

CGIAR Case Study Summary Report for ADE-PSC Workshop “Enhancing Research Productivity through Public Private Partnerships”

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Rodomiro Ortiz, CGIAR, Compiler

Workshop session subject:	Identifying best practice for productive partnerships
Processes highlighted:	Mechanics of core processes relevant for productive research-for-development (R4D) partnerships. Specific Focus on definition of mutual benefit, target setting, definition of deliverables and performance measurement

Case Study A

Partners:	International Livestock Research Institute (ILRI) – Merial
Period:	2004 – 2006
Matter of PPP:	Recombinant ecf vaccine research

Description (Scientific matter of the public-private partnership [PPP])

- Antigen discovery – identification of vaccine antigen candidates for cellular immune responses against the schizont stage of the *T. parva* parasite using genomics (The Institute for Genomic Research (TIGR)/ILRI) and cDNA library screening (Ludwig Cancer Institute) and screening using novel in-vitro methods by ILRI
- Prototype vaccine constructs using antigens above (Merial, Oxford and ILRI) and testing in cattle by ILRI

ILRI has been involved in ECF vaccine research and development for live sporozoite vaccines (Infection and Treatment Method) and recombinant sporozoite vaccines (with Intervet). The potential for an improved vaccine using new scientific tools was the motivation behind the current project. Live vaccines are efficacious but require an expensive delivery system. The Department for International Development (DFID, UK) provided funding for the public partners and Merial provided in-kind contributions for prototype vaccine constructs.

R4D processes highlighted

This was a combination of two research projects, one on antigen identification and one on prototype vaccine development and testing. Some R4D processes cut across both components and some were specific. The overall project had agreed plans of work and budget agreed by a project management group managed by ILRI for the public contribution. Outputs and milestones were evaluated by a staff member from DFID and a 3-person technical committee. The project leaders for different work packages had regular teleconferences and semi-annual face-to-face

meetings. After the semi-annual project meetings, there was a meeting with the DFID manager and technical advisor to assess progress and adjust plans as appropriate, which led to both a rigorous review of milestone achievement and research evidence to guide subsequent steps within an overall plan.

Critical success / non-success factors

1. R4D processes

- Investment in planning and evaluation of milestones a critical success factor.

2. Partnership perceptions and challenges

- Initial challenges of practice, trust and culture between public and private partners. Over time, practices converged and trust was established.

3. Policy issues, IP issues or other contractual issues

- Confidentiality agreements among project partners only partially mitigated initial mistrust.
- Exclusivity of the consortium during the project period slowed progress on overall ecf vaccine research (e.g. ILRI could not do parallel ECF vaccine research with another private partner)
- IP for a successful vaccine would be negotiated based on contributions and understanding of future benefits. Patent applications for antigens based on contribution

Benefits and value of the PPP

1. Contributions to vaccine research knowledge

- Key publications for antigen identification and vaccine development based on cell-mediated immunity
- Vectors for antibody-mediated vaccines not directly transferable in this case
- Vaccine development approaches are being applied in development of other vaccines. More basic research contemplated on cellular antigen presentation.
- Lessons applied to improve research management and a more product or impact focus of biotech projects at ILRI
- ILRI has continued with other partners on commercialization of live vaccines

John McDermott, ILRI, Nairobi, Kenya

Case Study B

Partners: World Agroforestry Centre (ICRAF) - Uniliver - World Conservation Union (IUCN) - Novel development companies in Ghana and Tanzania - TechnoServe, - Forestry research institutes of Ghana and Tanzania

Period: 2004 – now

Matter of PPP: Novella Africa, bringing *Allanblackia*, a new tree crop, to the global food market

Description (Scientific matter of the PPP)

Allanblackia (Clusiaceae), a genus of nine tree species, is the subject of the 'Novella Africa' private-public partnership. The purpose of this PPP is to build profitable and sustainable harvesting, marketing and cultivation of *Allanblackia*, the seed of which yields edible oil with potential in the global food market (as a 'hardstock' for the production of healthy spreads that are low in trans-fats). Unilever estimate that the present market potential for oil is more than 100,000 t annually and they would like to switch a full 10% of their vegetable oil use in food products to *Allanblackia* in the coming decades. Currently, oil collection is based on wild harvesting in Ghana, Nigeria and Tanzania, but extracted volumes (~ 500 t of seed in 2009, equating to ~ 170 t of oil) are small and expansion requires domestication. In 2004, ICRAF, with its experience in domesticating wild fruit trees, was invited to join the initiative to help bring the genus into cultivation. Other partners in the Novella Project include the IUCN, Novel Development Companies in Ghana and Tanzania (= national commercial partners), TechnoServe, and the forestry research institutes of Ghana and Tanzania. The vision of the Partnership is to develop *Allanblackia* as an indigenous, novel and sustainable source of income for smallholders and local enterprises

R4D processes highlighted

A participatory approach to domestication (local collection and selection of germplasm) is being applied to maximize livelihood benefits for farmers. Progress to date has involved the establishment of market supply chains for seed and initial plantings by smallholders (~22,000 trees in 2009). Further work will involve the development of rural resource centers to deliver improved germplasm to growers and provide other services such as market information, credit and access to buyers. Through this strategy it is foreseen that there will be progress towards the development of a market value chain which removes producers' constraints to profitable involvement and the diversification of the local economy. Likewise, the diversification of farmers' cropping systems should have positive impacts for biodiversity and provide resilience in the face of climate change. Currently, the most important activity under the initiative is research on improvement and promotion of *Allanblackia* planting (propagation methods, farm management, and germplasm delivery through local commercial enterprises), so that production constraints do not hamper market development.

Critical success / non-success factors

Technical developments are building an essential foundation of knowledge and resources on which future up-scaling can be based. Tree domestication research needs long-term support to generate benefits for farmers. In this partnership, partners jointly plan and execute activities with a view to accomplishing mutually agreed-upon objectives. Although not all in the partnership can provide monetary input, risks and benefits incurred in the process are shared. Novella Africa has made progress in market development and cultivation, but a step change in the scale of planting in coming years will be required before significant numbers of farmers benefit. We have found that addressing the different perceptions of the various specialists involved in particular areas of the initiative has been crucial to make it work, and that this requires constant and open communication between partners from different backgrounds so that consensus can be reached.

Benefits and value of the PPP

Already, Unilever with its resources and experience in food products has taken the oil from two species, *A. parviflora* and *A. stuhlmannii*, through European Union (EU) Novel Food Regulations that certify safe usage as a foodstuff, clearing an important hurdle to high future demand in the EU. Unilever has invested significant resources to drive progress, but the project has also been supported by various development agencies and initiatives that are supportive of PPP (e.g. ADA, DFID, PSOM and SECO). Experience shows that the commercialization of new tree crops is most likely to be successful when it is demand- rather than supply-driven, and Unilever's involvement is crucial in providing a market. What makes Novella Africa unique is its focus on developing a new crop to benefit both Africa's smallholders and the balance sheets of big business. This is the first time a multinational company has partnered in such an approach, and the initiative represents an example for the domestication of other new tree crops. The management skills and financial acumen of the private sector contribute significantly to creating a practical awareness of how to handle financial resources in public-, research- and development-sectors. Key issues for future attention include how to ensure intellectual property (IP) rights for farmer-selected cultivars, how to ensure production focuses on African smallholders rather than large commercial farmers within or outside the continent, what impact IP protection of processes based on *Allanblackia* oil will have on farmers' incomes, and how to guarantee markets sufficiently far into the future in order to make smallholder investment worthwhile.

Ramni Jamnadass, ICRAF, Nairobi, Kenya

Case Study C

Partners: Centro Internacional de Mejoramiento de Maíz y Trigo (CIMMYT) – Institut de recherche pour le développement (IRD, France) – Limagrain – DuPont/Pioneer Hi-Bred International, Inc. – Syngenta – Australian National University

Period: 1999 – now

Matter of PPP: **Apomixis characterization in maize**

Description (Scientific matter of the PPP)

For crops using hybrid cultivars, asexual reproduction through seeds based on apomixis provides fixed hybrid vigor that is maintained through multiple generations. This could greatly reduce breeding and seed production costs, whilst offering a mechanism for maintaining heterosis in crops derived from farmer-saved seed. Apomixis technologies may also be advantageous for resource-poor farmers, enabling economical development of high yielding cultivars for niche microclimates or specific uses. The Apomixis Consortium was established as a PPP for identifying and characterizing components required for apomixis in maize. It initially functioned through a licensing and joint research collaboration agreement between CIMMYT and IRD (France); and Pioneer Hi-Bred, Limagrain, and Novartis Seeds (now part of Syngenta Crop Protection). Earlier studies suggested that the genetic basis of apomixis in *Tripsacum* (a wild relative of maize) could be transferred to maize through wide hybridization. The first phase of the PPP (2000-2004) failed to stabilize transfer, due to epigenetic effects. This pre-breeding focus was replaced by strategic research during phase two (2005-2009), which formalized the Australian National

University (ANU) as external collaborator. This focused on analysis of the genetic basis of apomixis in maize and maize-*Tripsacum* hybrids. A third phase (2010-2014) is under discussion with a continued focus on strategic research.

R4D processes highlighted

The PPP has been cast as a 'frontier research partnership', undertaking joint research with uncertain but potentially beneficial outcomes. At times it has been more widely seen as a classic example of co-innovation. To these ends, project activities are managed by an 'Oversight Committee' which includes all public sector PIs and a manager from each private sector partner. Work-plans are collectively reviewed, revised and approved on a semi-annual basis based on collective assessment of outputs. Each partner is responsible for day-to-day coordination of activities at their facilities. Cash support is provided by the private sector, which annually contributes technologies and services. IRD and ANU contribute two research scientist positions apiece. CIMMYT has supported senior scientists in Mexico and then ANU, as well as staff and operational costs. It phased out in-kind contributions during 2008, but is committed to returning to active participation should research refocus on pre-breeding.

Critical success / non-success factors

The 1999 founding agreement is arguably a model achievement of bringing three major multinational companies into a consortium where they provide IP, in-kind, and financial contributions. Technical developments are building an essential foundation of knowledge and resources on which future apomictic product development can be based, notable for its evolving character that is managed through periodic evaluations and adjustments of the collaboration. The balance of partners also offers a route to practical dissemination of a future apomixis breeding system. All partners have contributed significant amounts of in-house legal counsel time to IP management issues. Under the agreement, the private companies have a non-exclusive license to deploy research outputs in their target markets. CIMMYT and IRD can deliver outputs to resource-poor farmers based on means test.

Benefits and value of the PPP

Apomixis research needs long-term support to generate products for delivery to farmers. Maintenance of effective partnerships between scientists in organizations on different continents, and in both the public and private sector, is essential. The PPP's historically diverse approaches to research and technology development – from interspecific (or wide) hybridization to strategic molecular research – and focus on maize render it a valuable source of expertise for the field, which has become increasingly lab-based and model system-focused in recent years. By putting together stakeholders for a range of potential end-users of apomixis technologies – the resource-poor, multinationals, farmers in Europe and the US – the PPP occupies a strategic position. CIMMYT's continued membership is crucial to maintaining this balance. The project also furnishes opportunity for training post-docs and grad students, and has enabled public sector partners to gain competitive grants to augment research.

Matthew Hodges, ESRC Centre for Genomics in Society, University of Exeter, United Kingdom

Case Study D

Partners:	International Institute of Tropical Agriculture (IITA) – Academia Sinica (Taiwan) – African Agricultural Technology Foundation (AATF) – National Agricultural Research Organization (NARO, Uganda), Institut de Recherches Agronomique et Zootechnique (IRAZ, Burundi) – other National Agricultural Research Systems in Africa – Public/Private Tissue Culture Labs in Great Lakes of Africa
Period:	2006 – now
Matter of PPP:	Developing banana cultivars with resistance to banana bacterial wilt (BXW)

Description (Scientific matter of the PPP)

In 2004, IITA identified a candidate gene for resistance to BXW that could be useful in transformation of local East African Highland banana cultivars. The technology was patented by Academia Sinica, Taiwan and was only available for collaborative research use. AATF negotiated a humanitarian use license from Academia Sinica for the *pflp* and *hrap* genes. They developed a full fledged research project to develop and disseminate the BXW resistant cultivars. This project involves AATF, IITA, Academia Sinica, NARO, IRAZ, other NARS partners, and public/private tissue culture labs in the Great Lakes of Africa. To date, IITA and NARO continue to test the *pflp* and *hrap* gene in the field and with other bacterial and fungal diseases. New opportunities are being explored to access new genes for the many other biotic constraints in banana and plantain.

R4D processes highlighted

This R4D undertaking was a complex PPP which involved patents and licenses from a semi-private research institute (Academia Sinica), an international agricultural research center (IITA), national public research institutes (NARO), regional public institutes (IRAZ), and emerging private sector (tissue culture labs). AATF is a not-for-profit organization that facilitates and promotes public-private partnerships for access and delivery of appropriate technology for small holder farmers in sub-Saharan Africa (<http://www.aatf-africa.org/>). The process is complicated by the need to also contribute to the development and implementation of national biosafety protocols and facilities. This issue has implications for the timing of each step of the product development and delivery. The delivery pipeline is dependent on the private sector tissue culture companies which are emerging and thus face many challenges for their business beyond this one product.

Critical success / non-success factors

The technology is licensed for humanitarian use but there are commercial uses for the technology in the same market. This complicates the distinction between the dissemination pathways. We have also faced challenges when other research institutes wish to also use technology. Most of these challenges are managed by AATF. It was critical for partners to have a shared and clearly articulated need for the joint action. Planning with clear roles and responsibilities for each partner was needed to insure pipeline from development to delivery with both public and private partners. A communications strategy was developed to manage

information flow. There have been a number of challenges that are described by Dr. Jacob Mignouna, in R4D Review, Edition 2, March 2009 (www.r4dreview.org).

Benefits and value of the PPP

AATF has been able to utilize this opportunity to access the technology, coordinate the planning and implementation of the product development and delivery pipeline with additional funds from donors, and facilitate all the necessary partnerships. Academia Sinica has gained visibility for their research, funds from the Government of Taiwan to assist in their contribution to the partnership, broad-testing for their technologies, and new research on their technologies. IITA and NARO has gained a new research partnership and opportunity to address the development of local East African highland bananas (EAHB) cultivars with BXW resistance, obtained funds to carry out this research, visibility for our research efforts, contribute to the development and implementation of a biosafety protocol in Uganda, experience in licensing and product development/dissemination pipelines, and new research on these technologies. IITA contributed to the building of the capacity of NARO in banana transformation. IRAZ and other NARS in the Great Lakes Region have gained capacity in banana transformation and biosafety, access to BXW resistant cultivars, experience in licensing and product development/dissemination pipelines, and possible new funds for testing and dissemination. Semi-private and emerging private sector issues culture companies will gain experience in access to licensed technology and product development/dissemination pipelines, business planning and funds for product delivery, communications and market assistance for a transformed banana cultivar, and a closer partnership with technology developers for future product access. Ultimately, smallholder farmers in the Great Lakes will benefit from the new BXW resistant local cultivars, increased availability of tissue culture plants, and greater research effort on banana diseases, greater food security and wealth from secure production of EAH banana.

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Chaclacayo, 4th November 2009