAR (Consultative Group on International Agricultural Research) began a major reform process. From 3,000 small, disconnected research projects implemented by its 15 research centres, it now focuses efforts on 16 coordinated and strategic research themes. It has doubled its budget. It is developing new ways of working in partnership with scientists outside the CGIAR and strengthening impact assessment and value-for-money.
- There are four scientific challenges facing international agricultural development research. These are to: (i) exploit the life sciences revolution of molecular biology; (ii) use information technology, with its potential for crop management and precision agriculture; (iii) develop holistic ecologically integrated and sustainable 'systems' approaches; and (iv) ensure research-into-use involving market linkages, food security and nutrition. Each of these challenges will require scientists in the public sector, including CGIAR, to work in partnership with other experts, including 'advanced science' scientists in the private sector.
- Although the UK's research base is depleted, it has a strong capacity in life sciences research and synergies can be developed among our research centres to produce a critical mass of effort in key areas. We can build back what we had before.

There was a lively discussion from the floor. One discussant argued that it is easier for other countries (eg France) to develop partnerships with the CGIAR and others because their international agricultural research centres receive core funding from government, which is not the case in the UK.

One interesting point made by Frank Rijsberman is that the cost of DNA sequencing is plummeting and life sciences is attracting many of the brightest young students. A team of young scientists at ICRISAT, for example, has sequenced the genomes of chick pea and pigeon pea in just five years.

The meeting was well-attended with 3-4 members of the APPG and about 30 others, including a number of TAA members

Steve Jones

Understanding innovation systems: biogas in pig enterprises in southern Philippines

Joan D Gervacio[1]

Dr Joan Gervacio is a faculty member at University of Southeastern Philippines (USeP). She was awarded a Ford Foundation International Fellowship to pursue a PhD in International and Rural Development at the University of Reading, which she completed in 2012 with her thesis 'Agricultural innovation processes and innovation systems in rural Davao Region, Philippines'. She is currently based at the Tagum-Mabini campus of USeP.

Summary

This paper examines the spread of biogas technology among small scale pig enterprises in Davao del Sur, Philippines. Innovation histories were traced through workshops, semi-structured interviews, observations and document analysis. The paper shows that there were diverse innovation system actors from both public and private sectors. Farmers played a leading role as they searched for solutions to problems that threatened their livelihoods. An innovation system emerged as farmers identified sources of technology and advice and learned how to integrate a new technology into their production systems. Although private and public sector agencies have provided support of various kinds, there has been a general lack of coordination between them. Innovation is a continuing process as the technology is adapted to the circumstances of each pig enterprise and as farmers find ways of using the biogas and slurry from their digesters. The innovation system is seen as an emergent, continually evolving phenomenon rather than a fixed, designed set of components with institutionalised mechanisms of interaction.

Background

The Philippine Council for Agriculture and Natural Resources Research and Development (PICARRD)'s Techno Gabay Program (TGP) aims to bridge gaps between research, development, extension, farmers and the market. One component comprises a network of *Magsasaka Siyentista* (MS). These are outstanding farmers who provide farmer-to-farmer advisory services which complement the work of Farmers Information and Technology Services (FITS) centres. MS demonstrate successful applications of science and technology-based and indigenous technologies on their own farms and are seen as active enablers, facilitators or initiators in the technology development and transfer process (Burgos, 2005). Implemented in Davao Region by SMARRDEC (Southern Mindanao Agriculture and Natural Resources Research and Development Consortium), MS are seen as a way of embedding local innovation processes into the public sector-led extension system.

One such *Magsasaka Siyentista* was appointed in 2003 to encourage pig farmers in the Davao region to use biogas technology to process animal waste from their enterprises. He had begun full-time pig production in 1997. As his enterprise expanded, people living in his peri-urban neighbourhood complained about the smell from his pigs. Through research and a process of trial and error, he was able to establish his own version of a bio-digester in his backyard using pig manure as the main substrate. His digester not only reduces the bad smell, it also now supplies cooking gas to ten nearby households. As a farmer who has successfully integrated an innovative technology in his own pig enterprise, he was seen as a good role model.

Other pig farmers in the area have also taken up biogas technology since 2003, raising the question of what role the MS has played in its spread. Rather than implementing a research design which followed the work and contacts of the MS, this study used an innovation systems framework to explore how pig farmers in the area found out about biogas and, if they decided to try it, how they have integrated it into their enterprise. The research shows that the process has been much more complex than a response to promotion and transfer of technology through FITS and MS. The research used participatory methods, principally tracing innovation histories (Douthwaite *et al*, 2006) through workshops, semi-structured interviews, observations and document analyses in two farming communities in Davao del Sur: Digos and Bansalan. RAAKS (Rapid Analysis of Agricultural Knowledge Systems) toolboxes (eg Windows A2 for identifying relevant actors and A3 for tracing diversity in actor objectives) (Salomon & Engel, 1997) and Actor Linkage Matrix (ALM) developed by Biggs & Matsaert (2004) were used to structure data gathering and analysis. Three workshops were conducted, attended by 21 farmers. Twenty five farmers were interviewed along with 17 other potential innovation system actors.

Findings

Responding to challenge and opportunity

Data from both research locations showed that pig farmers were proactive in seeking solutions to problems they faced, independently of any outside intervention. Farmers mentioned three related drivers: complaints from neighbours about the sight and smell of animal waste; city regulations and their interpretation (including a new (2003) land zoning ordinance and instructions by officials to limit the number of pigs to two per household); and on the positive side, the increasing price of liquid petroleum gas (LPG), widely used as a domestic fuel. It was a search for a solution to the problems that they were

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Table 1. Actors and their roles in the biogas innovation system identified by farmers

Actors	**Roles in the innovation system**
Farmers	• Initiated seeking solution to their problem • Technology users/adapters/innovators (experts), some farm demonstrations • Farmer-to-farmer interaction (spread of innovations)
Magsasaka Siyentista	• Technology expert • Farm demonstrations • Linked farmers to other agencies • Lobbying with government agencies (limited) • Consultancy on individual farms
Government (Extension) at different levels (region, municipality, local government)	• Support to MS through FITS • Monitoring • Information dissemination (limited) • LGU: Ordinance on land zoning limiting swine raising in certain areas • Assistance in farmers' group formation
Government (Research; led by State Universities and Colleges)	• On home-made, more affordable biogas digester • On effects of sludge on vegetables to help BAA market surplus sludge
Private sector (input suppliers, traders, etc)	• Assistance to farmers in seeking technology expert • Information dissemination (limited) • Production inputs • Technical services • Informal credit source (eg feeds, medicines)
Cooperatives & farmer groups	• Coops: Logistics and financial support for swine industry but NONE for biogas • Information dissemination • BAA: research demand for surplus gas and sludge
NGOs	• NONE
Financial services *(formal)*	• Limited (for swine industry) • NONE for biogas technology specifically

experiencing that led farmers to look for and contact people who might be able to help them, not a result of promotion by government or other agencies.

The initial conditions that shaped the biogas innovation system in Davao del Sur reflect an 'opportunity-driven trajectory' rather than an 'orchestrated trajectory' (World Bank, 2006). As one of the first farmers to go down the biogas route (farmer A) said: 'I heard about the technology a long time ago but I wasn't interested in it. But when neighbours started complaining … I decided to have it constructed in my piggery… I cannot afford to stop raising pigs: my family depends on it'. After a series of investigations by local animal production and veterinary officers acting on his neighbours' complaints, he set out to look for a solution before the local government acted to close his enterprise down.

He first inquired from an engineer friend who gave him a construction plan. He also attended a seminar in Davao City (about 65 km away) sponsored by the Department of Agriculture, but the installation package was very expensive. So, he sought assistance from his feed supplier (Five Jewels Corporation (FJC), a distributor of B-MEG agricultural and veterinary products), for another possible option. FJC and B-MEG staff searched the Internet for biogas experts in Davao Region and found the biogas MS from the SMARRDEC webpage. This then led to a key event in the innovation process: a seminar sponsored by B-MEG at which the biogas MS was one of the speakers. After the seminar, farmer A, together with three other pig farmers, arranged with the biogas MS to have bio-digesters constructed in their piggeries.

Sources of information, advice and support on biogas mentioned by farmers include co-farmers (neighbours/relatives), farmers' groups and cooperatives, government extension and research organisations, state universities and colleges, paid private consultants, input supply companies, and local dealers and traders. Other potential actors (NGOs, financial services providers) were also identified, who were seen as having played little or no role (Table 1).

Farmer-to-farmer communication has been an important element in the innovation process. Figure 1 shows the communication links between the 14 biogas users (BUs) in one of the research locations, including the MS (BU1-L1 – BU13-L1 and MS1). While the MS is clearly an important actor within the innovation system, he is named less frequently than farmer A as a source of information, influence and advice on biogas. The cumulative effects of information from different sources, and the importance of the credibility of those sources, are seen in the comment from one of the farmers: 'before I heard about [MS1], I learned about biogas from my brother-in-law…but I did not believe him. Then I met farmer A [BU1-L1]. I was impressed by his biogas unit; so I followed him.

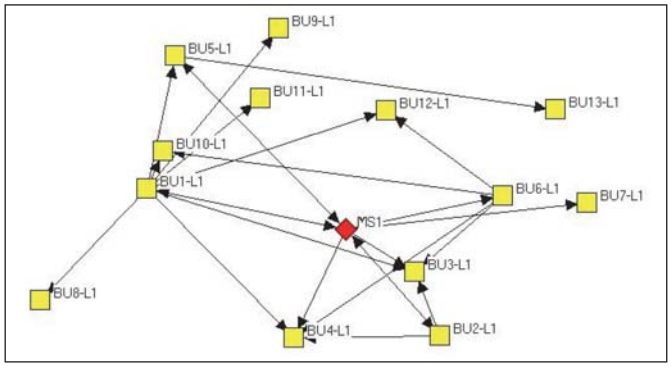

Figure 1. Communication network among pig farmers who installed biogas digesters

Innovation as a continuing process

Research visits to the pig enterprises showed that each one has adapted the technology to suit the layout and scale of their piggeries. Uses of the biogas also vary. One farmer installed a cooking stove outside her kitchen so that neighbours could freely access it. Another connected a hose to his nearest neighbour to share his surplus biogas. There is a clear reciprocal link here between innovation and farmers' social relationships. These influence whether and how the technology is used, and sharing the benefits may also strengthen existing social relationships and create new ones. All the farmers use biogas mainly for cooking; however, one farmer also uses it in his bakery shop by bottling the gas using an improvised container. Two farmers use the gas to fuel lamps, while one uses it to heat an incubator.

Some farmers use the sludge that remains in the digester on crops as organic fertilizer, soil conditioner, pest control agent and foliar spray, but most of them store it in pits, allowing it to flow from the digester into shallow pits, where it dries partially or fully in the sun, to be dug out and stored in bags. Some farmers have more than one pit, so that when the second one becomes full, the sludge in the first is dry enough for bagging and carting. One farmer applies it as it comes out from the digester after dilution with irrigation water into his rice fields. However, the disposal of excess sludge remains a problem for most of the farmers; attempts to give it away free to neighbours as fertilizer are met by the attitude that it is 'dirty' and should not be used on food crops. The innovation process continues as farmers look for solutions.

Biogas users association

Innovation is a social process and the local social context shapes perceptions of the problem, the need for change and the opportunities arising from the environment, which then eventually shape the technology emerging from the process of innovation. Various social processes were at work in the biogas innovation system: conflict, negotiation, agreement, compliance, solidarity, reciprocity, power sharing and collective wisdom. The formation of a biogas adopters association (BAA) in 2005 was one of the outcomes of these social processes, and became a forum in which other processes were played out. BAA aimed to address common issues (including disposal of sludge, bottling excess biogas, accessing group credit) and sought help from a private inventor to address technical issues. However, leadership issues and financial constraints have hindered the group in pursuing their plans.

Constraints

The research also revealed barriers that farmers and other actors felt were limiting the further spread of biogas technology among pig farmers. Finance is a problem, with limited financial services products and providers available for small-scale producers. Another is a perceived lack of coordination between actors, particularly between public and private sector organisations, but also within the public sector. Biogas is a technology that cuts across the interests and mandates of

Figure 2. Action linkage matrix being drawn up

different bodies, from local government and their responsibility for regulating land use, to ministries and agencies charged with reducing land and water pollution, and NGOs and public sector agencies seeking to enhance smallholder agricultural production and livelihoods. Effective, sustained innovation in this field calls for a coordinated response. However, it is left largely to farmers to make connections, building their own package of support, and there is no concerted effort to develop and promote the technology. This perception is supported by social network analysis of the data, which shows a high degree of fragmentation of the innovation system, with a particularly low level of connections between government agencies and private sector suppliers of technology and inputs (Gervacio & Garforth, 2012). Limited technical expertise in the locality was proving a bottleneck; the biogas MS was the main source of advice and technical support in designing of digesters to fit individual requirements and there is very little local capacity for repair and maintenance.

Figure 3. Mr Lopez with his gas cookers fuelled by biogas

Conclusions

Although an interesting mix of individuals and organisations has been involved in the biogas innovation system, the pivotal actors and the main champions for the technology were in the private sector, principally the farmers initially assisted by input suppliers. Röling (2009) calls this 'farmer-driven innovation' in which farmers develop innovations, using information and knowledge from a variety of sources, and test whether or not they will work well in their environment. Communication networks and contacts are seen as significant in identifying sources of information and continuing support in terms of coordination and cooperation (including initiatives in advocacy, mobilisation and lobbying), production inputs and financial services.

Several elements came together to support the application of biogas technology by pig farmers in the study area. Farmers needed a solution to a problem that threatened their enterprises and livelihoods, and were actively looking for one. Some individuals had, separately, sought and found relevant expertise in the private sector. Public sector research and extension bodies were, at the same time, seeking to promote biogas as a useful technology, though not specifically in small-scale pig production. One of the innovative farmers was recruited to become part of a public sector extension programme. Spread of the technology required adaptation to the scale, resources and circumstances of each farm and their households. A social innovation, the biogas users group, emerged as a forum for discussion, further development and application of the technology, and advocacy and negotiation with municipal authorities. Constraints to the further spread and impact of the technology are related to social (attitudes towards using digester sludge as a fertiliser) and institutional (financial services, lack of private sector capacity in repair and maintenance of digesters, lack of coordination between actors) at least as much as technological (digester design) issues.

This study reveals an innovation system that evolved in response to the decisions and actions of many different individuals and organisations. It is not a 'hard' system designed and put in place by public or private sector organisations, comprising fixed components and formal, institutionalised links between them, but a continually emergent phenomenon that at the same time moulds and is moulded by those seeking to address challenges and opportunities.

Acknowledgements

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References

Biggs SD, Matsaert H, 2004. *Strengthening poverty reduction programmes using an actor-oriented approach : examples from natural resources innovation systems*. Agricultural Research and Extension Network (AgREN) Paper 134. London: Overseas Development Institute.

Burgos BM, 2005. Technology management initiatives for sustainable agriculture. *Journal for International Business and Entrepreneurship Development* 2, 25-30.

Douthwaite B, Sikka A, Sulaiman R, Best J, Gaunt J, 2006. Learning with innovation histories. *LEISA Magazine* **22**, 42-43

Gervacio J, 2012. *Agricultural innovation processes and innovation systems in rural Davao Region, Philippines*. Reading, UK: University of Reading, PhD thesis.

Gervacio J, Garforth C, 2012. Biogas Innovation Processes and Innovation System: Lessons from Davao del Sur, Philippines. *International Proceedings of Chemical, Biological and Environmental Engineering (IPCBEE)* **47**, 68-72.

Röling N, 2009. Pathways for impact: Scientists' different perspectives on agricultural innovation. *International Journal of Agricultural Sustainability* **7**(2), 83-94.
Salomon ML, Engel PGH, 1997. *Networking for innovation: windows and tools*. Amsterdam: Royal Tropical Institute.

World Bank, 2006. *Enhancing agricultural innovation: How to go beyond the strengthening of research systems*. Washington, DC: The International Bank for Reconstruction and Development/World Bank.

News from the Field

TAA Agribusiness Specialist Group Report – The Food Development Company

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The 16th Belmont Management Consultants (BMC) Christmas Lunch was held on 18th December at the Leathern Bottle in Lewknor, Oxfordshire. Thirty two attended including some who were investors in the Food Development Company (FDC) and many were members of the TAA Agribusiness Specialist Group.

Jim Turnbull reported on the principal activities of BMC in 2012, which were very much focused on FDC in which BMC is the principal investor. We have put into practice what our small group of international development specialists have been preaching for decades:

- applying commercial market based strategies;
- promoting transparent, accountable and ethical investment;
- achieving viable and profitable business; as well as
- providing verifiable social, ethical and environmental objectives.

We are, of course, finding that the practice of social impact investment is much tougher than the theory, but at the same time our concept is constantly evolving and improving.

We completed the construction of our new process facility in Romania in 11 months and within budget, but only days before we were due to start processing acacia blossom and elderflower. In the middle of our peak processing period, we had a visit by HRH The Prince of Wales which generated much media attention and interest in our products.

Figure 1. The FDC facility in Saschig, Romania

We delivered 4,000 litres of acacia blossom juice and 39,000 litres of elderflower juice for further processing in the UK. The acacia blossom has been developed as a new drink and Waitrose has been chosen for a limited production release in February 2013. If successful, this could substantially increase demand for our acacia blossom from Romania. Our elderflower harvest in 2012 involved over 1,300 local people and this will rise to almost 4,000 by 2015. They are paid cash each day per kg collected and this provides much needed income to some of the poorest people in the community.

We also produce a range of artisan jams, juices, sauces and chutney, and bottle local honey. Our products are on sale in speciality food shops in Romania with exports to Italy, Germany,

Figure 2. Buying elderflower

Poland and the UK. Our apricot preserve and wildflower meadow honey is on sale under the Highgrove label at the estate shop and the Highgrove shops in Tetbury and Bath.

With only five full-time employees, we are the second largest private sector employer in the town of Saschiz in SE Transylvania where we are based. Our activities are having a significant impact on the local economy.

We now have twenty private investors and are looking forward to an even more demanding 2013 which will hopefully include the establishment of a second operational company in Chile to produce, out of the European season, a similar range of products.

The current funding round is still open and this represents an excellent opportunity for likeminded TAA members to invest on the “ground floor”. The first three years of operation of the Food Development Company have removed much of the early risk for new investors. Further information is available on request and /or visit www.FoodDevCo.com

We continue to meet for a pub lunch on the last Friday of the month throughout the year. There is no fixed agenda, but over the years there has been much discussion of why donor funded enterprise development projects often fail. The conclusion – because of the very fact that they are projects with a short term mind-set and funding with start/end dates and not run as enterprises from the outset.

Plantwise: Putting innovation systems principles into practice

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Summary

CABI's Plantwise programme runs local plant clinics in 24 countries across Africa, Asia and Latin America where trained 'plant doctors' provide on-the-spot diagnosis and advice for farmers who bring samples to the clinics. A database that records each consultation and shares knowledge across clinics and countries continually builds the ability of the programme to respond to farmers' needs. The programme embodies key principles of an innovation systems approach. Systems diagnosis, building networks and linkages, balancing supply push with demand pull, strengthening the role of intermediaries, and experimenting and learning are among the features which ensure the programme continually evolves to meet emerging needs and challenges. As well as providing a valuable service to smallholder farmers, enriching their ability to address production constraints, the sharing of lessons among stakeholders is having a positive overall effect on national plant health systems.

Introduction

Successful smallholder farmers must be masters of innovation, using knowledge to improve the economic and social benefits they derive from farming. Growing healthy and productive crops requires continuous innovation, so farmers need timely access to new and existing knowledge on plant health. Crop losses to pests are already estimated at around 30-40% (Oerke, 2006), and intensified production, climate change and globalisation are causing new problems to emerge at an increasing rate. Wheat stem rust (Ug99), banana bacterial wilt and oriental fruit fly are recent examples in Africa.

Rather than addressing each new problem with a piecemeal approach, developing capacity to prevent or respond rapidly to new problems as they arise is likely to be more efficient. Such capacity is an emergent property of the actions and interactions of the different organisations generating, sharing and using new knowledge – an innovation system. Rural and agricultural development lends itself to 'systems thinking', yet finding ways to put such thinking into practice can be a challenge (Hirvonen, 2008).

In this paper, we describe Plantwise, an initiative that seeks to improve the productivity of agricultural crops by strengthening the capacity of national plant health systems. We illustrate, with examples from the initiative, what eight features of innovation systems approaches mean at a practical level.

Plantwise

Plantwise aims to strengthen plant health systems, using provision of advice to farmers through community-based plant clinics as an entry point. Plant clinics are run by trained 'plant doctors', normally extension officers with knowledge of crop agronomy/crop protection, who are taught field diagnosis and approaches to giving pragmatic advice. Clinics are typically run one day per week or fortnight in a marketplace or other location readily accessible to smallholder farmers, so being a plant doctor is only a part of an extension officer's work.

Farmers can present any crop health problem they encounter, and are encouraged to bring samples of their sick plants to the clinic. Details of symptoms (both observed and from consultation with the client) are recorded, along with the diagnosis and recommendation, a copy of which the farmer takes away with them. Clinic records provide information that can be used in various ways, including quality assurance and giving a snapshot of the problems farmers face in an area around clinics.

The Plantwise Knowledge Bank (www.plantwise/knowledgebank .org) provides online resources that support plant doctors, including a diagnosis tool, treatment advice, a mechanism to share knowledge between clinics and countries, and a means to collate and analyse the information collected at clinics via secure national plant health portals.

Clinics are thus a cornerstone of Plantwise, but they serve to forge and strengthen links between various actors in plant health systems, including other extension providers (public and private sector), research, diagnostic services, input providers and regulators (Figure 1).

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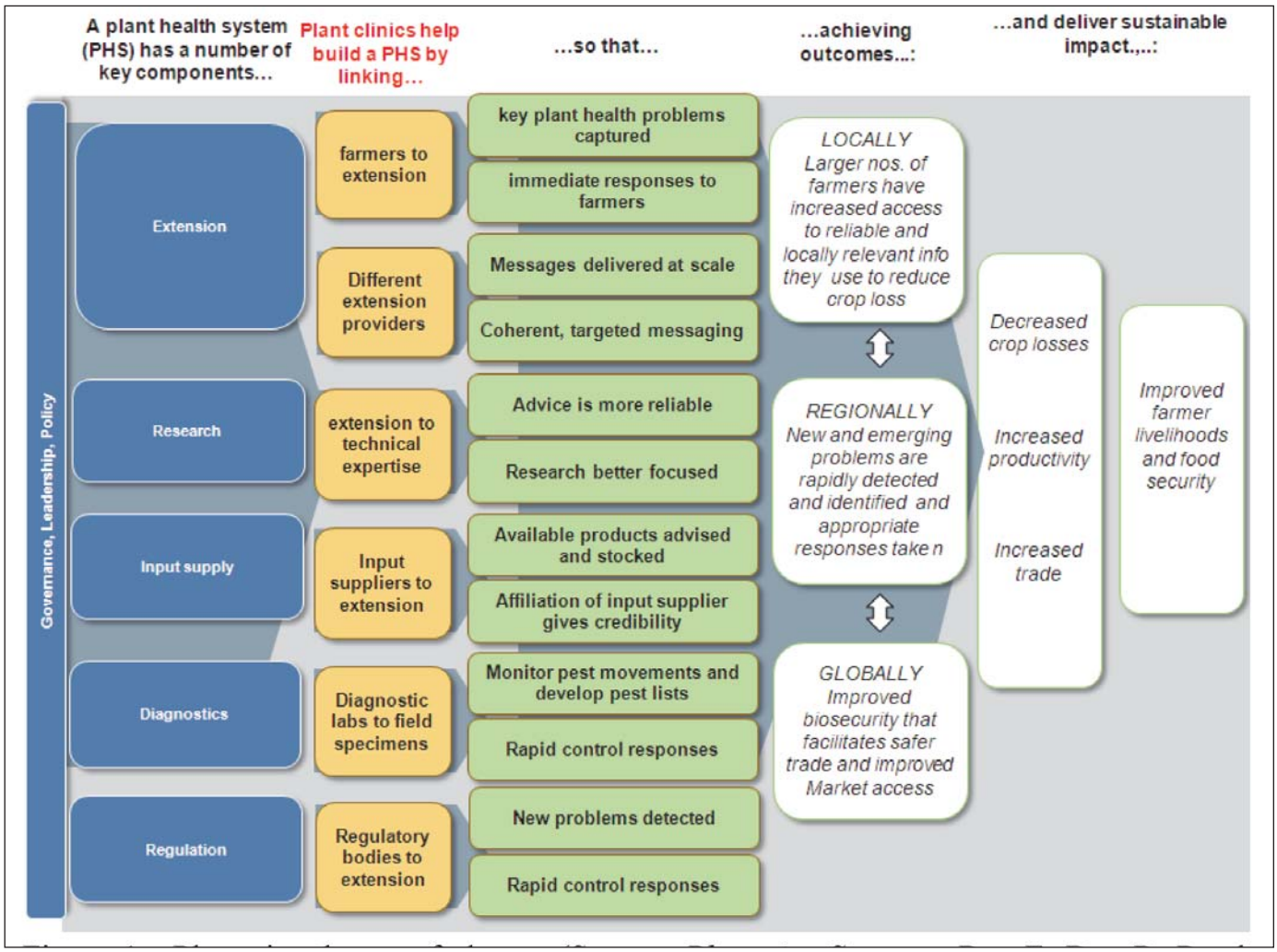

Figure 1: Plantwise theory of change (Source: *Plantwise Strategy*, Boa E, Day R, Reeder R, Romney D)

Practical approaches to innovation systems

One focus of innovation systems discourse concerns what aspects or characteristics of a system promote innovation, and the following eight generic features have been adapted from A Barnett (RIU 2009, Personal communication) and Jones *et al* (2009). We do not aim to assess the importance of each, but we illustrate each feature with practical examples from Plantwise that, in 2012, operated in 24 countries across Africa, Asia and Latin America.

1. *Using **system diagnosis** to understand the different actors, their interactions and power relations, and to determine constraints and identify opportunities*

When a country joins Plantwise and begins piloting plant clinics, we start by talking to the various key actors, particularly in agricultural extension and plant protection, to develop an understanding of their organizational mandates, structures, capacities and activities. Table 1 lists some of the key public sector functions in the system and illustrates differences between countries that need to be taken into account if the overall plant health system is to be improved. Key challenges include:

- local provision of plant health advice may be under a different ministry from national extension policy;
- responsibility for plant health may be dispersed between various agencies and ministries; and
- mandates for specific functions may not be well defined.

2. *Recognising that the **institutional context** (local policy, culture, ways of working and social values) strongly influences behaviour and therefore innovation*

The institutional environment has a big effect on success of the Plantwise approach. In Nicaragua, Danielsen *et al* (2011) describe the difficulties of moving to a systems approach and cooperation amongst actor networks when innovation capabilities are weak. In Kenya the existence of the information desk initiative where extension workers already went to market places to deliver advice created fertile ground for introduction of plant clinics (Negussie *et al*, 2011). Culture and social norms in relation to gender can have a profound effect on agricultural innovation. Table 2 shows the proportion of men and women attending clinics in different countries. Women in Pakistan do not attend clinics and in Afghanistan rarely, while in Africa and the Caribbean differences are much smaller. In the Democratic Republic of Congo the large numbers of men reflect the fact that the clinics were associated with the collection points of a cacao export company and that men manage these cash crops.

Depending on who is making and implementing plant health decisions on the farm, such data can indicate the need to change the way plant clinics are run. In Bangladesh, for example, women previously elected as local ward representatives were trained as plant doctors, and ran clinics in the village rather

Table 1. Public sector responsibilities for some functions in plant health systems in Kenya, Uganda and Afghanistan
Source: Otieno W & Tumuboine E (Personal Communication); Faizi Z (Personal communication)

Function	Kenya	Uganda	Afghanistan
Public provision of plant health advice to farmers	Department of Extension Services and Training, Ministry of Agriculture Extension. (Extension will be decentralised under the new constitution)	Local government; National Agricultural Advisory Services (NAADS), an agency under the Ministry of Agriculture, Animal Industry and Fisheries (MAAIF)	Extension and Agriculture Development Directorate, under the Ministry of Agriculture, Irrigation and Livestock (MAIL)
Controlling outbreaks of migrant pests (eg locusts)	Plant Protection Services Branch, Ministry of Agriculture	Department of Crop Protection (DCP), MAAIF	Plant Protection and Quarantine Directorate (PPQD), under MAIL
Regulation of pesticides	Pest Control Products Board (PCPB)	DCP, MAAIF	PPQD, MAIL
Regulation of seeds, fertilisers	Kenya Plant health Inspectorate Services (KEPHIS); a semi-autonomous agency	DCP, MAAIF	Fertilizer by PPQD, MAIL Seed by Department of Seed, MAIL
Responding to new pest outbreaks	No individual organization has responsibility	National Agricultural Research Organisation (NARO); DCP, MAAIF	PPQD, MAIL
Pest surveillance	KEPHIS; Ministry of Agriculture; Kenya Agricultural Research Institute (KARI)	DCP, MAAIF; NARO; Universities	PPQD, MAIL

Table 2: Proportion of men and women attending clinics in different countries

Country	Women (%)	Men (%)
Democratic Republic of Congo	12.6	87.4
Pakistan	0.0	100.0
Sierra Leone	40.3	59.7
Trinidad and Tobago	41.9	58.1
Kenya	38.0	62.0
Afghanistan	0.7	99.3

than in market places and these clinics were more used by women. We continue to gather information on the gender dimensions of the relationship between plant doctors and their clients, as well as on how siting of plant clinics may interact with local cultural and social values.

3. *Facilitating **networks and linkages** between actors to provide channels for flow of information*

Linkages between actors can take various forms, but two-way information flow is critical. Different actors in plant health systems see clinics as providing a mechanism for both receiving and disseminating information (Table 3).

Digitising, validating, analysing and communicating information from plant clinics is a significant undertaking requiring activities by and linkages between a range of actors. In many countries we are only just getting to the stage at which these linkages are functional.

Figure 2: Plant Doctors Mohsini, Sharifa and Shagul, giving advice to farmers at a plant health clinic at Dokani village, in Bamyan District and Province, Afghanistan (Photo: Muhammed Faheem)

4. *Balancing the power relations between the **supply push** of the research community and the **demand pull** of the users of new knowledge*

Improving research-extension linkages and making agricultural research more demand-led have been elusive goals over several decades, and one component of the quest is mechanisms for expressing or assessing demand. Clinic records give an indication of the problems farmers face. Data from Uganda and Kenya show that because clinic clients "self-select" they are different to the general population, but that differences are small.

A corollary of supply-led research is that advice and advisory services are supply led, and many "projects" focus on a particular crop or even plant health problem; in contrast, advice given at plant clinics is clearly demand led.

Table 3. Actor groups' expectations of clinics as channels for improved information flow (summarized from various workshops)

Actor group	Clinics as a source of information	Clinics as a dissemination route
Extension	Understand crop pest and disease distribution in the country to drive extension campaigns	Deliver new extension messages
Research and training	Identify areas of research/training required on new or re-emerging plant health problems	Promote uptake of new technologies, research outputs
Regulation	Surveillance of pests; feedback on problems with inputs	Increase awareness and implementation of regulations
Agro-inputs	Confirm what problems farmers have; know what advice is being given and what products recommended	Promote correct use of quality products

Figure 3: Farmers visiting plant clinics with sick plant samples in a busy market of Ngoma district, Eastern zone, Rwanda (Photo: Negussie Efa)

*5. Strengthening **intermediaries** between the suppliers and users of new knowledge*

Intermediaries are not only passive channels for information flow; they need to find out what their clients (farmers) need, and search through existing and new knowledge to find options that best meet those needs. Plant doctors are intermediaries, and during training they are encouraged to become 'searchers' of information. When setting up clinics, relevant local information is collated from various sources, but access to information is also provided through the Knowledge Bank. Plantwise also builds capacity to create problem-specific fact sheets, one-page illustrated documents that describe in simple terms a plant health problem and ways in which it can be addressed. Dissemination materials are often written by researchers in language suitable only for other researchers, so validation by farmers is included in the process (Bentley *et al*, 2013).

Our theory of change (Figure 1) also envisages strengthening the capacity of other intermediaries in the provision of plant health advice to farmers. Knowledge Bank resources are freely available to all users, and include information from many sources. Information from the plant clinics should also strengthen the ability of intermediaries to provide relevant information at the right time. A sudden upsurge in enquiries about a particular problem could indicate the need for a complementary extension campaign reaching large numbers of farmers quickly with key messages.

*6. Creating **incentives** that motivate people and organisations to play their role in the innovation process*

The Plantwise approach appears to motivate plant doctors in several ways. Being able to provide better advice to farmers is satisfying, particularly when farmers provide positive feedback. Where extensionists have target numbers of contacts with farmers, plant clinics provide the mechanism and verification. At an organizational level, Plantwise supports extension services with tools and approaches that assist them to deliver on their mandates.

We also recognize the importance of organizational and individual incentives. At an individual level, this may involve including the running or supervision of plant clinics in job descriptions and performance contracts. Different ministry departments often compete for funds. As the capacity to analyse and use information from plant clinics develops, we anticipate there may be a need to formalize the different responsibilities among the different organisations involved.

*7. Using both **tacit knowledge** and **codified knowledge***

The Plantwise approach supports the use of tacit as well as codified knowledge. When training plant doctors, one emphasis is on enabling them to use the knowledge they already have. Much of this may be tacit, gained from years of experience, so the training helps them reflect on and evaluate such knowledge in making diagnoses of problems, and in providing recommendations to farmers. Through the collaborative development of fact-sheets by extensionists and farmers as well as scientists, codification of tacit knowledge is encouraged.

*8. **Experimenting** and investing in **learning**, so that individuals and organisations improve their performance through an evolutionary process*

Experimentation and learning are very much part of the Plantwise approach. Usually a few clinics are started to begin with, so that experience can be gained and reviewed by the various actors involved. Regular meetings of plant doctors from clusters of clinics are held, where they are assisted to critically reflect on how clinic services can be improved, including individual

performances. Analysis of clinic registers contributes to this learning, particularly in determining the extent to which doctors make good diagnoses and provide appropriate advice (Danielsen *et al*, 2012). National stakeholder forums provide for wider reflection, learning and decision making on implementation. In some countries, committees established from across the actor groups serve some of the functions of innovation platforms.

The Plantwise initiative itself is a product of experimentation and learning by CABI and its partners in the Global Plant Clinic (GPC). The GPC evolved out of a long-standing diagnostic and advisory service (Boa, 2009). Countries sent pest specimens, and received a diagnostic report with information on what to do about the problem. But it was realized that to increase the value of the service, the diagnosis and advice needed to be taken much closer to farmers. If there are clinics for sick people and sick animals, why not clinics for sick plants? Experiments with plant clinics in various countries found that not only were they a popular way of providing advice, they could also trigger wider changes in the way plant health services were delivered (Danielsen *et al*, 2011).

Conclusions

Thus Plantwise now has much wider system-level objectives than when plant clinics were first started. We have learnt a lot about how to set up and run plant clinics, but we still have much to learn about how they can stimulate and catalyse the whole system. Perspectives from innovation systems approaches, and working through what these mean at a very practical level, is helping us in the journey. We continue to experiment, evaluate and apply what is learned.

Acknowledgements

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References

Bentley J, Boa E, 2013. The snowman outline: fact sheets by extensionists for farmers. *Development in Practice* (in press).

Boa E, 2009. How the global plant clinic began. *Outlooks on Pest Management* **20**, 112-116.

Danielsen S, Centeno J, Lezama L, Varela G, Castillo P, Boa E, 2011. Innovations in plant health services in Nicaragua: from grassroots experiment to a systems approach. *Journal of International Development* 23. DOI: 10.1002/jid.1786

Danielsen S, Matsiko F, Mutebi E, Karubanga G, 2012. Second generation plant health clinics in Uganda: measuring clinic performance from a plant health perspective 2010-2011. Work Paper 2. Centre for Health Research and Development, Faculty of Health and Medical Sciences, University of Copenhagen, Denmark, 68 pp. http://curis.ku.dk/ws/files/38142206/Second_generation_plant_clinics_in_Uganda_2010_2011_Work_Paper_2.pdf

Danielsen S, Boa E, Mafabi M, Mutebi E, Reeder R, Kabeere F, Karyeija R, 2012. Using plant clinic registers to assess the quality of diagnoses and advice given to farmers: a case study from Uganda. *Journal of Agricultural Education and Extension* DOI:10.1080/1389224X.2012.741528.

Hirvonen M, 2008. A tourist guide to systems studies of rural innovation. LINK Policy Resources on Rural Innovation Series No. 1 http://innovation-studies.org/index.php?option=com_content&task=view&id=261

Jones N, Romney D, Jones H, Walden D, Mitra S, Neggusie E, Fish J, 2009. Conceptual review on innovation systems approaches and their use in understanding pro-poor innovation in the renewable natural resources sector. *Report to Research Into Use* (RIU) Programme. London: ODI.

Negussie E, Karanja P, Day R, Romney D, Reeder R, Boa E, Muriithi C, Kamau R, Phiri N, Danielsen S, Murage N, Gitare I, Wanjiku R, Mutisya J, Ngige D, Kimani M, Festus W, 2011. The role of plant health clinics towards meeting the needs of smallholder farmers for advisory services: experiences from East Africa. *A paper presented to the International Conference on Innovations in Extension and Advisory Services*. Nairobi, Kenya, 15 – 18 November, 2011.

Oerke E-C, 2006. Crop losses to pests. *The Journal of Agricultural Science* **144**, 31–43.

International Agricultural Research News

Innovation systems

Since its inception, the international agricultural research system has been concerned not only with the development of new technologies and policies, but also with the process of innovation itself. In the early 1970s, several CGIAR centres, as well as other international institutions such as the Centro Agronómico Tropical de Investigación y Enseñanza (CATIE) in Costa Rica, pioneered the development of farming systems research methods. As a result of this, and the subsequent work on participatory research methods carried out over the following three decades, the centres have remained at the forefront of international efforts to understand, develop and strengthen rural innovation systems.

Recent years have seen these efforts expand considerably to embrace not only innovation systems in agriculture but also in forestry and fisheries. Most of the 16 CGIAR Research Programmes (CRP), all of which have now been approved for funding by the Fund Council, include active engagement with local communities in the setting of research priorities as well an in the research itself and the wider dissemination of the results. Many new approaches are being investigated including the establishment of learning alliances, the elaboration of participatory monitoring and evaluation methods, and the development of multi-stakeholder innovation platforms. Indeed, a very broad set of methodologies is being explored, often grouped together under the general term "Participatory Learning and Action".

Following are just two recent examples of ways in which international research is helping to develop and strengthen innovation systems:

- ***Site-Specific Agriculture Based on Farmers Experiences (SSAFE)*** is a ground-breaking project that is being led by the Centro Internacional de Agricultura Tropical (CIAT) together with the Colombian fruit and vegetable growers' fund (Fondo Nacional de Fomento Hortofrutícola - FFNH). Less than 15% of the growers of avocado, citrus, mango and plantain in Colombia can be classified as highly productive, with a large majority of the rest producing relatively meagre yields. Recognizing this, a project was set up to try to understand why it is that some farmers are so much more productive than others and to make this knowledge available to all. The project involves many growers – some 4,000 are currently enrolled - who use a standardised methodology developed by the SSAFE team to collect a range of data on their soils, weather, management practices and crop yields. The data are pooled and analysed using state-of-the art analytical techniques to detect significant patterns and relationships among the somewhat messy data. This enables the best growers to be identified together with the specific circumstances and practices that make them successful. The information and knowledge generated is then made widely available to farmers, extension agents and farm advisers. A web portal is currently being developed through which the farmers can record their experiences and access processed information and decision support tools. The SSAFE researchers consider this novel approach to be particularly useful in situations where more conventional research methods may be too expensive.
- ***Participatory video production*** has been used in a project in Ethiopia to promote better communication between local communities and policy makers. The Nile Basin Development Challenge (NBDC) project, funded through the CRP on Water, Land and Ecosystems, is working with innovation platforms in the Ethiopian highlands to help improve rural livelihoods through a better management of rainwater. The platforms bring together a range of stakeholders to collectively identify technical and institutional challenges, enhance communication and plan joint action. Participants include members of the local government administration, Bureau of Agriculture, national research institutes, local NGOs and community leaders. While overall the platforms are considered to be effective, it is widely felt that the local communities do not have a strong enough voice. Thus, in order to strengthen their participation, the project has provided funds to enable three community groups to work together to make a video as a tool to bring local issues to the attention of policy makers. The resulting video, *'A Rope to Tie a Lion'*, captured the views and concerns of the communities, focussing on grazing practices, water stress, and soil and water conservation. The video was positively received by members of the innovation platform and, in discussion with community members following its screening, it was agreed to conduct a series of trials to explore ways of overcoming the issues raised. For example, to address concerns over land degradation resulting from unrestricted grazing, several pilot enclosures were established together with back-yard fodder production systems. While it is early days yet, it appears that participatory video production could contribute significantly to improving communication between local communities and researchers, planners and policy makers.

The agenda of the international agricultural research system is likely to continue to include innovation systems among its priorities for some time to come. As David Spielman, a Senior Research Fellow at the International Food Policy Research Institute (IFPRI) in Washington DC points out: "When trained with an eye to innovation systems thinking, the scientist is better able to conceptualize a path from scientific discovery to technology development to product delivery and, ultimately, to outcomes and impacts that improve people's livelihoods." However, he also notes: "Of course, innovation systems thinking is not a substitute for good science. We need much greater investment in the agricultural sciences - solid, rigorous

research grounded in the biophysical and social sciences. Innovation systems thinking should be used to help prioritize how we invest strategically in these areas of science."

Situation at ICARDA

Dr Mahmoud Solh, Director General of ICARDA, has provided the following update on the situation in his centre: "The ICARDA Board has decided on Lebanon to be our temporary headquarters, based on the host country agreement we have had since 1977 and the Terbol and Kafardan Research Stations. However, our expatriates are stationed all over the region depending on where they can be most effective and we are working now on a medium and long term decentralization strategy to be considered and approved by the Board next April."

Geoff Hawtin

Newsflash

UN Climate talks, Doha

It would be pardonable to expire a sigh of resignation as we contemplate the glacial pace of the latest in the 20 year history of climate talks. The Doha talks (completed on 8 December 2012) marked the end of the original commitment to the Kyoto protocol, and one of the positive outcomes of the talks has been that a second period of the protocol has been agreed until 2020. Fewer countries are signed up to this extension (Canada and Russia are notable exceptions, and of course Kyoto has always been cold-shouldered by the US) but at least emissions control is still on the agenda. Sadly, we are still far from reaching global consensus on GHG emissions, even though we are now heading for anything up to a 6°C rise in temperature by the end of the century. To paraphrase environmental activist George Monbiot, a four, five or six degree warming is now predicted for this century by 'green extremists' like the World Bank, the International Energy Agency, and Pricewaterhouse Coopers. Last year, the Durban talks (see *Ag4Dev 15*) agreed to keep talking about global action in preparation for a new international agreement to be reached in 2015; and meanwhile the problem continues to grow.

Despite Hereward Corley's thorough and informative analysis of the climate change situation (*Ag4Dev 16* and *17*), there is still enough climatic chaos to be deeply worrying, with drought in the US, floods in Europe, melting Arctic ice and hurricane Sandy the 'perfect storm'. I tend to side with New York Mayor Michael Bloomberg who, when faced with the evidence of climate change raising sea levels, warming oceans and producing higher energy storms said, 'Our climate is changing and while [Sandy] may or may not be the result of it, the risk that it may be should be enough to compel immediate action'.

In Doha, representatives from 195 countries met to consider the impacts of climate change and to inch towards agreement on global action. But, in the meantime, some of our political leaders would have us believe that we must not, after all, jeopardize our national fights for economic growth by controlling GHG emissions and conserving natural resources. Hydraulic fracturing, or 'fracking', of shale rock is to be the next wheeze being dreamt up.

The indications for achieving a globally acceptable energy production policy that recognizes the necessity of reducing dependence on fossil fuels are, as is sadly usually the case, not encouraging. But it is essential that we achieve such an agreement if we are not to exceed the limits outlined by Mark Lynus in his book The God Species. Lynus clearly indicates that CO_2 emissions in excess of 450 ppm will lead to at least a 2°C rise in global temperatures. At our present rate of increasing coal-fired power generation, we are inexorably ramping up global CO_2 emissions (a 3% increase in 2011 alone). Some countries, like Germany, show that the transition to renewable energy is possible if undertaken as a result of rational policy implementation. In fact, Europe seems to be on track to cut GHG emissions by 20% by 2020. Without controls, however, the global trend is the other way, with China and India industrializing on the back of fossil energy.

In conclusion, it can be said that, as is usual with UN Climate Talks, all is not lost and some agreements were rescued from the Doha meeting. Poor countries now have a pledge that they will be recompensed for the loss and damage that they have incurred from climate change effects induced by rich industrialized countries. There are still many details to address, such as who will administer the new fund, and will it be 'new' money or subtracted from current aid budgets. These and other questions will be the subject of fierce debate at the next annual conference in Warsaw.

Brian Sims

Bookstack

Agricultural Innovations in Sub-Saharan Africa - Experiences from Multi-stakeholder Approaches
Adekunle AA, Ellis-Jones J, Ajibefun I, Nyikal RA, Bangali S, Fatunbi O, Ange A, 2012

Forum for Agricultural Research in Africa (FARA), Accra, Ghana
151 pp. www.fara-africa.org
ISBN 978-9988-8373-2- 0 (print)
ISBN 978-9988-8373-2-4 (pdf)

Two types of innovation are encompassed by the title: (1) the outputs of new agricultural research and (2) an innovative methodology for clarifying the optimum context within which research results are most likely to be adopted and applied. The latter is the subject of this book, which is a well-written, informative and encouraging report on the results of FARA's investigations into the use of the Integrated Agricultural Research for Development (IAR4D) approach for enabling research to have greater effects in improving rural livelihoods and quality of life in Africa.

The approach has been under test in eleven countries across three pilot regions (East, West and Southern Africa), by means of 21 case studies across a range of topics concerning agricultural development. Problems and potentials were identified and discussed by a total of 36 'innovation-platforms' of stakeholders – including, as appropriate, policy-makers, researchers, operational project personnel, civil society organisations, farmers and private agri-business groups who showed capacity and willingness for mutual co-operation. Topics included the husbandry of crops, land, and livestock, marketing, building public/private partnerships, development of pilot learning sites, and others. Participants developed proposals for engendering 'environments' which would be conducive to people making more-effective use of research products.

Each chapter is arranged into a standard sequence of sub-headings, which allows easy cross-comparisons between case-studies. The conclusions from the comparative analysis of them at the end are insightful and supported by clear tables, bar-charts, diagrams, and references.

FARA is to be congratulated not only on promotion of IAR4D and the participatory work of the Innovation Platforms by which its effects are evaluated, but also – together with the book's authors – on the production of this report with the cross-cutting insights and positive validations which it provides. The document merits being read by a wide range of those interested in both the development of progress and the progress of development.

This book also has striking relevance to solving various problems of agricultural development, in the same broad regions of Africa, mentioned in the recent book *'What is the matter with African Agriculture?'* (Mutsaers HJW & Kleene PWM, eds, KIT Publishers, Amsterdam, 2012).

Francis Shaxson

One finger cannot lift a rock - Facilitating innovation platforms to trigger institutional change in West Africa
Nedlorf S & Pyburn R eds, 2012

KIT Publishers, Amsterdam
ISBN 9789460221972
Paperback, 142 pages, €25.00

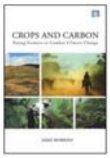
Innovation and institutional change are often the result of stakeholder interaction and concerted action. But interaction and concerted action do not just happen. They require stimulation and facilitation. Innovation platforms bring stakeholders together with that aim, and a facilitator guides the process. This book looks at the experiences of nine such facilitators.

The research programme Convergence of Sciences – Strengthening Agricultural Innovation Systems in Ghana, Mali and Benin (CoS-SIS) explores and experiments with new pathways for agricultural innovation. It has put in place innovation platforms – referred to as 'Concertation and Innovation Groups' (CIGs) – for a variety of sectors: water management and rice, oil palm and cotton in Benin; oil palm, cocoa and food security in Ghana; and crops and livestock, water management and shea in Mali. The programme aims to enhance institutional change through these CIGs.

In this book, West African research associates from the CoS-SIS programme describe how they initiated innovation platforms and facilitated the different steps in a CIG cycle. The stories show that the facilitation of innovation platforms is not easy: it requires specific skills and a lot of time, and is very much determined by the context. But they also illustrate that there are creative ways of dealing with the challenges and unpredictable situations that facilitators face.

The book is written for development professionals who are in a similar position to the CoS-SIS research associates, individuals and organizations involved in facilitating multi-stakeholder processes and building partnerships, and students and professionals in the field of innovation, institutional change and agricultural services. Readers will recognize their own challenges in facilitating innovation and can draw lessons from the experiences reflected here.

Publisher's Book Notice



Crops and carbon: Paying farmers to combat climate change
Mike Robbins, 2011

ISBN: 978-1-84971-375-7
Hardback, 300 pages, £49.99
Routledge, London

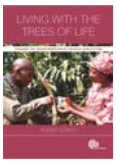
All but the most resistant climate sceptics now recognise that emissions of greenhouse gases are warming our planet, and leading to climate change in dangerous ways. The longer we wait to take measures to curb such emissions, the harder and more expensive it will be, and the greater the damage incurred. It is also clear that there is no single technology or sector which will get us out of trouble. The agricultural sector and patterns of land use play a big role in generating emissions of carbon, methane and nitrogen, reckoned at 30% or more of global emissions, so there is much potential to harness the land use sector.

Soil carbon is important stuff to understand. Any gardener knows the importance of building up mulch for getting chrysanthemums to bloom and harvest prize marrows. Careful management of soils to replenish those that are carbon poor and add to organic matter could offer a major contribution to absorbing carbon from the atmosphere and stemming

losses from land use. We need to find ways to understand better how soil carbon works, the flows into and out of the soil, as well as how to monitor and measure these flows. This would allow farmers and other land users to be rewarded for providing valuable carbon services from their land.

This book provides a clear, well-presented case for investing in soil carbon, its measurement and management. Recognising the complex and diverse settings in which farming operates, it takes an in-depth look at the Atlantic forest zone of Brazil, to see how it might work in practice. The author shows how prospects for adoption of improved farming methods that conserve carbon are highly dependent on context, especially on landscape, soil type and labour availability. Payment mechanisms need to recognise this diversity and address the high transaction costs of rewarding millions of small farmers for how they manage their land. Monitoring of changes in land use practice makes more sense than trying to measure actual shifts in carbon content. A comprehensive bibliography makes this book an excellent first step in understanding why carbon management cannot ignore soils and the farming sector.

Camilla Toulmin



Living with the Trees of Life: Towards the transformation of tropical agriculture
Roger Leakey, 2012

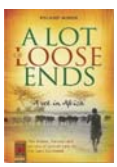
CABI, Wallingford, Oxfordshire
ISBN 9781780640983 (PBK)
200 pages, £27.50

This is Roger Leakey's first-hand account of how agroforestry has the potential to redress many of the wrongs that have been inflicted on smallholder farmers in developing countries. The goal is to restore their food sovereignty and security and to bring them into the global market on their own terms. Thirty years of experience are packed into the story and there are accounts of an array of soil and water conservation possibilities for trees from alley cropping to improved fallows to hillside contour barriers, fertilizer trees and much more. The *Trees of Life* of the title are indigenous species producing multiple useful products which poor smallholder farmers can incorporate into their multifunctional agroforestry systems. One example is *Garcinia kola* which provides, *inter alia*: bactericidal twigs to be used as toothbrushes; nuts to cure bronchial infections; fruit flesh used as a purgative; bark for leather tanning; gum to cure gonorrhoea; latex for cuts and wounds; and sap for skin diseases and parasites.

Trees on farms not only provide fuel, wood, food, medicines and timber, but they also provide environmental services such as shade, wind protection, erosion control and soil fertility maintenance. For these reasons, the book explores the ways and means of selecting the best ('plus') trees and the methods of vegetative propagation and multiplication. It is the ability to propagate 'plus' trees vegetatively that is the key to enriching agroforestry systems and opening up opportunities for generating income from village-level tree nurseries. The book goes to great lengths to give case studies and to discuss the need for good marketing strategies for tree products which safeguard the interests of smallholder farmers, who need to be protected against biopiracy and its subsequent unfair competition. It would, for example, be grossly unfair for a company to recognize the potential in a particular agroforestry product and then to develop monocultural plantations in a location with a similar climate, but no law would prevent it at the moment. Fortunately, ethical approaches are being seen as good business by some multinational companies; the case of Brazilian-built Mercedes cars is one positive example which shows how the production of materials for incorporation into cars through small-scale agroforestry is feasible and profitable for all.

There are now 1.2 billion smallholder farmers incorporating agroforestry in their production systems and, by doing so, are increasing the number of trees in the environment with all the attendant benefits that this implies. If, as seems likely, agroforestry can contribute to the necessary goal of doubling food output for the planet's predicted population increase, using far less water, less land, less energy and less fertilizer, then this richly informative and thought-provoking book points the way.

Brian Sims



A Lot of Loose Ends: A vet in Africa
Roland Minor, 2013

ISBN 978-1-909304-72-7
Paperback, 368 pages, £12.99
Memoirs, Cirencester, UK

I have no hesitation in giving this book a clean bill of health. It is a most enjoyable read and is well and concisely written with a balanced mix of anecdote, science and some fascinating historical references (for instance, that David Livingstone on one occasion had watered his oxen on water melons). With its breadth of knowledge and experience, the author's professional life has clearly been a strong thread in the rich tapestry of tropical veterinary medicine.

His Argentinean origin, twinship, a bitter winter in England, a Polish bacteriologist, infection with bovine tuberculosis all played crucial roles in Roland's life. His arrival in Uganda at a critical time, soon after independence, offered great opportunities, which he seized avidly, and his descriptions of the ethnic complexities of Karamoja and surrounding areas are of great interest.

What is apparent, time and again, whether controlling contagious bovine pleuropneumonia (CBPP) and East Coast Fever (ECF) in Uganda, rinderpest in Ethiopia, Foot and Mouth Disease (FMD) in Botswana and UK, tuberculosis in UK or rabies on the Kenya coast, is how politics, national, local and organisational, can conspire against the application of veterinary science in disease control. The author's trenchant views come over loud and clear, as they do also in relation to the aid industry, with particular reference to FAO, WFP and the World Bank. If there is a criticism, perhaps he dwells a little too much on his dissatisfaction on certain individuals, such as an odious line-manager in South Sudan.

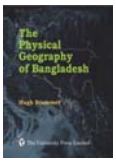
He describes well his particular experiences of tick-borne diseases (especially ECF), canine rabies and heartworm, ear worms in cattle, avian flu, CBPP, FMD, and rinderpest control. He even covers the trade in astrakhan in Botswana.

There is humour too: men in Holy Orders pragmatically confusing celibacy with chastity and infuriating dog owners. Not many veterinary people have lived to tell the tale of their own hound retrieving an emperor's pet toy lapdog, or gained the ear of a president at a cabinet meeting!

His training alongside medics bore fruit later on when he had to step in on occasions as obstetrician and licensed circumciser (scalpels proved safer than broken beer bottles).

I recommend this book not only to animal health professionals but to all with an interest in Africa and development in general.

Tim Fison



The Physical Geography of Bangladesh
Hugh Brammer, 2013

The University Press Limited, Dhaka 548 pages, Tk2050 (overseas US$72)
ISBN 978 984 506 049 3

In his eighth book on Bangladesh's physical environment and agriculture, the author draws together his long experience in surveying, observing and studying the country's physical geography and provides a revised map of the country's physiographic regions. He draws attention to the interrelationship between geomorphology and soils, and to the country's dynamic geomorphology, particularly changes in river courses and the impacts of earthquakes. Chapters 1 – 6 give a comprehensive description of Bangladesh's geology, geomorphology, climate, hydrology and soils. They provide the background for the detailed descriptions of the 18 physiographic regions in Chapter 7–24. A novel feature is a concluding section in each of the latter chapters suggesting further studies that could be undertaken to provide more detailed information on each region's geomorphological development. Chapter 25 compares the units shown on the geological map of Bangladesh and those on the physiographic map in this book. Differences in interpretation of the field evidence are discussed, especially in relation to the origin of the Madhupur Clay and the soils formed over it.

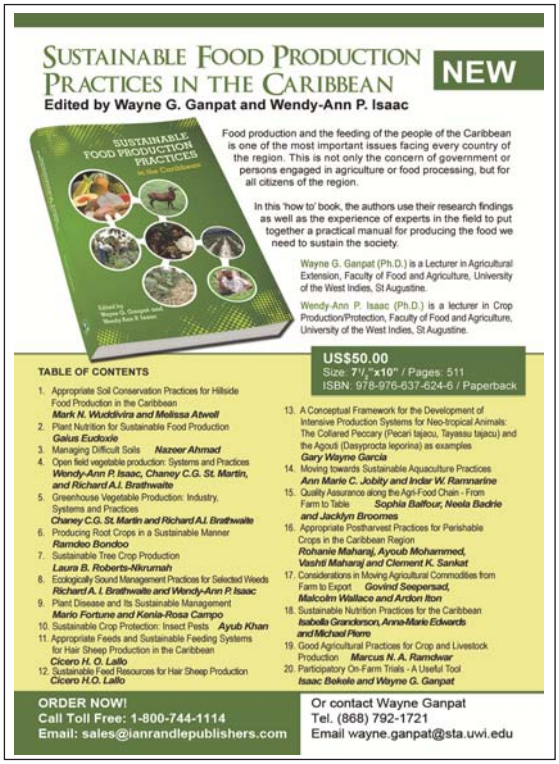
Publisher's Book Notice

Amazon Forest and Savanna Lands: A guide to the climates, vegetation, landscapes, and soils of central tropical South America
Thomas T. Cochrane, Thomas A. Cochrane, 2011

CreateSpace, 190 pages, US$49
ISBN/EAN13:1452866376 / 9781452866376

This book provides an overview of the land resources of the Amazon in terms of the complex of climates, landscapes, vegetation and soils found throughout this vast, often misunderstood region. It has been prepared for a broad audience of scientists, agronomists, foresters, farmers, ecologists and also administrators. The study is partly a sequel to the original Land Systems study of the region carried out by the senior author between 1976 and 1980 that was published with the title 'Land in Tropical America'; however it includes a wealth of interesting information from subsequent studies conducted by the authors over the past 30 years. Apart from the additional detailed land resource studies of Amazonia summarized in the book, it provides a fresh and novel insight into the ecological complex of forest and savanna lands throughout the region. Further, it includes a broad range of technical information of importance to the study and understanding of tropical lands in general.

Abbreviated from the publisher's book notice



A full review of this book will be included in the next issue of *Agriculture for Development*

Newsflash

Cambridge Conservation Forum (CCF) Symposium 2013

The 14th Annual CCF Symposium, held at the Judge Business School in Cambridge on 10 January, was a great success. Presentations covered a wide range of subjects from ecosystem services, progress on the Convention on Bio-Diversity, conservation and mining in Madagascar, marine conservation, business leadership, climate change and conservation agriculture. The latter was presented by Brian Sims of TAA under the title '*Conservation Agriculture for smallholder farmers in developing countries*' and generated a lot of interest from participants (interest which he is still following up), see http://www.taa.org.uk/content.asp?menuId=79. Lively interactive sessions discussed future activities for the CCF and enabled people to get to know each other. TAA members involved, apart from Brian Sims, included Toby Gardner who chaired the opening session and Keith Virgo who was a facilitator at an interactive session. Also present was Garry Robertson and Brian's wife Veronica, but Lin Blunt unfortunately could not attend due to illness. The event raised the profile of TAA and also established links with individuals who expressed interest in participating in future TAA events.

The next Summer Symposium is set for 26 June 2013 and the 15th Annual Symposium for 9 January 2014.

Keith Virgo

Rural-urban linkages in development: Is strengthening agriculture the best way forward? A case study from Guatemala

Ioulia Fenton

Ioulia Fenton, a former TAAF awardee, holds a Distinction in the MSc Development Studies from the School of Oriental and African Studies (SOAS), University of London. She has lived and worked in Thailand, Bolivia, Guatemala and Nicaragua and is now heading up the food and agriculture research stream at the Centre for Economic and Environmental Modelling and Analysis (CEEMA) at Bolivia's Institute of Advanced Development Studies (INESAD). She will begin her PhD studies in Autumn 2013.

Introduction

When it comes to international aid work, most theorists and practitioners specialise in either 'rural' or 'urban' development. But is the distinction between the two really quite so simple and if it is not, then what is the reality, how did it come about and what does it mean for people's lives?

These were broadly the questions I set out to investigate in the summer of 2011 during four months of fieldwork for an MSc in Development Studies supported by an award from TAAF. The research was conducted in the city of Sololá, the capital of a municipality and department of the same name in the Western Highlands of Guatemala. In particular, I chose to explore the existence and effects of rural-urban linkages on livelihoods and food security of the country's poor.

Box 1: Food Security

Food Security exists "when all people, at all times, have physical and economic access to sufficient safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life" (FAO, 1996). It depends on availability and stability of access to, and correct usage of, a healthy, culturally appropriate food supply.

Rural-Urban Linkages Approach

The rural-urban linkages approach to development has come about as a result of widespread observations of the changes occurring in developing countries. Firstly, what constitutes a rural or urban area has been increasingly difficult to define as national population-based definitions fall redundant. For example, it is widely cited that Latin America has undergone rapid urbanization and is now 75% urban. Yet, as Chomitz & Thomas (2005) showed, on closer inspection 45% of the people in that category live in low density places within an hour of urban centres and many of even the most clearly 'urban' residents and their 'urban' locales are embedded in an agriculturally-based countryside (see Box 2 for the Sololá example).

Secondly, people's work no longer fits into neat categories of being entirely rural or urban. People have diversified their livelihoods into a variety of urban and rural activities in order to manage risk and seek out alternative income streams in the face of poor access to land and diminishing, and increasingly unstable, farming incomes that render subsistence-agriculture and agricultural day-labour insufficient food security strategies. Meanwhile, peri-urban food production and growing urban agriculture have emerged as strategies for food security, whilst growing rural-urban and international migration over the last few decades has ushered in an unprecedented growth of remittance flows.

Proponents of the approach recommend strengthening linkages to enhance development and food security efforts. This can be done through: infrastructure and communications development to facilitate spatial flows of goods, knowledge, money and people (within and across borders); decentralization of government to improve linkages in service delivery; and combining rural and urban development plans to facilitate forward and backward sectoral linkages between agriculture and more urban industries.

Box 2: The Urban City's Rural Face

Like all municipal capitals in Guatemala, the city of Sololá is considered 'urban' by the national statistics office with the latest official population being 68,120 people. Whilst this figure would 'feel' far too large to any visitor, warranting further investigation, it builds a certain image in the mind of a distant reader. Imagine the difference in analysis and policy recommendations if one was told that in fact only 8,851 (barely 13% of the official figure) people actually reside in what can be deemed urban spaces.

National statistical classification is not the city's only rural-urban misconception. Walking around the city reveals that even the lives of the city's urban residents are steeped in rural activities, whilst its outer edges are embedded in an agricultural countryside. It is not uncommon, for example, to see chickens, geese and turkeys in backyards and on rooftops. Meanwhile, the city's built-up southern edge is buffered from the lakeshore by a couple of hundred metres of small family plots and an occasional grazing cow, whilst to the north, just as rapidly, a concrete cityscape makes way for a patchwork of fields of corn planted on steeply sloping, marginal cliffs. The residents of the city maintain agricultural activities in the belly of the beast, whilst in all directions from the centre a few steps can, in an instant, transport you from 'urban' to 'rural', blurring all definitions and divisions in a complex hybrid space.

The study

My research was carried out using a mixed-methods approach including: participant observation; community focus groups; semi-structured interviews with market vendors, wholesalers and customers, designed using the DFID sustainable livelihoods model in order to incorporate the different forms of capital that affect people's lives (human, natural, social, financial, political); food frequency questionnaires; and interviews with expert informants ranging from FAO Directors to senior representatives of NGOs, hospitals and local government departments.

Guatemala is a middle low-income country with a large rural (65%) and indigenous (40-60%) population who face a myriad of challenges. Despite steady GDP growth, (ranging between 2.3% and 6.3% per year with the exception of 2009 when it grew only 0.55%), according to the World Bank, half its people are poor with 72% of rural and 76% of indigenous populations living below the poverty line. Eighty seven percent of the rural Guatemalan poor are estimated to depend on agriculture either as subsistence farmers or agricultural day labourers. Despite overall food availability, it suffers the world's fourth highest child chronic malnutrition rate of 43.3% (greater than most sub-Saharan African countries) and is currently in the grips of an acute food security crisis. In addition, at 29%, it suffers very high adult obesity and overweight rates, primarily among the urban poor, due to over-consumption of "junk foods", resulting in substantial and increasing risk and occurrence of heart disease and diabetes.

Most relevant findings

Even though Sololá is considered an urban city, the lives of Sololátecos are found to be steeped in rural and agricultural activities (Box 2). Despite living in the city, most people retain rural links either through extensive urban agriculture or through ownership of farmland outside the city. Such activities have been found to have positive effects on dietary diversity and food security of Guatemala's urbanites (Zezza & Tasciotti, 2010).

Figure 1. Women cooking corn tortillas in the market

Although over eighty percent of study participants owned farmland, none owned enough to meet family subsistence needs (86% owned 10 acres or less). Many complained that the land does not produce enough for the family, so they buy much of their food in the market. Some 62% of rural residents and 70% of urban dwellers drew no cash income from their land at all, growing mainly maize and beans (the country's staples) for family consumption. All families had diversified to non-farm income to meet their other needs, as one lady explained: *"Right now I have a thousand occupations and work in many different places, we do what we can to get food"*.

Depending on educational levels, these occupations include: agricultural day labour, making and selling traditional clothes and jewellery, logging, construction work, running small refreshment stalls (Figure 1), teaching and domestic work. Importantly, these have the effect of connecting rural residents to urban spaces and vice versa.

Figure 2. An intermediary fruit retailer

Vitally, whereas previous research of Guatemala's regional markets (Murakami, 1997) found them to be dominated by farmers selling their own produce, today, Sololá's market is comprised mainly of intermediary sellers (Figure 2), which could be seen as a livelihood 'specialisation' strategy dividing people into either producers or sellers of agricultural produce, rarely both. They buy goods from local wholesalers, who in turn buy from national and regional wholesalers who buy at the farm gate. They travel great distances (up to five hours each way) to sell at different large regional markets six to seven days a week. Tracing the supply chains of different fruits, vegetables and animal products shows that they have significantly lengthened in less than two decades, so much so that any given product exchanges hands up to five times before it reaches the consumer.

What is interesting about the narratives of Sololátecos is that much of their livelihood diversification and specialisation has not come about as an income accumulation strategy, but rather as a coping mechanism to deal with several agricultural push factors:

1. Shortages of land due to historically vastly unequal land distribution that began with dispossession through colonization and continues to date (0.2% of powerful elites control 70% of arable land), confounded by high rural fertility rates of up to 15 children per couple (Box 3) that decrease inter-generational inheritance.
2. Declining land productivity due to the chemical treadmill of increasing dependence on expensive inorganic fertilizers set in place during the Guatemalan Green Revolution and exacerbated by widespread soil erosion.
3. Reducing profitability of agriculture, since agricultural wages have remained stagnant despite a generally rising GDP, whilst the costs of imported agricultural inputs have increased, with biggest jumps experienced during times of economic shocks such as the current global crisis.
4. Increasing risks associated with agriculture as an income source since Guatemala is subject to unpredictable weather

patterns: huge agricultural and infrastructure losses were incurred during hurricanes Mitch (1998) and Stan (2005), the 2009 El Niño, and hurricane Agatha (2010), to name but a few.

Livelihood diversification has not led to any great improvements for Sololátecos; according to USAID, 64% of the department's children are chronically malnourished, while 28.6% of its men and 46.6% of women are obese with 70% of adults exhibiting symptoms of diabetes (Monterroso *et al*, 2002).

Box 3: The "Ruralisation" of Guatemala

According to the UNDP, the rural indigenous Guatemalans are reproducing at twice the ladino (white or mixed-descent) rate, essentially compensating for any rural to urban migration. There are signs of this slowing, however, since the average number of siblings in the study was 7.24, but an average number of children among those who had finished reproducing was only 4.90 (N=30).

What does this mean for policy and practice?

The majority of the literature argues for the need to enhance rural-urban linkages in order to facilitate income accumulation and, thus, support people's livelihoods and ensure food security. Such generalisations are unhelpful in practical contexts and the broad-based recommendations can engender more harm than good. Local investigations are vital and whilst many government departments, NGOs and donor groups still work on Guatemala's 'rural development', rural-urban linkages remain an uncharted territory. The research at hand was an attempt to begin to bridge that gap. Whilst a comprehensive land reform that addresses the vast inequalities in, and concentration of, land ownership would be the most effective way to begin to alleviate the poverty and malnutrition problems of Guatemala, the findings point to some useful practical possibilities for micro-level intervention. Six of the most relevant to readers of *Agriculture for Development* are addressed as follows.

1. Time and resource constraints prevented an investigation of the effect of the growth of commodity supply chains on the value that each actor along the chain is able to extract. However the possibility exists that interventions to better link farmers directly to urban and peri-urban markets and improve their financial lot at the farm-gate could be warranted. The supply chain requires further investigation without a pre-determined assumption that the intermediary traders are inherently exploitative; the observed specialisation in producing and selling has obviously created viable self-employment for the intermediaries and may have created more wealth all around.
2. The most common preservation activity in Guatemala is the drying and salting of fish, shellfish, grains, legumes and spices. Surplus fruit and vegetable conservation, however, is non-existent though the country enjoys plentiful strong sunshine and clear blue skies. Projects teaching families or cooperatives simple drying methods for pineapples, mangos, tomatoes, peaches and the like, that allow the foods to be preserved refrigeration-free for up to a year, could be highly beneficial in terms of managing seasonal shortages (thus improving food security), reducing food waste and preventing end-of-harvest fire sales, thus ensuring more income through a higher value product (for sale domestically or internationally).
3. Similarly, many agricultural projects in Guatemala promote the sale of raw produce rather than higher-value added, processed goods. As the Director of the Guatemala Ministry for Agriculture said, for poverty reduction and food security enhancement, urban-like processing facilities need to come to rural Guatemala to encourage local production of expensive products such as soy, conserves and jams, tinned sauces, fruit and vegetables. Projects injecting valuable financial and knowledge resources to such initiatives could thus be vastly beneficial.
4. Projects aiming to strengthen both rural and urban agricultural production would be one of the keys to better livelihoods and to ensuring food and nutritional security. For this to work, investments are needed in:

- Technologies, such as no-till, organic and/or agro-ecological production methods that heal the land. Such practices tend to lower production costs over time and reduce reliance on high cost purchased inputs.
- Prioritising conventional biotechnologies such as breeding, tissue culture, cultivation practices and fermentation over genetically modified (GM) solutions in order to encourage long-term sustainability of production and minimise reliance on external sources of germplasm.
- Combining traditional local and scientific knowledge systems and practices for greater ownership of projects.
- Encouraging community management of land, seed banks, grain repositories and other resources to manage seasonal and adverse weather shortages, whilst encouraging sustainable management of natural resources.

5. Since the 1980s, strengthening producer links to international markets through switching to the production of non-traditional export crops (NTECs), such as broccoli, snow peas and cardamom, has been the strategy of major donors in Guatemala, such as USAID, Taiwan International Cooperation and Development Fund and the Food and Agriculture Organisation. To-date, NTECs continue to be prioritised, citing benefits of a higher-value alternative to traditional subsistence and cash crops.

   However, there are several problems associated with NTEC production: farmer vulnerability to market vicissitudes; high barriers to entry; production of food for sale instead of consumption; increasing diversion of land away from food production towards biofuel crops; the resultant reduction of availability of domestic staples; and so on. Meanwhile, the financial and nutritional benefits to farmers flowing from NTEC production have been contested in a number of World Bank and Oxfam studies, as has the future viability of growing non-traditional crops in the face of predicted climate change. Reducing linkages with international markets and focusing on helping farmers switch back to production of local varieties could, therefore, help not only to address the long-term financial and climatic sustainability of agriculture, but could also address the food and nutritional security needs of the population at large.
6. Finally, it will be imperative for future projects to adopt holistic approaches that recognise rural-urban links and the vital and central role that agriculture plays not only in the economy, but in food security and the physical and even

mental health of Guatemalans. Part of the growing double burden of malnutrition (simultaneous existence of child malnutrition and adult onset of obesity) can be attributed to the increasing reliance of people on the market for their food and the imbalance created by trade liberalisation policies that have ushered in an unprecedented growth of the processed/junk food and drink industry, whose cheap, usually imported products undercut prices of healthier local alternatives. Strengthening agriculture in both rural and urban settings could help counter these trends.

Conclusions

In conclusion, the growth of rural-urban linkages in people's lives is a reality. However, further research into their causes and effects in Guatemala is vital for effective, evidence-based policymaking and project design. The findings of the research at hand point to a need to rethink traditional approaches to rural development in Guatemala, to take into account urban development as well and the linkages between the two. In the absence of political will to implement a land redistribution programme, projects focusing on strengthening both rural and urban agriculture, at the subsistence and domestic commercial levels, may well be the best route forward. This is in line with findings elsewhere that, compared to growth in secondary and tertiary sectors of the economy, agricultural growth can be more effective in poverty alleviation (Ravallion & Chen, 2004). Business as usual, however, will not do. Re-localising and re-naturalising agricultural production, encouraging value-added processing and conservation, and encompassing traditional forms of knowledge and community management of resources into agricultural production, hold the best hope for sustainable livelihoods and for solving Guatemala's food security crisis.

References

Carletto C, Kilic T, Angeli K, 2009. Non-traditional crops, traditional constraints: long-term welfare impacts of export crop adoption among Guatemalan smallholders. *World Bank Research Papers*. Available Online at: http://hdl.handle.net/10986/4335

Chomitz KM, Thomas TS, 2005. Quantifying the Rural-Urban Gradient in Latin America and the Caribbean. *World Bank Policy Research Working Paper* 3634, June 2005.

FAO, 1996. *Rome Declaration on World Food Security*. Rome, Italy. World Food Summit, November 1996. Food and Agriculture Organization of the United Nations. Available at: http://www.fao.org/docrep/003/ w3613e/w3613e00.htm

Monterroso G, Prado P, Humberto J, García W, Alexander J, 2002. Prevalencia de Diabetes Mellitus en la Población Indígena del Departamento de Sololá. *Revista Medicina Interna*, **13**(1), 9-13.

Murakami T, 1997. Los mercados y pueblos mayas en el altiplano de Guatemala. *Informe de las Investigaciones Etnológicas en el Centro y Sur de Guatemala 1991-1994*. Tokyo: Museo de Tabaco y Sal.

Ravallion N, Chen S, 2004. China's (uneven) progress against poverty. *Policy Research Working Paper 3408*, World Bank.

UNDP, 1999. *Guatemala: el Rostro Rural del Desarrollo Humano*. Guatemala City: UNDP.

USAID, 2010. Guatemala Food Security Framework Analysis. , Paper prepared by James T. Riordan for Chemonics International, available online at: http://pdf.usaid.gov/pdf_docs/PNADU457.pdf

Zezza A, Tasciotti L, 2010. Urban Agriculture, Poverty, and Food Security: Empirical Evidence from a Sample of Developing Countries. *Food Policy* **35** (4), 265-273

Mailbox

Letter ***from*** the Editor

Dear Members,

There are no letters to the editor for this issue of *Agriculture for Development,* so I thought I would take the opportunity to write a letter to the members of the TAA.

Your Publications and Communications Committee (the current members are listed on the Contents page) have made tremendous efforts in recent years to transform the TAA Newsletter into your journal *Agriculture for Development*. Efforts to further improve the journal are continuing, with Guest Editors contributing to special themed issues of the journal, high quality papers being commissioned from international experts, and regular features such as International Agricultural Research News, Bookstack, and the Corporate Members' Page.

Like all officers of the TAA, the P&C Committee members are volunteers who give their time free of cost. It is estimated that each issue of *Agriculture for Development* requires about 200 days of unpaid work, shared between the editors, other P&C Committee members, Guest editors, authors of papers, and authors of other items such as Newsflashes, News from the Field, book reviews, obituaries etc. The one thing that these volunteers do not write is Mailbox, for this we rely on members to send letters to the editor.

The TAA has an interest in many important issues of current concern, such as food security, nutrition, commercialisation of smallholder agriculture, sustaining agricultural production, responsible management of natural resources, the role of women in agriculture, adapting to and mitigating the effects of climate change, agricultural research developments, education, and government policies, to name but a few. The TAA also has almost 600 well-qualified members with enormous aggregate experience throughout the world, all of whom will have something of relevance to say. If each of you wrote just one letter every 50 years, that would provide four letters for every issue of *Ag4Dev*. So please, get out your computers, dust down your typewriters, or just write an old fashioned letter with your views on current issues, recent articles in *Ag4Dev*, or about your association. Your editors will be pleased to receive your letters, and I am sure that fellow members will be interested in your views.

Paul Harding
Coordinating Editor, *Ag4Dev*

Newsflash

The Dr Harry Potter Scholarships in Agriculture, Food Security, Environmental Studies or Natural Sciences

Dr Harry Potter OBE died suddenly on 30 April 2012 at the age of only sixty nine. He was undertaking voluntary work for Temwa (www.temwa.org) as their Strategic Adviser and was planning to make a visit to Malawi in the summer to chair some partnership meetings. He had a career of thirty eight years in the developing world, with his last post being Malawi. Information about him can be found on www.independent.co.uk/news/obituaries/dr-harry-potter www.temwa.org/news/39-malawi/385dr-harry-l-potter-obe www.scotland-malawipartnership.org.news

Dr Harry Potter co-chaired the Mersey Synod United Reformed Church Malawi Task Group for the past seven years and he helped in particular with a five year review and the Water Project at two missions. He loved Malawi and it was here that he did work on food security, introducing starter packs that led to him being awarded an OBE. Not only did millions of subsistence farmers benefit from his work, but also other African countries have learnt from this approach.

It is widely recognised that African countries like Malawi need to grow their own leaders and this depends on good education. Dr Potter enjoyed sharing his knowledge, expertise and skills, and often did it by getting alongside people and becoming their mentor. It seems appropriate to establish a scholarship in Agriculture, Food Security, Environmental Studies or Natural Sciences as **a living memorial** to him so that young, bright Malawians with leadership potential who are financially challenged may benefit (as he did from a government grant to study at Caius College, Cambridge) from study at a Malawian University.

www.test4africa.com is a UK registered Charitable Trust that operates in Malawi (and other countries) and aims to aid the social and economic development of Malawi by enabling bright but needy students to receive undergraduate education in Malawian Public Universities. In return, they pledge to work for five years for the benefit of their communities and their nation upon graduation. It only costs £500 per year for a self-financed student and £160 per year for a government-sponsored student.

The way it works is that a student applies for a university place and, if successful, the university then applies to **test4africa** for funding. The student has to complete a lengthy application. It is the Trustees who read all the information and supporting documentation and who approve any full or partial funding. It is possible to receive progress reports on students, and also to learn what the students do after they return to their communities.

It would be wonderful if you could make a donation towards a Scholarship for Dr Harry Potter in Agriculture, Food Security, Environmental Studies, or Natural Sciences. £20,000 is needed to secure the scholarship in perpetuity and there is over £6,000 to date. **You could make a difference to the future leadership of Malawi and to the lives of subsistence farmers, many of whom are women.**

If you would like to make a donation please identify it as:

Dr Harry Potter Scholarship
Account Name: The Tertiary Education Scholarship Trust for Africa
Bank: HSBC, The Peak, Vauxhall Bridge Road, Victoria, London SW1V 1EJ
Account No: 71736289
Sort Code: 40-01-13

Please can you indicate if Gift Aid can be claimed on your donation. The Gift Aid forms are available on the HMRC website.

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Genetically modified crops: time for a reasoned stance

Brian Sims[1]

Formerly leader of the International Development Group at Silsoe Research Institute, Brian Sims is now an FAO agricultural mechanization consultant focusing on the needs of conservation agriculture.

Summary

This paper gives an account of the origins of the science of plant genetic modification (GM). It then reports on a seminar held at NIAB in Cambridge which discussed GM and asked if it was time for a public-good programme. The regulatory environment in Europe is somewhat hostile to GM and there are just three institutions working in this field in the UK. GM crops discussed and demonstrated during the seminar included: anthocyanin-rich tomatoes; aphid-resistant wheat; long-chain fatty acid Camelina; and potatoes for bioplastics. There is a wide range of future R&D possibilities for GM, most importantly for insect resistance and herbicide tolerance, but also for resistance to blight, drought and salinity, conversion from C_3 to C_4 photosynthetic pathways, N fixation and creating perennial cereals.

Introduction

On 12 September 2012, the NIAB Innovation Farm[2] hosted a seminar on GM *'Is it time for a public-good programme?'* Participation in this event provided a good pretext to delve a little into the history of genetic modification.

The early years

James Watson, in his classic book, 'DNA: the Secret of Life' (Watson, 2004), gives a concise review of the needs for, and origins of, GM. Modern agriculture produces crops in ways that pests, diseases and weeds find very convenient (uniform well-fed and watered monocrops) and flooding the environment with agro-chemicals used to be the only way to control pests like the cotton bollworm (*Helicoverpa* spp). But this short-term solution was, as Rachel Carson graphically exposed, a disaster for the environment (Carson, 1962). Genetically engineering crop plants with on-board pest resistance is not only good for production and the pocket, it is of great environmental benefit as well. But let us back-track a little and see how we can transfer desirable traits from one organism to another by an exchange of genetic material.

How is it done?

First there is the soil bacterium *Agrobacterium tumefaciens*, the cause of crown gall disease, which infects plants by tunnelling into them and delivering its genetic material, which it extracts from a plasmid and is wrapped in a protective protein coat. The transferred DNA produces plant hormones and specialized proteins. The former promote cell division and produce the gall; the latter form the substrate for the bacterium and the invader's renegade DNA is copied with each division of the host's cells. Apparently, it is not difficult for molecular biologists to cut and paste desirable genes into the bacterial plasmid and so gain access to the host plant on the back of the bacterium. *Agrobacterium* is, as James Watson describes, a natural genetic engineer.

Agrobacterium has itself been the subject of genetic engineering and it can now be persuaded to perform its magic on even the most recalcitrant crop species. Before this, getting desirable DNA into plant cells involved firing gold or tungsten pellets, attached to the DNA to be transferred, into the target cells. Haphazard and lacking in finesse, the 'gene gun' (or biolistic particle delivery system) is nevertheless successful and is still used.

By modifying *Agrobacterium* plasmid DNA, major advances have been made possible. *Bacillus thuringiensis* (Bt) produces a toxin lethal to insect pests. In contrast to the application of pesticides, crops modified by incorporation of the Bt toxin gene will only kill the insects that feed on the crop plant and not their predators. Today, Bt cotton is able to withstand the attacks of bollworms and their ilk, without the need for insecticide sprays. But GM crops have the potential to offer a broader promise to diminish human suffering and improve human nutrition. Golden Rice has been modified to carry a vital vitamin A precursor, beta-carotene, and is an important weapon in the fight against vitamin A deficiency in children whose diet consists predominantly of vitamin A-free rice. After 30 years of research and development, Golden Rice is to be released to farmers in the Philippines in 2013 (Mckie, 2013). Future examples are likely to correct other nutritional deficiencies and may, indeed, include the delivery of vaccines.

The GM debate

Mark Lynas (Lynas, 2011) is a spirited commentator on the GM debate as he is an erstwhile anti-GM activist who has had a change of heart. In his treatise on the Earth's nitrogen boundary and the inefficient and excessive use of N in modern agriculture, he calls on the need to engineer crops with improved N uptake efficiency. Genetic engineering allows

[1] www.engineering4development.co.uk

[2] www.innovationfarm.co.uk

much more precise and rapid changes than conventional selective plant breeding by selecting a gene from an efficient species. Better N uptake means that fertilizer use can be reduced, with the resulting reduction in environmental contamination. GM canola (oil seed rape – *Brassica napus*) in Canada, modified by inserting a gene from barley which is a more efficient user of N, achieves the same yield as unmodified crops, but with 40% less N fertilizer.

There is much debate on the Monsanto 'Roundup Ready' herbicide-tolerant GM crops (soya, canola and sugar beet). At first sight, this would appear to be a multinational company out to lock farmers into using their products and coming back for new seeds each year. In fact, the glyphosate herbicide used is a lot more benign than the herbicide cocktails that would otherwise be required and, when combined with resistant GM crops, much less of it is needed. The introduction of the so-called 'terminator gene', which flips genetic switches and produces seeds incapable of germinating, was a PR disaster for Monsanto and it was withdrawn from the market. As always, farmers have the last word and they are the ones who can see the advantages of Roundup Ready crops and select them through preference.

What are we doing now?

Currently, Europe has a hostile regulatory environment with respect to GM R&D. This means that there is limited private sector investment which could, in the near future, put us at a disadvantage compared with the rest of the world. In this scenario, it may be time to call for increased public investment so that the outputs remain in the public domain as public goods[3]. Barriers seem to have been erected to achieving improved genetic potential from crops and, given the kind of poor harvest that we have had in 2012, this may not be the wisest course to take. One question to ask, for example, is that if the UK needs to import wheat, then where would the source be in these times of droughts, floods and dramatically reduced yields? Crop productivity is the key to increased production and, at the moment, the rate of improvement of 0.5% annually is not enough to satisfy rising needs. With GM, although it would be a long and expensive process[4], yield improvements of up to 2% per year could be achieved.

The situation today is that GM crops are used for livestock feeds practically universally. With regard to GM crops for other uses, there has been double digit expansion in production every year since 1996. In the UK, there are GM trials at three sites: two BBSRC[5] research centres (Rothamsted and John Innes) and Leeds University. NIAB's Innovation Farm is an important demonstration and technology transfer platform (from research to commercial reality) for the UK farming and food supply chain. The following are some of the GM crops demonstrated during the seminar:

Purple tomatoes

Cathie Martin of the John Innes Centre described the genetic modification of tomatoes to produce anthocyanin-rich fruits[6]. Anthocyanins, like the anti-oxidants in blueberries, are recognized as cancer-suppressing and health-protecting pigments when included in the diet. Transgenic purple tomatoes, rich in anthocyanins, have been produced by the inclusion of genes from *Antirrhinum* spp (snapdragon); the result (Figure 1) is a tasty, purple-fleshed fruit (Butelli *et al*, 2008).

Figure 1. Anthocyanin-rich purple tomatoes produced by transferring a gene from snapdragon to the tomato. Photo: John Innes Centre.

Other genetic modifications have been accomplished, for example to improve the resveratrol content of tomatoes. Resveratrol is the red-wine ingredient associated with longevity and cancer control, and the tomatoes have a content of up to 1000 times that of red wine. Another example is to boost the content of isoflavone, a phytoestrogen associated with reductions in breast and prostate cancer. Figure 2 shows juices made from high flavonol tomatoes on the left, high anthocyanin tomatoes on the right and a cross between the two in the middle.

Figure 2. Juice from high flavonol tomatoes (left); high anthocyanin tomatoes (right) and a cross between the two (centre). Photo: Andrew Davies, John Innes Centre.

Aphid-resistant wheat

Huw Jones (of Rothamsted Research) discussed the Rothamsted work on transgenic aphid-resistant wheat (Beale *et al*, 2006). Aphids such as *Sitobion avenae* suck the sap of plants and so drain them of nutrients; they can also transmit viral diseases (Figure 3). Many aphids emit an alarm pheromone when under attack; this causes them to migrate from the site and also attracts predators. Genetic modification has been achieved by introducing two genes (with a gene gun) which cause an attacked plant to emit alarm pheromones. The genes have been synthetically produced: that is, they are not taken from plants or animals,

[3] This was one of the main points made by Dr Tina Barsby, CEO of NIAB TAG, in her seminar presentation.

[4] Monsanto estimates (perhaps with some hyperbole) that the development of a GM crop will take 8-10 years and cost USD100 million.

[5] Biotechnology and Biological Sciences Research Council.

[6] Details of the research and where it is going can be accessed at, for example: http://www.jic.ac.uk/corporate/media-and-public/current-releases/08102martin.htm

although they do both occur naturally. The advantage of aphid-resistant wheat is that it has no negative impact on aphid predators and other beneficial insects, in the way that sprayed insecticides necessarily would have (Figure 4).

Earlier this year, Rothamsted scientists made efforts to convince anti-GM campaigners not to destroy their aphid-resistant wheat trials. They achieved this through reasoned debate and by full disclosure[7] which is the only logical way to proceed.

Figure 3. Grain aphid (Sitobion avenae). Photo: Rothamsted Research Image Library.

Figure 4. Rothamsted's aphid-resistant GM wheat trial. The trial plots are surrounded by 10 m of barley plus 3 m of a wheat 'pollen barrier' all surrounded by 20 m of tilled soil. Photo: Visual Communications Unit, Rothamsted Research.

Camelina

This work is also the result of Rothamsted research. Camelina (*Camelina sativa*) is a Mediterranean oil crop (used in the UK for game cover) used in the production of cooking oil. Genetic modification has improved the long-chain fatty acid content (those good fatty acids that fish oil contain). The genes have been transferred, not from fish, but from marine algae which is what the fish eat. These fatty acids have been shown to be effective in reducing cardio-vascular diseases and are particularly important for foetal development.

Potatoes

Research at the University of Rostock (Germany) has enabled the extraction of a gene from Cyanobacteria which modifies potatoes to produce large quantities of the protein cyanophycin. This is then used in the production of biodegradable bioplastics at a greatly reduced cost (both financial and environmental) compared with the industrial fermentation process.

What is the public perception?

It seems that Rothamsted's scientists have won the day in explaining the nature of, and strict controls over, their work. The fear of 'Frankenfoods' has been dissipated and the benefit to human health and the environment of GM crops has been emphasized[8]. The conclusion seems to be that 'science has some of the answers for a hungry world and GM looks as if it could be one of them'. But the science must be seen in the context of the wide array of other factors (social, economic, climatic, environmental and technical) that are the subject of debate in *Agriculture for Development*. On its own, GM cannot do much.

What of the future?

GM technology is advancing rapidly and, as has been pointed out, the rate of uptake world-wide is accelerating. Europe, and the UK in particular, are well placed to be considered among the leaders of genetic engineering, but tight regulation is likely to hamper these efforts. At the moment, only two GM crops are licensed to be grown by the European Food Safety Authority (EFSA): Monsanto's Bt fodder maize (Mon 810), and BASF's high amylopectin starch potato (Amphlora) for paper making.

The targets for future traits will include:

- insect resistance and herbicide tolerance (IR/HT) in food and fibre crops
- blight resistance in potatoes
- salinity resistance
- drought tolerance
- converting C3 photosynthesizers (such as rice and wheat) to the more efficient C4 (eg maize, millet, sorghum and sugar cane) photosynthetic pathway
- creating perennial cereal crops
- nitrogen fixation in cereal crops

The last two points were dealt with in some detail by Alessandro Bozzini and Maddelena del Gallo in the Summer 2012 edition of *Agriculture for Development* (Bozzini & del Gallo, 2012).

References

Beale MH, Birkett MA, Bruce TJA, Chamberlain K, Field LM, Huttly AK, Martin JL, Parker R, Phillips AL, Pickett JA, Prosser IM, Shewry PR, Smart LE, Wadhams LJ, Woodcock CM, Zhang Y H, 2006. Aphid alarm pheromone produced by transgenic plants affects aphid and parasitoid behavior. *Proceedings of the National Academy of Science*, USA 103, 10509–10513.

Bozzini A, del Gallo M, 2012. Two strategic objectives for the development of sustainable food production: crops with a perennial habit and with N2 fixation. *Agriculture for Development* 16, 24-26.

Butelli E, Titta L, Giorgio M, Moek H-P, Matros A, Peterek S, Schijlen EGWM, Hall RD, Bovy AG, Luo J, Martin C, 2008. Enrichment of tomato fruit with health-promoting anthocyanins by expression of select transcription factors. Nature Biotechnology **26**, 1301-1308 [http://www.nature.com/nbt/journal/v26/n11/abs/nbt.1506.html]

Carson R, 1962. *Silent spring*. Boston: Houghton Mifflin.

Lynus M, 2011. *The God species: how the planet can survive the age of humans*. London: Fourth Estate.101-109.

Mckie R, 2013. GM food: is the way now open? *The Guardian Weekly*, 188(9):1&6. 8 February. London.

Watson J, 2004, DNA: *The secret of life*. London: Arrow Books.134-163.

[7] http://www.guardian.co.uk/environment/2012/jun/01/letter-take-flour-back-rothamsted

[8] http://www.guardian.co.uk/commentsfree/2012/jun/01/editorial-gm-foods-science-society?INTCMP=SRCH

Newsflash

The ETHAS Consortium: an exciting new opportunity for the TAA

In recognition of the quality and experience of its members, and its growing international reputation, the TAA has been invited to participate in a proposal for a European Consortium on the ethical issues surrounding research, particularly those affected by the globalisation of research.

The Consortium is known as the ETHAS (Ethics Assessment) Consortium, and has been developed by the University of Aachen, in response to a Call from the European Commission's Seventh Framework Programme, Science in Society work programme. The tasks of the ETHAS Consortium will include evaluating existing ethical practices, legislation and guidelines; analysing the effects of globalisation on research and its ethical aspects; developing a framework of common ethical principles and practices; proposing practical tools for ethics assessment (eg, certification); and producing policy recommendations.

The scope of the ETHAS proposal is very broad, covering research on biomedicine, energy, information technology, robotics, and agriculture/food production. The TAA was invited to submit a proposal and to coordinate the work package on Agriculture and Food Production. The TAA Executive Committee agreed that we should respond positively to this invitation, and asked Paul Harding to take this forward on behalf of the TAA. The full proposal was submitted to the European Commission in January 2013, and a first indication of the success or failure of the proposal should be known by late-April. Detailed negotiations will then continue for several more months before contracts will be signed. If successful, the Consortium will work for three years, from the Autumn of 2013, with a total budget of about euros 3.5 million. This will fund a part-time coordinator for each work package, a series of online discussions for round table meetings, publications, and some travel costs.

If successful, the TAA Coordinator will form an Advisory Committee of perhaps 12 experts to advise and guide the work of the work package on Agriculture and Food Production. These will be TAA members, plus representatives of other partner institutions (including GFAR, the Global Forum on Agricultural Research). A series of on-line discussions, open to all TAA members and others, will be arranged and facilitated. These will be in preparation for a series of round table discussions, leading to publications, guidelines and policy recommendations. Some funds will be available for commissioned keynote papers; facilitating and reporting on online discussions; facilitating and reporting on round-table meetings; drafting policy recommendations; and travel and accommodation costs involved in participating in Advisory Committee meetings, round-table discussions and other meetings.

Paul Harding

TAA Forum

TAA Annual General Meeting, Minutes and resolutions

Wednesday 28 November, 17.00 at the Royal Overseas League

1. **Apologies**
   Francis Shaxson, Brian Sims, Jim Turnbull, John Wibberley.
2. **Approval of Minutes** of AGM of Wednesday 23 November 2011 as presented in *Agriculture for Development* 15, Spring 2012.
   Proposer: Hugh Brammer Seconder: Antony Ellman
3. **Matters Arising** - None
4. **Reports from Officers**
   - Chairman and Secretary
   - Treasurer
   - TAAF Chairman
5. **Awardee Presentation**
   – James Brockington
6. **Adoption of Audited Accounts** for the 2010-2011 Financial Year
   Proposer: Keith Virgo Seconder: Henry Gunston
7. **Reappointment of Examiners** for the Association - Montpellier Professional of Dashwood Square, Newton Stewart, Wigtownshire for next financial year.
   Proposer: Roger Smith Seconder: George Taylor-Hunt
8. **Ex-Co Elections**
   Chris Garforth standing down as TAA Chair at the 2013 AGM. The TAA President invited nominations for a new Chair by mid-year, for an election vote by members in the Autumn.

   Paul Harding as Co-ordinating Editor
   Linda Blunt as Membership Secretary
   Brian Sims as President's Ex-Co Member/Technical Editor

Renewal of Officers

Elizabeth Warham - General Secretary
Amir Kassam - Convenor of the Land Husbandry Group
Antony Ellman - Chair of TAAF
Hugh Bagnall-Oakeley - President's Ex-Co Member
Jim Waller - President's Ex-Co Member/Technical Editor
Keith Virgo - Convenor of the East Anglia Group
Jim Turnbull - Convenor of the Agri-business Group
George Taylor-Hunt - Convenor of the South-West Group
Bill Reed - Convenor of the South-West Group

Proposer: Gary Robertson Seconder: Jim Watson

9. **Any Other Business**
   Remember friends and colleagues who have passed away.
   Laurie Robertson – former TAA Treasurer
   Ted Wilmot – Contribution to TAA Stand, Royal Show
   Joseph Smyth Mulholland OBE (1927 – 2012)
   Vernon Robertson OBE (1922 – 2012)
   Robert Bruce Karim King (1937 – 2012)
   Harry Potter OBE (1943 – 2012)
   Andy Tainsh (1939 – 2012)
   Alan Stobbs (1928 – 2012)
   I.L.A. 'Reen' Ysselmuiden

10. **Presentations:**
    Recognition of distinguished careers and achievements for TAA.
    - TAA Award of Merit – Tony Reynolds - In recognition of his demonstration and promotion of transformational change in agricultural production.
    - TAA Award of Merit – Hugh Brammer - In recognition of his many years of service to TAA's publication and advisory work, and his wide ranging professional contribution to agriculture for development.

Chairman's and General Secretary's Report to the 2012 AGM, 28 November 2012

During the year, Ex-Co has been taking forwards the proposals to strengthen the TAA website and has also improved the membership database.

Regional Groups and Overseas Branches: Regional groups in the UK have continued to be strengthened. Groups offer exciting programmes of meetings to their members that link effectively with the international research and development agenda. We continue to encourage the establishment of overseas Branches, building on links with India, and CAARDI, Caribbean. This year the South West and East Anglia regional groups have been particularly active, with several activities held jointly with other organisations with interests in sustainable agriculture and rural development. The London and SE Group still seeks to fill the vacant post of Coordinator.

Agriculture for Development: The TAA Journal, the Association's flagship publication, called *Agriculture for Development* has continued to be well received by members. The Publications and Communications Committee, under the leadership of a new Coordinating Editor, has worked hard to broaden the range of material being covered, with topics that are increasingly relevant to agriculture in the 21st Century, as well as commissioning more articles from overseas experts.

TAA Website (www.taa.org.uk): During 2012, the new TAA website, with its modern and user-friendly image supported by comprehensive and easy to navigate content, has been further refined. The range of information made available has been expanded; with job and business opportunities (including the consultants' directory and technical advisers), and information on funding and resources available. A new e-mail alert feature allows members to receive details of new updates on the website.

Annual Memorial Lectures: The traditional Ralph Melville Memorial Lecture and the mid-year Hugh Bunting Memorial Lecture at the University of Reading have continued to be promoted as high profile international public events. The Lectures are being recorded for wider dissemination to TAA members and the public. The 2012 Hugh Bunting Memorial Lecture was delivered by Andrew MacMillan on "The Future of Agriculture through a Hunger Eradication Lens". The 2012 Melville Lecture will be delivered by Dr Mark Holderness on "Shaping the future together: transforming agricultural research *for* development".

Directory of Consultants and Technical Advisors (www.taadirectory.org.uk): The redesigned consultants' Directory continues to be successfully used by members to promote and communicate their expertise, with many responses from potential employers. It is now accessible from the new TAA website.

TAA Award Fund: The expanded TAAF programme continues to be very popular with both MSc students and recent graduates to gain overseas development experience. We are seeking ways to attract new funding for TAAF to enable us to offer opportunities to more applicants. We shall hear a report from the Chairman of the TAAF committee.

Access to British Expertise: TAA's Agri-Business Group has membership of British Expertise (formerly BCCB) that is available to all TAA members. TAA members who have signed up to the Agri-Business network group have received copies of the British Expertise News and members' access to meetings and training opportunities organized by British Expertise.

UK Forum for Agricultural Research for Development (UKFARD): Hosted by TAA, UKFARD provides a means to foster, strengthen and optimize UK research, innovation and development services for agricultural development in developing countries. The All Party Parliamentary Group (APPG) on Agriculture and Food for Development, established in 2008 by UKFARD and corporate TAA members, continues to gain strength and support with an informative and successful calendar of events, organized by Dominic Foster, the APPG Secretariat.

Honours: The Honours Panel, established three years ago by ExCo, oversaw the process of recommending an individual or group of individuals, not restricted to TAA members, for the award of TAA Honours for outstanding contributions to the science or practice of agriculture for development. It also recommends nominations from amongst TAA members for *UK National Honours*, and for *Honorary Membership of TAA and/or a TAA Award of Merit*. All nominations for honours can be submitted at anytime to the Panel Chair. This year the TAA Award of Merit is awarded to Tony Reynolds and Hugh Brammer.

General Administration and Executive Responsibilities: We will soon hear reports from other ExCo members, particularly the Treasurer, and the Chair of the TAAF Committee. However, we ask the membership to join in expressing our grateful and special thanks for the hard work that they, and all other members of ExCo and the members of the Regional and Specialist Sub-Committees have done during the year, in the UK and overseas. We are grateful to the new Membership Secretary, Lin Blunt, for all the work she has done on updating the membership database. A particular word of thanks is due to one of the editors of *Agriculture for Development*, Jim Waller, who will be stepping down after ten years of service during 2013.

Chris Garforth and Elizabeth Warham

Treasurer's Report to the 2012 AGM: TAA Accounts 2012

TAA's 2012 annual accounts (July 2011 to June 2012), finalised by our external accountants, Montpelier Professional Limited, were presented and approved at the AGM on 28 November 2012. These are submitted each year to the Charities' Commission and can be viewed on www.taa.org.uk under the page on Finance and Accounts. Key points include the following.

Income

Total income was £29,038 including:

- Subscription income of £18,141 from 592 members, 14 of whom were corporate members.
- Seven donations were received for the Award Fund amounting to £7,271, all from TAA members. This is greatly appreciated.
- A tax rebate of £2,759 was received from the Inland Revenue for 'Gift Aided' subscriptions and donations. Unfortunately, less than a third of ourmembers sign 'Gift Aid' forms, meaning we continue to lose potential income.
- Other income included £709 from events, £125 for directories, £29 interest and £4 miscellaneous.

Expenditure

Total expenditure was £20,577, classed as being £18,575 charitable and £2,002 governance.

- *Agriculture for Development* journal costs were £5,488. Although three publications are now produced each year, only two were paid for during the 2011-12 financial year.
- TAAF approved eight new awards and paid four retentions from earlier years amounting to £9,575, some 20% less than the amount awarded in 2011.
- Other charitable expenditure included £1,366 for membership of British Expertise, £880 for events, £730 for on-going development of the website and £250 for membership of the Biology Society.
- Governance costs were £2,002, representing less than 10% of total costs. This is due to individuals on the Executive Committee charging only minimal costs.

Funds available

A surplus of £8,461 was achieved largely due to the donations received and under-expenditure on the Journal. This compares with a surplus of £10,295 in 2011 and a deficit of £5,415 in 2010. The total funds available at the end of June 2012 were £53,438, with commitments of £13,691 for TAAF and £1,320 on behalf the UK Forum.

Looking forward

A deficit of just under £4,000 is expected in 2013, largely due to declining subscription income and funds for TAAF awards being received in earlier years.

TAA continues to provide £3,000 per year for TAAF. However, new sources of funds do need to be identified.

Jim Ellis-Jones
Treasurer

TAAF Annual Report to the 2012 AGM

(1) Finance:

- £9,500 was spent on TAAF awards in 2011/12 and £10,500 was budgeted for expenditure in 2012/13. The funds available for 2012/13 comprise money carried forward from 2011/12 plus a £3,000 subvention from TAA.
- It is anticipated that the money will be spent on 1-2 long term awards and 6-8 MSc awards. An additional £6,000 which is restricted for TAAF use will be carried forward to 2013/14.
- Despite best efforts by the TAAF Committee, no further funding sources have been identified, other than TAA's annual subvention and possible donations or legacies from individual TAA members.
- Unless additional funding sources can be found, TAAF will be obliged to continue its operations at a relatively low level until the financial climate improves.

(2) Long term awards:

- Two long term awardees, Ben Frampton and James Brockington, completed their assignments in 2011/12 and submitted good reports. Ben is now working on conservation agriculture in Zambia; James is a teaching assistant at Bangor University where he is registered for a PhD.
- An article by an earlier awardee, Graham Clarkson, on tree planting in Malawi appeared in the summer 2012 issue of *Ag4Dev*; another by Ioulia Fenton on rural-urban linkages in food security in Guatemala will appear in the Spring 2013 issue.
- Another long term awardee, Jessica Chu, completed her assignment in October 2012 on the social and economic impact of 'land grabs' in Zambia. Her report will be summarised in the Spring 2013 issue of *Ag4Dev*.
- Very few applications for long term awards are currently being received. This is surprising given the dearth of graduate job opportunities in UK, but it is perhaps fortunate given the tight financial situation facing TAAF.

(3) MSc awards:

- 17 high quality applications for MSc awards were received in March 2012 from students at eight UK universities: seven awards were made at a cost of £6,950. The students have completed their fieldwork and have submitted excellent reports: summaries will appear in the Winter 2012 and Spring 2013 issues of *Ag4Dev*.
- One awardee is scheduled to speak at the AGM. All the awardees have been asked to present their research findings at their universities. These presentations are useful for advertising TAA and TAAF, and for motivating the awardees to continue their membership of TAA.

(4) Young Development Agriculturalist of the Year:

- None of last year's awardees was considered a suitable candidate for this honour. It is possible that a nomination will be made in 2013.

(5) TAA Membership and Awardee Networking:

- Several recent TAAF awardees have expressed interest in maintaining contact with each other as well as with other TAA members, both during and following their fieldwork period. This would make continued membership of TAA more appealing.
- Ways in which such networking could be achieved, either through the TAA website, *Linkedin* or *Facebook*, or through separate blogs are under discussion.

Antony Ellman
TAAF Chairman

ACCOUNTS July 2011 to June 2012

	2012	2011	Change
Receipts			
Subscription	£18,141	£18,213	-£72
Award Fund donations	£7,271	£14,211	-£6940
Other donations	£0	£5,000	-£5,000
CV Directory	£125	£344	-£219
Functions	£709	£784	-£75
Inland Revenue	£2,759	£3,317	-£558
Bank Interest	£29	£22	£7
Miscellaneous	£4	£31	-£27
Total receipts	**£29,038**	**£41,921**	**-£12,883**
Expenditure			
Charitable			
Journal	£5,488	£11,115	-£5,627
CV Directory	£285	£140	£145
Shows and functions	£880	£2,067	-£1187
Regional Subventions	£0	£0	£0
Biology Society	£250	£250	£0
British Expertise	£1,366	£1,327	-£39
Award fund and expenses	£9,576	£11,404	£1,828
Internet/web costs	£730	£4,304	£3,474
sub total	***£18,575***	***£30,607***	**-£12,032**
Governance			
Insurance	£503	£0	£503
Accounting services	£408	£353	£55
Executive Committee	£993	£627	£366
Admin	£98	£110	-£12
sub total	***£2,002***	***£1,090***	**£912**
Total expenditure	*£20,577*	*£31,696*	**-£11,119**
Excess of receipts over payments	£8,461	£10,225	-£1764
Bank balance brought forward	£44,977	34752	£10,225
Funds available	**£53,438**	**£44,977**	**£8,461**

Report of the Land Husbandry Group (LHG) to the 2012 AGM

Networking

The LHG continued to network with organizations and individuals overseas and in Europe who are interested in promoting soil health and sustainable land husbandry. This has included: FAO; No-Till Farmer Association, Argentina (Aapresid); European Conservation Agriculture Federation (ECAF); Institute of Sustainable Agriculture (IAD), France; The African Conservation Tillage (ACT) Network; and US Soil & Water Conservation Society (SWCS).

Articles

Basch G, Kassam A, Friedrich T, Santos FL, Gubiani PI, Calegari A, Reichert JM, dos Santos DR, 2012. Sustainable soil water management systems. In: Lal R, Stewart BA, eds. *Soil Water and Agronomic Productivity*, Advances in Soil Science, CRC Press, 229-289.

Friedrich T, Kassam A, 2012. Do no-till systems require more chemicals? *Outlooks on Pest Management*, **23** (4), 153-157 (DOI: 10.1564/23aug02).

Kassam A, Mello I, Goddard T, Friedrich T, Bartz H, Laurent F, 2012. Harnessing on-farm and landscape ecosystem services from agriculture in Brazil and Canada: A poster presented at the *International Symposium on Managing Soils for Food Security and Climate Change Adaptation and Mitigation* held at IAEA, Vienna, Austria 23-27 July 2012.

Kassam A, Friedrich T, 2012 (April). An ecologically sustainable approach to agricultural production intensification: Global perspectives and developments. *Field Action Science Reports*, Special Issue 6: Reconciling Poverty Eradication and Protection of the Environment, 1-6 (http://factsreports.revues.org/1382).

Friedrich T, Derpsch R, Kassam A, 2012 (September). Overview of the global spread of Conservation Agriculture. *Field Actions Science Reports, Special Issue 6*: Reconciling Poverty Alleviation and Protection of the Environment, 1-7 (http://factsreports.revues.org/1941).

Kassam A, Brammer H, 2012. Combining sustainable agriculture production with economic and environmental benefits. *The Geographical Journal*, **179** (1), 11-18 (doi: 10.1111/j.1475-4959.2012.00465.x).

Sims B, Thierfelder C, Kienzle J, Friedrich T, Kassam A, 2012. Development of the Conservation Agriculture equipment industry in Sub-Saharan Africa. *Applied Engineering in Agriculture* **28** (6), 813-823.

Amir Kassam

Membership Secretary's Update

Membership

During 2012, the Membership Secretary contacted many members personally by email and letter to work towards updating the membership database and payments. Many thanks to those who responded, contacted the Membership Secretary, updated payments, and updated their details online. The membership database is now as up-to-date as it can be and the summary data are presented below.

As of March 2013, the TAA had 582 members from 45 countries, with 27 of these registered as new members since 1 August 2012 (some of these are actually returning members). Of the 582 members, 276 are full members who receive hard copies of *Agriculture for Development*, demonstrating the continued popularity of the printed journal, particularly among older members. Online members now number 258, of which 33 are aged over 70.

There are 33 student members, and currently 22 TAAF members. This high number of TAAF members is due to the fact that some TAAF awardees from last year did not receive their one-year free membership, and are therefore receiving it this year instead.

Of the 461 members living in the UK, 64 live in the Scottish region, 67 in East Anglia, 115 in the South West, and 139 in London and the South East. This means that 76 members living in the Midlands and Wales are currently not assigned to a region, highlighting the need for a co-ordinator based in this region, willing to organise events and correspondence. *If you are interested in this role, then please do get in touch with the Membership Secretary*.

We still have a large number of past TAA members whose membership has lapsed. This illustrates the importance of paying TAA fees on 1 August each year by standing order agreement with your bank, since this ensures that your membership is continuous. In the next few months, these lapsed former members will be contacted, and we hope to see many of them back on board.

Gift Aid

If you are a UK tax payer, and you sign up to Gift Aid for a charity, then for each £1.00 received, the charity can claim an additional 25 pence tax benefit from the tax authorities. Currently, only 162 of the 461 UK members are signed up to Gift Aid, so we need to significantly increase this number. This would greatly benefit the TAA, and enhance the funds available for TAAF travel awards for students. Therefore, if you are not registered for Gift Aid, then please complete the form available online, or contact the Membership Secretary for a form.

Recruitment

A new TAA brochure is now available, and one copy will be included with the hard copies of the journal posted to members. Copies can also be downloaded from the website. Please distribute these as widely as possible, encouraging people to visit our website and to join the TAA using one of the many options available. Contact the Membership Secretary if multiple copies of the brochure are required. The journal and the website are valuable resources that are created for the wider benefit of the international agriculture community.

Linda Blunt
TAA Membership Secretary
(membership_secretary@taa.org.uk)

Publications and Communications (P&C) Committee Update

New Guidelines for Authors

The P&C Committee have developed new, more comprehensive Guidelines for Authors wishing to submit articles for consideration for inclusion in *Agriculture for Development* (*Ag4Dev*). They are presented on the inside front cover of the journal, and are used for the first time with the current issue.

The new Guidelines are based on those used by the journal *Plant Pathology*, with the permission of the Editor. They include a more modern, neater, minimalist style for references. Authors who manage their references with *Endnote*, or *Reference Manager*, or similar software, can simply key-in *'Plant Pathology'* to format their references accordingly.

Guest Editors of *Ag4Dev*

Professor Chris Garforth is thanked for his contributions as Guest Editor of the current special issue of *Ag4Dev*, on the theme 'Innovation Systems'. Guest Editors for the next three issues have already been identified, as follows:

Ag4Dev No 19, 'Commercialisation of Smallholders', Brian Sims
Ag4Dev No 20, 'Water in Agriculture', Chris Finney
Ag4Dev No 21, 'Climate Change', Paul Harding

Any members wishing to contribute articles, *News from the Field* or book reviews for any of these special issues, please contact the Coordinating Editor, or the relevant Guest Editor.

We are currently seeking Guest Editors for special issues on 'Women in Agriculture' and 'Post-Harvest Issues'. *Members wishing to volunteer, or with suggestions of suitable candidates, should contact the Coordinating Editor*.

Technical Editor of *Ag4Dev*

With the publication of the current issue, Jim Waller is retiring as Technical Editor, after ten years in the job. Jim was a key contributor to the evolution of the Newsletter into the journal, *Agriculture for Development*, which we now all enjoy. It is fitting that Jim also led the effort to produce the new Guidelines for Authors, which are used for the first time in the current issue. We wish Jim well in his retirement, safe in the knowledge that we can call on his advice and experience whenever we need them.

We are grateful to Dr Elizabeth Warham for offering to take over, with immediate effect, from Jim as one of the two Technical Editors of *Ag4Dev*.

'Reflections'

Several retired members have recently produced books of reminiscences, for example, Roland Minor's *A Lot of Loose Ends*, which is reviewed by Tim Fison in *Bookstack*. It has therefore been suggested that it would be a good idea if *Agriculture for Development* provided space for 'reflections' by older and retired TAA members.

A regular 'Reflections' feature could contain short descriptions of technically interesting tasks or postings, amusing anecdotes or events, and career summaries. Contributions would have to be short and 'punchy', and range from about 250-1000 words. *Before establishing this regular feature, I would appreciate feedback from members on the merits or otherwise of this suggestion*.

Linked to this idea, is the thought that the TAA should be able to archive longer reminiscences and career records of its members. These could be archived on our website. *Would members also appreciate, and utilise, this facility?*

Finally, it has been suggested that periodically the TAA could publish a book of members' reminiscences. This idea would require a volunteer, or a group of volunteers, to design, edit and compile the books. The books would then be sold at cost price, or perhaps at a small profit. Hugh Brammer has offered to take the lead in coordinating this effort. *Would this idea attract any interest from members?*

I look forward to hearing your thoughts on these three ideas. I can be contacted by email (coordinator_ag4dev@taa.org.uk), or by post or telephone (details on the back cover of this journal).

Paul Harding
Coordinating Editor, *Agriculture for Development*

Obituaries

Professor Dennis J Greenland FRS (1930-2012)

Dennis Greenland was born on 13 June, 1930, in Portsmouth, England. He was educated at Portsmouth Grammar School (1941-48) and at Christ Church, Oxford University, from where he graduated with 1st Class Honours in chemistry in 1952. Interested to work outside as well as inside a laboratory, he took Dr EW (Walter) Russell's soil science course and developed a strong interest in the subject, investigating the interaction of simple organic compounds, organic polymers and soil organic matter with clay mineral surfaces; areas of research that were to continue as a theme through much of his career. In 1954, during his post-graduate studies, Dennis was invited to join a four-month University expedition to the West Nile Region of Uganda. This experience stimulated his interest not only in the relationship between soil and agricultural productivity but also in tropical regions. He graduated with MA and DPhil in 1955.

After graduation, Dennis took up a position as Research Fellow and Lecturer at the (now) University of Ghana in Accra (1955-59). He worked closely with Peter Nye and together they published the seminal work *The Soil Under Shifting Cultivation* (1960). He then took up the position of Lecturer, then Reader, at the Waite Agricultural Research Institute, University of Adelaide, South Australia (1959-70). There, he resumed his studies on the effects of organic matter on soil fertility and soil structure. Through these activities, he had a substantial impact on Australian soil science and was also actively involved in organising the 1968 World Congress of Soil Science in Adelaide.

In the meantime, Walter Russell had been appointed Professor of Soil Science at Reading University and, when Russell retired in 1970, Dennis was selected to succeed him and occupied the Chair there from 1970 to 1978. During this period, he was invited to assist in the planning and development of the International Institute of Tropical Agriculture (IITA) at Ibadan, Nigeria, and he became a member of the Board of Trustees. Subsequently, he was asked to take up the position of Director of Research at IITA (1974-76).

From 1978-1987, Dennis was Deputy Director for Research at the International Rice Research Institute (IRRI), first under Nyle Brady as Director General then, from 1981, under MS Swaminathan FRS. Dennis had a high regard for Swaminathan, and together, they established a very effective group of scientists and an innovative research programme with an end-user focus. Towards the end of his service at IRRI, the substantial managerial demands and increasing travel requirements began to take a toll on his health. Consequently, in 1987, he returned to Britain to take-up the position of Director of Research Services at CAB International (1987-92), where he initiated the reorganisation and relocation of the four CABI Research Institutes. Following his retirement, he undertook many consultancies for industry, universities, government departments and various United Nations agencies, and served as chair for the advisory board of the International Board for Soil Research and Management (IBSRAM).

In addition to these many positions, Dennis also spent some time in the USA as visiting Professor at the Universities of Minnesota and Iowa. He also contributed significantly to the work of learned societies, serving as a member of the Committee on International Programs and the Committee on Statutes and Structures of the International Society of Soil Science, President of the British Society of Soil Science, and Chair of the Scientific Advisory Panel of the Commonwealth Development Corporation, UK.

Dennis Greenland published more than 180 papers plus a number of influential authored, co-authored or edited books including: The *Soil Under Shifting Cultivation* with Peter Nye (1960), *Soil Conservation and Management* in the *Humid Tropics* with Rattan Lal (1977), *The Chemistry of Soil Constituents* (1978) plus *The Chemistry of Soil Processes* (1981) both co-edited with Michael Hayes, *Characterization of soils in relation to their classification and management for crop production* (1981), *Cherish the Earth* (1994), *Sustainability of Rice Farming* (1997) and *Land Resources: On the edge of the Malthusian precipice?* (1998) edited with Peter Gregory and Peter Nye.

In recognition of his outstanding record and service, he was awarded the Honorary degrees of Doctor of Agricultural Science by the University of Ghent, Belgium (1981), and Doctor of Science by Ohio State University, USA (2003). He was made a Fellow of both the American Society of Agronomy and the Soil Science Society of America (1993), the World Academy of Arts and Science, and the Institute of Biology, UK. He received the most highly esteemed recognition for his contributions when he was elected Fellow of the Royal Society, London, in 1994.

Impressive though this record is, it does not fully capture the essence of Dennis Greenland. He was a strong mentor to many talented young scientists whom he helped to nurture, develop and support throughout their careers. Those who knew him were aware of his keen intellect, clarity of thought in the identification of purpose and direction, and the leadership qualities to achieve the required objectives. He always insisted on high quality research work underpinned by sound scientific principles. At the same time, he had a strong commitment to the implementation of research findings with an end-user or client focus. It was through the application of these qualities and skills that he was able to make such a substantial contribution to soil science and agriculture, particularly through his extensive work

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in the tropics. Dennis had an almost encyclopaedic knowledge of soils, and was both a specialist in several areas and a generalist that allowed him to make a crisp synthesis of several complex matters. Through the sum of these activities, he made a large impact on soil science and he leaves a substantial legacy which will continue to resonate, inspire and inform for many years.

Dennis's family was a cornerstone of his life. Whilst in Oxford, Dennis met Mary Johnston from Tauranga, New Zealand, who was to be his constant companion and support in the many and varied locations where they lived around the world throughout the remainder of his life. They married in 1955 shortly before moving to Ghana. Dennis is survived by his wife, three children and seven grandchildren.

(Abbreviated from an obituary by Roger Swift and Alfred Hartemink in the IUSS Bulletin, January 2013)

Tony Stubbings (1943-2012)

Anthony (Tony) David Miller Stubbings (69) died of a stroke in the Aga Khan Hospital, Dar es Salaam, on 31 May 2012. He is survived by his children, Gillian and Andrew, by his brother Simon, ex-wife Ailsae and many cousins, nephews and nieces. He was born in Dar es Salaam, Tanzania on 19 January 1943 to Basil and Jean Stubbings, both deceased. Tony's father was in the colonial service and was Provincial Commissioner, Arusha, as well as serving as DC in Tanga, Tabora, Sumbawanga and Moshi.

Tony attended Michaelhouse School in Natal Province, South Africa. He began a law degree at Trinity College, Dublin, but left in his second year. For several very happy years he worked for James Finlay as a tea estate manager in the High Range in Kerala, South India. It was here he acquired a good working knowledge of Tamil, a demonstration of his ability to assimilate the language of the countries in which he worked. These ranged from Hausa to Bahasa Malay, and included Nepali as well as Swahili.

In 1975, he left Aberdeen University with an MSc in Agricultural Economics. It was at Aberdeen, too, that he met his wife (for 27 years) Ailsae. His first position as an agricultural economist was on a contract to the World Bank in the Northern States of Nigeria, and this set the pattern for his working life. He continued to work in the developing world throughout Africa as well as parts of Asia including Tibet, Nepal, Pakistan, Bhutan, Cambodia, Malaysia and Vietnam. Whilst working for various Danish aid organisations, he was inordinately proud of having earned the nickname 'Blood-axe Stubbings', but his favourite name of all, 'Bwana Mamba', was given to him by staff at the Tanzanian Parks Authorities.

In 2000, he was involved in a very serious car crash in Tanzania. He recovered speech and movement during eight months of neurological rehabilitation in Edinburgh. It was in 2001 that Tony decided to make a new life for himself in Tanzania and he settled in Iringa. In 2011, the opportunity arose to buy land in Njombe and it was in this area that he chose not only to build a new house, but was finally able to realise a long-held ambition to own and run his own farm in Africa. Having finally got a little closer to his own dream of paradise, it is a great pity that he did not live long enough to really enjoy his time there.

Tony loved fishing, sailing, bird-watching, Beethoven, Haydn, Handel, Bach and Abba. His dogs were an integral part of his life and he really appreciated good food, good wine and whisky, as well as good company to share them with. He hated whiners, moaners, cheesecake, snakes, rats, horror films, crowds and visitors who outstayed their welcome or past his bedtime. It is probably quite fitting that the man who gave so much of his working life to Africa should end eleven very happy years in one of his favourite places, Tanzania.

"We shall not cease from exploration
And the end of all our exploring
Will be to arrive where we started
And know the place for the first time"
(TS Eliot 'Little Gidding', The Four Quartets)

David Wendover

Laurence (Laurie) Robertson, BSc (1932-2012)

Laurie was born in Perthshire, the son of a farmer. He graduated with a BSc in Agriculture from Edinburgh University in 1956, and then had the misfortune to lose his left arm whilst fixing agricultural machinery on the Bush Farm. Whilst recuperating at the Edinburgh Royal Infirmary, he met his future wife Anne who was a nurse at the Infirmary. They married on 27 August 1957, and three days later he took up a post as a Banana Field Researcher in Cameroon, West Africa, for the Commonwealth Development Corporation. All three of their children, Laurence, Kenneth and Fiona were born in Cameroon.

In 1963, the political situation in the Cameroon was unsettled, and they all moved back to the UK where, after a brief spell with the Angus Milling Company, he went, in 1964, with his family to Ethiopia to work for Mitchell Cotts on a cotton growing project. By the time he left in 1970, 30,000 acres of desert were irrigated and the plantation had a permanent workforce of 3000. In 1970, he was transferred by Mitchell Cotts to Ecuador to be head of a commercial farming operation which produced wheat, barley and pyrethrum. He returned to Ethiopia in 1973, but only stayed for about a year because of political unrest in the country.

In 1974, he joined the FAO in Rome as an Agronomist, helping to identify and design agricultural projects in developing countries for the World Bank to finance. These countries included India, Pakistan, the Philippines, Indonesia, Yemen, Burma and Laos. A road accident in 1977 curtailed his overseas trips for a year, and this meant he had time to become President of the Association of Professional Staff at FAO. He returned to London in 1982 to work for Crown Agents as the Director of the Agricultural Services Unit with responsibilities for managed projects in Africa and Asia. He returned to Rome in 1984 to continue his work with FAO before he took early

retirement in 1989 to live in Wigtown, Dumfries and Galloway, from where he undertook consultancy work for the World Bank with trips to India and Ethiopia.

In retirement, he got involved in many charities and organisations. He joined a charity mission and made two mercy missions to Croatia during the Balkans War. He was Treasurer for the West Galloway Voluntary Accident Service and played an active role in chairing the patient support group in Wigtown. He also served for two years as a member on the Children's Panel of Dumfries and Galloway and was Treasurer of the Dumfries and Galloway Beekeepers Association. He was also President of the Newton Stewart Probus for a year. He was also a very keen gardener and, in his later life, he was a keen member of the TAA. He joined the organisation in the 1990s and was a regular attendee of TAA meetings both in Scotland and in London. He became its Treasurer in 1998, a post that he retained until 2006. Whilst he was Treasurer, to reduce travelling and to save the TAA money, he pioneered the use of teleconferencing for Executive Committee meetings split between London and Glasgow.

He died suddenly but peacefully at home on the evening of 7 November 2012. He is survived by his wife Anne, his children Laurence, Kenneth and Fiona, and six grandchildren.

Tony Smith

Dr Thomas (Tom) HR Hall, FLS (1926-2013)

After a long and distinguished career as an arboriculturist, Tom Hall passed away in the Ballater Clinic in Royal Deeside on 12 January, aged 87. He obtained his BSc in forestry from Edinburgh University in 1946, and was awarded his PhD by Birmingham University in 1971 with a thesis on Cocoa Tissue Culture.

He worked for the Colonial Service in several African countries including Nigeria, Ghana and the Sudan and later in Borneo, until he returned to the UK in 1978, spending 3 years as Curator of the Birmingham University Botanical Gardens followed by a further 3 years as Arboriculturist with the Metropolitan Borough of Calderdale. In 1977, he was appointed Superintendent of Oxford University Parks, his final post before retiring.

Tom made a unique contribution to Arboriculture both in the UK and overseas. He was editor of the Arboricultural Journal for 24 years until 1977, and he received the Arboricultural Association's Annual Award in 1983, due largely to his remarkable achievements as the Journal's editor.

Perhaps Tom's most important contributions concerned his tireless promotion of urban forestry, developed in participation with the American landscape architect Henry Arnold and through his friendship with Dr Alex Shigo of the USDA Forest Service. On a visit to the USA, he met other foresters, became the first British professional to deliver a paper at a US National Urban Forestry Conference, became convinced of the relevance of urban forestry to Britain, and effectively became its first ambassador, promoting urban forestry ideas and practices. His impact in this area will certainly continue for many years to come.

I first met Tom in 1956 when we were Colonial Office students at East Malling Research Station in Kent, and then became colleagues at the West African Cocoa Research Institute (now CRIG) in Ghana. We remained good friends and he will be sadly missed.

Roger Smith

Dr Roger Whitehead (1934-2012)

Botanist/Plant Breeder - Coconut Industry Board, Jamaica

After graduating from Durham University, Roger Whitehead obtained a Colonial Agricultural Research studentship, which involved one year at East Malling Research Station in Kent followed by one year at the Imperial College of Tropical Agriculture in Trinidad (en route to which he was shipwrecked off the Portuguese coast). Having obtained his Diploma in Tropical Agriculture, he went to work in the West African Institute for Oil Palm Research in Nigeria from 1957. When the Research Department of the Coconut Industry Board in Jamaica was set up in 1959, he was appointed botanist/plant breeder, a position he held until mid-1967.

He soon made his scientific debut when *Nature* published his letter in 1962 on room temperature storage of coconut pollen. His subsequent work on vacuum freeze drying coconut pollen contributed to the thesis for his doctorate from Reading University. He also published findings from the preliminary survey of the four coconut populations that were then present in Jamaica; their distinctly different habits, flowering, fruiting and germination patterns. Selected representatives of all four were included in his first controlled cross-pollinations for a breeding programme aimed at hurricane tolerance and lethal yellowing disease resistance – the two major constraints faced by Jamaican coconut farmers.

In 1964, he spent three months carrying out a sample survey and collection of coconut germplasm in the Pacific islands for the UK Ministry of Overseas Development. While in the British Solomon Islands Protectorate, he had to be rescued and the storm-damaged ship towed back to port when making an abortive attempt to visit Rennell Island, later to become the source of a very successful pollen parent of hybrids in the Solomons and Vanuatu. The unprecedented air-freighting of 1,766 partly or completely husked seednuts to Jamaica catapulted the Coconut Industry Board to the forefront of coconut research worldwide. In 1966, the Food and Agriculture Organization of the United Nations recognised the importance of the coconut breeding work in Jamaica by funding an extension to the germplasm collection, mainly from Asia.

Replicated trials of local, introduced and hybrid material were planted in areas where lethal yellowing disease was epidemic, to test for resistance, and in

disease-free areas, to test for yield. However, results from field exposure trials take time and it was not until 1974, seven years after he left Jamaica, that one of his earliest hybrid combinations was produced in commercial quantities and released as part of the lethal yellowing rehabilitation programme. Despite the outbreak of a more virulent epidemic in the late-1990s and early-2000s, this hybrid, named Maypan, remains the planting material of choice in Jamaica and Florida, and similar hybrid combinations between the Malayan Dwarf and the Pacific Coast Tall in Mexico and Honduras.

Upon leaving Jamaica in 1967, Roger joined the Joint Coconut Research Scheme, Yandina, British Solomon Islands Protectorate. Having been greatly impressed with the diversity of both tall and dwarf populations across the Pacific, he persuaded Levers Pacific Plantations (a subsidiary of Unilever) to establish a seed garden for Malayan Red Dwarf by Rennell hybrid seed production. Later, Levers replanted many thousands of hectares with this hybrid, with outstanding results.

In 1976, he contributed a chapter on coconut in a text book on crop plant evolution and considered a coconut breeding position in Thailand, but did not take it because the FAO withdrew funding due to economies by UNDP. Instead, Dr Whitehead became Head of Biology at the prestigious Blundell's School in Devon. At least two of his students took up careers in tropical agriculture by joining New Britain Palm Development in Papua New Guinea in the 1980s and, only two days before he died in November 2012, a scientific paper on coconut diversity was published that was directly based on his 1965 paper 'Speed of germination, a characteristic of possible taxonomic significance in *Cocos nucifera* L.'

Roger Smith, Mike Foale and Hugh Harries

TAAF News

The 2012 AGM overview of TAAF activities over the year appears in the TAA Forum. Here are summaries of some of the individual awardees' research:

Alex Tasker, MSc Anthropology, Environment and Development, UCL

The changing use of development interventions in risk-coping among the Gabra of North Horr

This project examined the perception and use of development interventions by the Gabra (nomadic camel-herders) in Northern Kenya. The study constructed a culturally-relevant framework for analysing attitudes to development and risks, and found that wealth primarily influenced how development interventions were prioritised and used. The study identified evidence of an increasingly sophisticated exploitation occurring by both local populations and NGOs. Multiple examples of the subversion or misuse of interventions were identified, with humanitarian programmes seemingly both the most at risk and most culpable.

The research provided a fascinating insight into an area in receipt of 'chronic aid'. By examining the motivations of local populations in their use of development, light was shed on the methods used to misdirect resources or undermine local coping mechanisms. The findings are of particular use to development organisations 'on the ground', identifying both current trends in thinking and use whilst also providing guidance to minimise the undermining of future interventions. On a personal level, the research allowed me the chance to explore complex participatory techniques, and provided an insight into the practical problems associated with development and humanitarian programming in the East African arid and semi-arid lands (ASALs). I am currently trying to secure funding for a PhD to continue exploring several of the themes raised in this study.

Figure 1: PRA exercise in Yaa-Algana, Kenya

Jessica Chu, Long-term Awardee, School of Oriental and African Studies

The Cultural Economy of 'land grabs' in Zambia: rumours, discourses and the social productions of new land acquisitions

I was awarded a TAAF award to undertake an eight-month research fellowship position with the Zambia Land Alliance (ZLA), to conduct research on the rising large-scale land acquisitions in Zambia. ZLA is a Zambian civil society organization that campaigns on behalf of land rights for the poor and marginalized. As part of their ongoing efforts to promote pro-poor land rights, they have become increasingly interested in the rise of large-scale land acquisitions. As part of my role with ZLA, I was tasked with helping build their research capacity while helping them formulate an evidence-based policy advocacy

campaign through scoping work and field research on four case studies of large-scale land acquisitions.

My primary interest lay in understanding the socio-economic impacts of new commercial farming projects and to understand the role they played in agricultural development discourses. Land has been primarily acquired by European agricultural investors, such as private equity funds and hedge funds, to rehabilitate brownfield farm sites. Interestingly, the context that has allowed for the growth of such investments has not necessarily been weak land governance, but rather the growth of the domestic food markets. The success of the mining sector in recent years has prompted a growth of the Zambian middle class and the attraction of further foreign investment, which has created a large demand for foodstuffs such as wheat and soya products (for both food oils and feedstock). Much of the agricultural production thus far has remained within Zambia for domestic consumption, with ambitions for export to neighbouring countries.

These key insights into the processes and impacts of large-scale land acquisitions for agriculture in Zambia help provide an opportunity for organizations such as ZLA to target their campaigns for when negative impacts on local communities take place. ZLA is now able to build such a campaign to engage policy makers, investors, and the Zambian civil society on how to mitigate negative impacts to local smallholder farming communities. My assignment with ZLA helped provide me with integral experience by providing the opportunity to conduct field research as well as the chance to work with a local NGO in formulating targeted evidenced-based policy advocacy campaigns. I am extremely grateful for both these experiences, as they have been integral to my own PhD research and for looking towards future employment in agricultural development research.

David Sabogal Habedank, MSc in Anthropology, Environment and Development, University College of London

A case study on the implementation of climate mitigation initiatives in an Amazonian community in Madre de Dios, Peru.

In view of the insufficient knowledge regarding sub-national climate mitigation initiatives, the work undertaken for this research project was a case study on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries (REDD+) implementation among the community of Infierno in Madre de Dios, Peru. This study aimed foremost to provide an anthropological analysis of community dynamics shaped by repeated waves of in-migration and frontier expansion, with a particular focus on social cohesion, land-use models and commons resource management. In addition, it provided a critical and constructive insight into REDD+ implementation within the context of on-going transformations among Amazonian communities in region. This project enriched our understanding of current REDD+ approaches, and contributed to the literature and wider debates about the potential role and impacts of these initiatives among participating communities.

With this research project and the support of TAA, I have been able to gain rich fieldwork experience in the collection of both qualitative and quantitative data through the use of a variety of methodological tools. More importantly, I have been able to comprehend some of the practical issues and limitations in their application. In addition, this study has given me the opportunity to broaden my understanding of the theme chosen and critically examine the implications of my results. Ultimately this experience has been fundamental for both my academic and professional development.

FUNDING NEEDED FOR THE TAA AWARD SCHEME

The world faces a growing crisis in food production, and developing countries in particular struggle to cope with uncertainty resulting from climate and environmental change. Britain has always played a major role in this campaign, and will do so even more from next year when its aid programme reaches the UN target of 0.7% of GDP. To ensure that aid money is well used, there is an urgent need to increase the supply of young professionals in the UK who have practical field experience of international rural development, and are qualified to fill the posts in consulting firms, aid organisations, NGOs, agribusinesses, and research and training organisations which fall vacant as more experienced staff reach retirement age.

The TAA Award Fund (TAAF) has now helped some 200 UK graduates qualified in agriculture, forestry, economics, social and environmental sciences to gain practical experience of international rural development since the Fund was established in 1989. Awardees have worked in more than 30 countries of Africa, Asia, South America and the Caribbean in diverse fields such as food security, conservation agriculture, sustainable forestry and fisheries, impact of land grabs, cattle and conflict. Following their awards, many have continued to important jobs in DFID, UN organisations, NGOs, universities and commercial organisations.

Gemma Holloway, TAAF awardee in 2010, with women farmers in Uganda

Over the last five years, TAAF has operated with a budget of £12,000-£15,000 p.a. This has enabled it to make, on average, 10-12 awards per year: 2-3 long term awards (6-12 months); and 8-10 short term awards (6-8 weeks) aimed at MSc students.

Sarah Wells, TAAF awardee in 2011, with her homestay family in Indonesia

In the past, TAAF has raised money for its awards from DFID, Gatsby Charitable Foundation, private companies, individual donations and the TAA itself (20% of membership fees are allocated to the TAAF). In the current economic climate, many of these sources are drying up, and, despite intensive searches, alternative sources have proved hard to find. There is a real risk that TAAF may be obliged to scale down its activities, despite continuing demand from award applicants and employers.

Any organisations or individuals interested in providing financial support to enable TAAF to continue its important work are encouraged to visit the TAA website (www.taa.org.uk), or to email the TAAF Chairman (taa_award_fund@taa.org.uk), Secretary (secretary_taaf@taa.org.uk) or TAA Treasurer (treasurer@taa.org.uk). Support at any level will be greatly appreciated, particularly by the next generation of young professionals. Legacies from older TAA members will be particularly welcomed, and advice on appropriate wording can be obtained from the Treasurer.

Antony Ellman
TAAF Chairman

New Graduate Employment Opportunities in DFID

DFID recently announced two new employment opportunities for graduates in subjects related to natural resources development. These are intended for people with UK, EEA or Swiss citizenship. Commonwealth citizens with indefinite leave to remain and work in UK are also eligible to apply.

Graduate Recruitment Scheme (GRS) 2013

This scheme offers paid work experience, for graduates, over a 50 week period in one of DFID's specialist teams in London. The teams cover a range of areas including:

- Agriculture, Food and Nutrition
- Climate, Environment and Infrastructure
- Research, Evidence and Evaluation
- Development Education
- Aid Project Analysis
- Civil Society
- Private Sector Development

The scheme was open for applications between 15 January 2013 and 12 March 2013. Applications should be made on line through the Civil Service website www.jobstatic.civilservice.gov.uk/csjobs.html

DFID Entry Scheme for Advisers (DESA)

DFID has also recently announced a new DFID Entry Scheme for Advisers which aims to build in-house technical advisory capability in the following fields:

- Climate and Environment
- Education
- Evaluation
- Governance
- Humanitarian Aid
- Infrastructure
- Livelihoods
- Private Sector Development
- Social Development

Three-year fixed term contracts are offered, the first year being a placement in the UK, the two subsequent years being an overseas placement. Postgraduate qualifications (MSc or PhD) are required, plus 2-3 years prior work experience which should preferably, but not essentially, be in development.

An application pack can be downloaded from the Civil Service website www.jobstatic.civilservice.gov.uk/csjobs. The closing date for 2013 DESA applications was 31 January 2013.

Although, by the time of publication, the 2013 application deadlines for both schemes will have passed, it is likely that similar schemes will operate in 2014. In response to a request for information about the 2014 schemes, DFID has confirmed that, subject to approval, the 2014 DESA will be advertised in the autumn of 2013, with successful applicants beginning in June 2014.

Corporate Members' Page

World class strength to face global challenges

As the world's population continues to grow, it is estimated we will need something like 40% more food, 30 or 40% more available fresh water, and 50% more energy, making food, water and energy security key global challenges.

Scotland is well-placed to meet some of those challenges, and research at the James Hutton Institute encompasses a distinctive range of integrated, world-class strengths in land, crop, water, environmental and socio-economic science. This range of science disciplines interconnect, delivering knowledge, products and services that improve quality of life.

In partnership with people, organisations and governments, the Institute's work enhances sustainable environmental, social and economic development, delivering practical solutions for our shared future, and influencing the agenda for land use and development for the 21st Century. The Institute undertakes work in a wide range of areas for customers including the Scottish and UK governments, the EU, and other organisations world-wide. Researchers at the Institute are currently involved in on-going work in Europe, North and South America, Asia, Africa and Oceania.

The James Hutton Institute is a multi-site organisation with a staff of around 600, plus 150 PhD students. It was formed in 2011 by the merger of the Macaulay Land Use Research Institute (MLURI) in Aberdeen and the Scottish Crop Research Institute (SCRI) based in Invergowrie near Dundee. Its name comes from the 18th century Scottish Enlightenment scientist, James Hutton, who is widely regarded as the founder of modern geology and who was also an experimental farmer and agronomist.

The Institute organises its research through seven principal themes which enables it to meet global challenges: Safeguarding Natural Capital; Enhancing Crop Productivity and Utilisation; Delivering Sustainable Production Systems; Controlling Weeds, Pests and Diseases; Managing Catchments and Coasts; Realising Land's Potential; and Nurturing Vibrant and Low Carbon Communities.

In order to provide commercial services, the James Hutton Institute operates two subsidiaries. Macaulay Scientific Consulting (MSC) Ltd is an environmental consultancy centre offering unparalleled experience in soil and water consultancy, and land evaluation. Mylnefield Research Services (MRS) Ltd undertakes contract research, especially plant breeding, licenses plant varieties internationally and delivers analytical services.

New environmental research links with China

The James Hutton Institute and the Natural Environment Research Council's Centre for Ecology and Hydrology, the Chinese Academy of Sciences, and China Agricultural University have jointly announced a new Centre-Centre research collaboration developed to tackle some of the global challenges of food, water and energy security. This unique Centre-Centre collaboration, built on the scientific excellence of the partner institutions, will provide knowledge and understanding to support long term economic growth hand in hand with environmental protection.

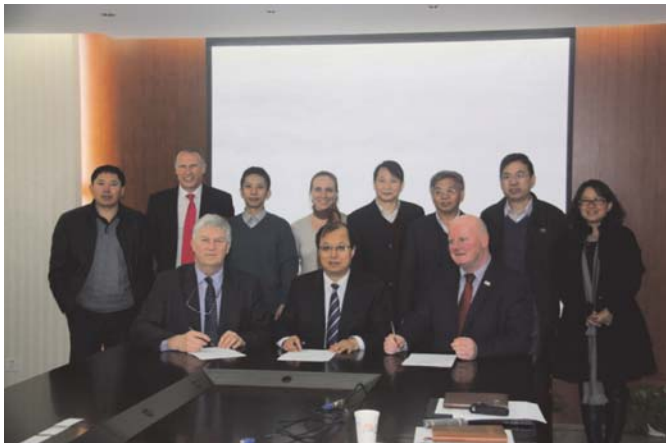

Figure 1. Signing the MOUs with Chinese partners

The Centre for Ecology and Hydrology and the James Hutton Institute will collaborate with the Chinese Academy of Sciences and its Research Centre for Eco-Environmental Sciences to initially target research on the remediation and recovery of polluted environments, water and food security and watershed management, soil contamination, and the development of eco-toxicology tools for environmental monitoring.

The collaboration with China Agricultural University's Centre for Resources, Environment and Food Security will focus on food and water security, in particular, the damaging impact of

air pollution on crop productivity, and promoting soil health and function.

Professor Bob Ferrier, Director of Research Impact at the James Hutton Institute, said: "This unique Centre-Centre collaboration will provide a long-term platform for science between UK and China which we aim to strengthen further in the coming years".

"This signing is a significant development in establishing a critical mass to deliver science excellence in environmental research between China and the UK," added Professor Mark Bailey, Director of the Centre for Ecology and Hydrology.

Mr Li Zhaohu, Vice President of China Agricultural University said: "We look forward to strengthening our partnership which will see scientists and students working between the two countries".

Professor Jiang Guiblin, Director General of the Research Centre for Eco-Environmental Sciences pointed out that "this partnership is built on our shared understanding and I welcome the opportunity for us to work together".

Professor Alan Jenkins, Director of the Water Research Programme at the Centre for Ecology and Hydrology highlighted the "importance of the collaboration in addressing the pressing challenges of food and water security".

The Centre-Centre collaboration will promote bilateral exchange, joint studentship opportunities and the development of collaborative research programmes. The Centre-Centre approach will strengthen the growing scientific relationship between UK and China.

Bernardo Rodriguez-Salcedo
Media and External Relations Coordinator
The James Hutton Institute

UNIVERSITY of GREENWICH | Natural Resources Institute

Poor farming communities to benefit from new research into viruses that damage yam crops

The University of Greenwich's Natural Resources Institute (NRI) has received a grant from the Bill & Melinda Gates Foundation to support research to detect damaging viruses, which can reduce the yield of valuable yam crops for smallholder farming communities in West Africa and other parts of the developing world.

NRI researchers aim to develop a cheap and reliable testing system, which can be used to select virus-free yam tubers for planting by smallholder farmers. The aim is to improve food security and household incomes of some of the world's poorest farmers.

The three year ~$1.5m project, entitled *Development of on-farm diagnostic toolkits for yam virus diseases*, is being led by Dr Susan Seal, Head of the Biodiversity and Molecular Biology Research Group at NRI. She says: "Yam is a staple crop formillions of people in many tropical countries. We aim to produce sensitive, cost-effective testing devices, which will test the yams for viruses, and give clear results in minutes – just as a pregnancy test kit does."

The Natural Resources Institute (NRI) works to support food security, sustainable development and poverty reduction in developing countries. It has a special focus on, and expertise in, development in Africa. Other large projects with the Bill & Melinda Gates Foundation include research to tackle agricultural pests such as whitefly, and economic development work with producers of another important staple crop, cassava.

Ruth Leavett
Communications Specialist, NRI

Upcoming events

Seminar on Agriculture in Tanzania

Date and time: 9 May 2013, 10.00

Details: Held during the course for agricultural college senior staff in Africa, the seminar will concentrate on development in Tanzania. Combined with presentations by invited speakers, papers will be put forward by some of the course participants. Fuller details will be presented as soon as the final agenda is available. Moderate fee and lunch in the College canteen.

Venue: Bicton College, near Budleigh Salterton, Devon EX9 7BH

Contact: Register with David Wendover or George Taylor-Hunt

Deleloping methods in agriculture and health research

Date and time: 13-14 June 2013, 0900

Details: The Leverhulme Centre for Integrative Research on Agriculture and Health (LCIRAH) is proud to announce its 3rd Annual Conference. The focus of this two- day conference will be on methodological and integrative aspects of research on agriculture and health; and will feature the work and findings of researchers in agricultural development, nutrition, public health, economics, anthropology, veterinary science and other related fields.

Venue: Royal Veterinary Colleges Camden Campus, London.

Contact: Ibi Wallbank, LCIRAH Administrator,
+44(0) 207 958 8262

Annual Meeting of the Caribbean Food Crops Society (CFCS)

Date and time: 30 June-6 July 2013, 0900

Details: This will be a joint meeting with the Caribbean Agro-Economic Society and the International Society for Horticultural Science. Attendance by TAA members would help to strengthen the linkages between TAA and CFCS. The TAA has strong historical roots in Trinidad, and this would be an opportunity to reignite links.

Venue: Port of Spain, Trinidad

Contact: Any member who would like to attend, please contact Bruce Lauckner, our representative in the Caribbean. There will be a registration fee.

TAA SW Group Summer Outing: Mendips and the Chew Valley

Date and time: 17-19 July 2013, 10.00

Details: The TAA Southwest Group plans a summer outing. Members and friends will be able to become acquainted with the Mendip Hills AONB and the Chew Valley, with its two scenic lakes: Chew and Blagdon. There will be visits to farm businesses, the Bristol Community Farm, Bristol Waters famous beam engine pumping station and small local museums. With a two-night stay at Folly Farm which is owned and managed by the Avon Wildlife Trust.

Venue: Itinerary and cost to follow. Mark in your diary!

Contact: George Taylor-Hunt, 01626 362 782

Threats to Land and Water Resources in the 21st Century: Prevention, Mitigation and Restoration

Date and time: 4-7 September 2013, 09.00

Details: This is the 2ndWorld Association of Soil and Water Conservation's World Conference (WASWAC-WCII). There will be a post-conference excursion to the Eastern part of Thailand, 8-10 September. The conference topics will cover fields of management and conservation of soil and water resources, to be circulated in the near future. Deadline for abstracts is 15 April 2013. Full details are available on the WASWAC website http://www.waswac.org/

Venue: Chiang Rai, Thailand.

Contact: Please complete registration forms from WASWAC website and send to Khun Samran at sombatpanit@gmail.comor

International Congress: Sustainable livelihoods in the tropical drylands

Date and time: 17-21 September 2013, 09.00

Details: Over the last decade, significant advances have been made in tropical and subtropical drylands of Sub-Saharan Africa to boost sustainable livelihoods. This international symposium aims to create a forum for exchanging results and experiences for those conducting research in the dry highlands of Africa, or in comparable regions around the globe. Themes will be: Water harvesting for improving livelihoods; Soil conservation and forestry; Technologies for improved rural welfare; Aquatic ecology; Crop productivity; Socio-economics of sustainable livelihoods. Full details are available on the website: http://ees.kuleuven.be/livelihood2013/index.html

Venue: Hosted by Mekelle University, in the Axum Hotel, Mekelle, Northern Ethiopia (about 780 km north of the capital Addis Ababa). Daily air links with Addis.

Contact: livelihood2013@ees.kuleuven.be

First International Conference on Global Food Security

Date and time: 29 September - 2 October 2013, 09.00

Details: The Conference aims to deliver state-of-the-art analysis, inspiring visions and innovative research methods arising from interdisciplinary research. An opportunity to ensure that the best science is garnered to support the emergence of the Sustainable Development Goals. Achieving global food security whilst reconciling demands on the environment is the greatest challenge faced by mankind. By 2050 we will need to feed 9 billion people. We aim to better understand economic, social, biophysical, technological and institutional drivers of current and future global food security. Full details on http://globalfoodsecurityconference .com/index.html

Venue: NH Conference Centre Leeuwenhorst, Langelaan 3, 2211XT Noordwijkerhout, The Netherlands.

Contact: Register on the above website.

TAA AGM and Ralph Melville Memorial Lecture

Date and time: 27 November 2013, 17.00

Details: The TAA 2013 AGM and Ralph Melville Memorial Lecture. The guest speaker will be Sir John Beddington, presenting a lecture on 'Challenges of the 21st Century'.

Venue: To be held at the Royal Over-Seas League Club, Park Place, London.

Contact: To reserve tickets for the meeting and the buffet supper please contact Elizabeth Warham, TAA General Secretary (elizabeth_warham@hotmail.com). Prices will be announced in due course.

THE EIGHTH HUGH BUNTING MEMORIAL LECTURE

Monday 17 June 2013

Presented by

Professor Dyno Keatinge

Director General, AVRDC – The World Vegetable Center, Taiwan

Horticulture – The Key Ingredient in the Developing World for Nourishing Families, Empowering Women and Commercializing Small Holders

Date: Monday, 17th June 2013

Venue: John Madejski LectureTheatre
Agriculture Building, Earley Gate
University of Reading

Programme: *Chair – Dr Andrew Bennett CMG, President, TAA*

- 18:00 - 18:30 – Assemble
- 18:30 - 18:40 – Welcome – *Professor Michael Gooding, Head of School*
- 18:40 - 20:00 – The Hugh Bunting Memorial Lecture – *Dyno Keatinge*
- 20:00 - 21:30 – Reception and finger buffet – *free*

Spouses and partners are very welcome.

RSVP to: **Mrs Linda McCarthy (l.mccarthy@reading.ac.uk; tel: 0118 378 4549).**

How to get there? Consult the University of Reading map website – www.rdg.ac.uk/maps/
The Agriculture Building, opened in 2000, is Building Number 59 (Square D8) on the Whiteknights campus map. Please use the Earley Gate entrance to the campus.

Hugh Bunting made many contributions during his career to the understanding and practice of tropical agriculture. He inspired and challenged many generations of his students, many of whom went on to fill influential positions around the world. Hugh was Professor of Agricultural Botany at the University of Reading from 1956 to 1982. For seven years he was Dean of the Faculty of Agriculture and Food. He contributed substantially to enhancing the University's reputation in agricultural science and technology and in developing the University's competence and reputation in tropical agriculture.

Hugh would happily take development agencies to task if he felt that they were guilty of woolly thinking or actions not firmly based on evidence. He held the first and only Chair of Agricultural Development Overseas at Reading, funded by the British Aid Programme – ODA and ODM. He was Chair of the working group set up by Bob Cunningham and ODA to decide on the future of the ICTA Association, which resulted in the establishment of the TAA. Working with David Betts he was largely responsible for the drafting of the first constitution and for the registration of the TAA as a UK charity.

Hugh always encouraged us to learn the lessons of the past but to look forward, so the overall theme of the memorial lectures is 'agricultural futures'.

TAA Executive Committee

Regional Group Convenors

Specialist Group Convenors

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