Institution: University of Greenwich

Unit of Assessment: (UoA 6) - Agriculture and Veterinary and Food Science

a. Context

Work from the six research groups submitted to the Agriculture and Veterinary and Food Science UoA aims to bring economic, livelihood and environmental benefits to resource poor groups linked to agricultural activities in developing and emerging economies. Our research is targeted to impact predominantly on smallholder farmers, their organisations and communities; small and medium businesses connected to smallholder production and commodity value chains and markets; and labourers within the farming and trading systems. Research and subsequent outcomes are designed to address constraints experienced in the production and postharvest management of smallholder crops, livestock and fisheries. Where possible, research has aimed to produce differentiated impacts on different social groups (by gender, wealth, age, disability, HIV/AIDS). Research outputs also seek to create favourable changes in those government, public and NGO organisations and the private sector that support the enabling environment for our target beneficiaries.

At the production level, impacts on farmers' incomes, health and environment have been achieved through collaboration with farmers, the private sector and regulatory bodies in the development and distribution of a range of pest and disease control products and management systems. The Agriculture Biosecurity Research Group's research has provided the technologies and capacity building to support the establishment of three SME companies in Thailand (2008), Kenya (2009) and Tanzania (2013) to produce biopesticides. This has been supported by changes in the regulatory environment to allow registration of these products in Kenya (two new biopesticides registered in 2009), in Thailand (four biopesticides in 2009), and Kenya (35 biopesticides registered since 2008). Further impacts on crop pest control and food security have been delivered to 80,000 farmers in Kenya and 25,000 farmers in Tanzania who used pheromone forecasting armyworm traps developed by the Chemical Ecology Research Group in collaboration with the private sector (Suterra).

Research outputs by the Pest Behaviour Group have improved food security where food production is threatened by rodent swarms. Policy changes have been made in South Africa to inform the training requirements and programmes of all pest control operators since 2008. Newly designed rat traps are now sold commercially throughout the member countries of the South African Development Community. Research on population dynamics and food sources was used by international and national agencies to mitigate a potentially life threatening swarm of rodents caused by gregarious bamboo flowering in Bangladesh from 2008 to 2010.

Research on crop production, storage, new food product development and processing by the Postharvest and Value Addition research group has significantly raised incomes for roots and tubers farmers, processors and traders. Over US$ 11 million additional income has been generated for over 90,000 smallholder farmers, 7,191 processors and 2,481 labourers in Nigeria, Ghana, Tanzania, Malawi and Uganda through the production and sale of high quality cassava flour from 2009-13. Research on the nutritional content and product development of orange-fleshed sweet potato has benefitted 24,000 households in Uganda and Mozambique (2008-10).

Research on postharvest grain losses has provided the basis for informing key policy documents by the World Bank (*Missing Food: The case of postharvest losses in Sub-Saharan Africa*, 2011) and FAO (*Continental Framework Paper on Post-Harvest Loss Reduction in Africa*, 2009) and the creation of an innovative pan African network to quantify cereal losses (Africa Post Harvest Losses Information System).

b. Approach to impact

The unit's approach to achieving impact is encapsulated in its use of the 'innovations systems' framework to promote greater integration of all stakeholders in research and uptake. This approach develops and builds partnerships between staff in the research groups and beneficiaries (such as farmers and their organisations) and enabling intermediary organisations. The latter include other research organisations, NGOs and government organisations and the private sector. Small- and medium-sized enterprises are often partners in projects to foster impact linked to value chain development. Over the last five years this approach has created 1,200 partnerships in projects in

65 countries. Evidence of the nature of these relationships and impact can be seen in project websites associated with the unit's research groups such as the Pest Behaviour Research Group working on vegetable crop improvement (http://susveg-asia.nri.org/susvegasiacontacts4.html); and the Post Harvest and Value Addition Research Group reducing losses from root and tuber crops (http://www.fp7-gratitude.eu/). Research is often adapted *in situ* to support production and processing activities of farmers and farmer/processors with elements of south/south co-operation. For example support has been given to cassava business partners in Nigeria to transport and demonstrate a flash dryer to processors in Malawi (http://cava.nri.org).

The unit interacts with and supports beneficiaries and intermediaries not only through normal project processes, but through a range of interactive approaches to foster relationships, including:

- facilitation of multi-stakeholder learning processes, alliances and platforms, which can be used for the sharing as well as generation of information to create impact at scale. Eg research conducted by the Chemical Ecology and Plant Biochemistry group has created a multi-stakeholder network for optimising and promoting the use of indigenous botanical knowledge for food security and poverty alleviation in Africa (http://www.nri.org/projects/adappt/index.htm);
- using on-line decision making tools and guides to help end-users and beneficiaries plan programmes of intervention, eg in projects on the eradication of tsetse flies (http://www.tsetse.org/) undertaken by the Pest Behaviour research Group;
- participation in organising and contributing to the All-Party Parliamentary Group on Agriculture and Food for Development which aims to engender progressive and informed debate on poverty, agriculture, nutrition and wider food/water security (http://www.appg-agdev.co.uk/). We are currently providing speakers for the seminar series on Postharvest Losses and Global Food Waste.

NRI employs a full-time Communications Specialist, an IT Systems Development Manager, and a Web Development Officer who advise and assist staff on production of publications, use of social media and design of websites. NRI produces a monthly newsletter, The Resource (http://www.nri.org/about-us/the-resource-archive), which showcases people, projects and issues in research and development.

Researchers also make use of the Enterprise Europe Network (EEN) South East UK project, run by the University of Greenwich and other partners to make contact with small and medium enterprises. A Biopesticides Market Place event was held in 2013 by the Agriculture Biosecurity research group to bring together industry representatives to learn about alternative approaches to pest management (http://www.enterpriseeurope-se.eu/xse/events/register.asp?eventid=115). This led to partnership building and the submission of a 9-million Euro proposal on integrated pest management systems to the EC's Framework 7 programme.

The research groups have also made use of investment of £1 million from Higher Education Innovation funding since 2008 to foster uptake of research with end users. As an example, these 'seed corn' funds have been used by the Post-Harvest and Value Addition Research Group to initiate work with commercial companies on fresh produce storage and transport that has led to more substantial adaptive research with industry partners funded by the Technology Strategy Board and Waste and Resources Action Programme.

The groups' research-derived expertise and reputation are often used by third parties to achieve impact through contract research, consultancy and advisory services, eg development of sustainable supply chains from smallholders to multinational food companies.

c. Strategy and plans

Achieving impact is at the forefront of our approach to research and is encapsulated in our mission (goal) "To discover, apply and share knowledge in support of global food security, sustainable development and poverty reduction".

Strategies to enable and support research to achieve impact include the creation (beginning in 2013) of cross-cutting thematic Development Programmes (http://www.nri.org/development-programmes) that will bring together staff from all the research groups (to include social scientists and market economists submitted under Anthropology and Development studies - UoA 24). This

will promote interdisciplinary approaches to foster engagement with beneficiaries and end-users. This also includes other 'non-research active' staff who focus on capacity building and advisory activities, and support staff who provide important administrative and financial management.

The research groups will widen the dissemination of research outputs in non-academic formats (eg bulletins, web pages, policy briefs, and training materials) to the private sector, NGOs, international organisations and donors (eg CONCERN, World Bank, Food and Agriculture Organisation, Department for International Development). We will use these different formats to disseminate research to different target audiences in order to widen our visibility and promote uptake of research findings and recommendations.

A key element of researcher activity to achieve impact will be to bridge the gap between researchers and policy makers and practitioners in the field – staff in the research groups will continue to play a leading role in supporting the All-Party Parliamentary Group on Agriculture and Food for Development.

We will also continue to seek close partnerships to raise funding support from donors and foundations to achieve the uptake of its research findings at scale; for example the on-going yam technology uptake in Ghana and Nigeria - http://www.iita.org/web/yiifswa/home) and a second phase of a cassava programme with a vision of within 8 years to reach at least 250,000 smallholders having sold at least $400 million of roots into value chains.

d. Relationship to case studies

The unit has selected case studies that clearly demonstrate different pathways to impact, the development of 'research products' and a range of beneficiaries/end users.

The case study on 'Better pest control in Africa and Asia through biological pesticides and insect resistant crops' demonstrates the development of a range of pest control products through a multi public-private partnership approach which supported the evolution of small- and medium-scale businesses (supported by donors) from some of the research partners in the target countries, aided by technical support and training programmes from the unit's research team. The unit also created an enabling environment for product development through engaging with the regulatory processes for testing and registration of biopesticides.

The case study 'Transforming cassava to improve livelihoods in sub-Saharan Africa' illustrates the importance of having small- and medium-scale enterprises at all stages of the innovation cycle, and the need for a multi-disciplinary research team to understand the technical (pre- and post-production), engineering, socio-economic and business aspects of creating high-value products from a low value staple crop. This has created an enabling environment to achieve impact at scale and reach in Africa for the benefit of poor farming households and other actors in the value chain that purchase cassava roots from farmers.

The case study on 'Ecologically-based rat management for increased food security and improved livelihoods in Africa and Asia' presents impact pathways demonstrating collaboration with governments to support changes in policy and regulatory frameworks to control rodents. Direct collaboration with United Nations and government agencies and NGOs supported the deployment of research tools and knowledge within local communities in Asia to prevent potential loss of life from catastrophic rodent swarms.