

**BIOTECHNOLOGY AND BIOLOGICAL SCIENCES RESEARCH COUNCIL &
DEPARTMENT FOR INTERNATIONAL DEVELOPMENT**

FINAL REPORT FORM

SECTION 1: PROJECT DETAILS			
Grant Reference	BB/F004028/1	Capacity Building Grant Reference	BB/H531743/1
Project Title	How resistant plant varieties avoid suppression of RNA silencing by viruses as exemplified by sweetpotato: Better food security through virus control		
Principal Investigator	Dr Richard W Gibson		
Lead Research Organisation & Department		University of Greenwich, Natural Resources Institute	
Co-Investigator(s)		Research Organisation	
Dr Settumba Mukasa Prof Sir David Baulcombe Dr Jan Kreuze Dr Neil Boonham Dr Gorrettie Ssemakula		Makerere University, Uganda University of Cambridge, UK International Potato Center [CIP], Peru Food & Environment Research Agency [FERA], UK National Crops Resources Research Institute [NaCRR], Uganda	

SECTION 2: OUTPUTS
<p>Agricultural technologies of relevance to the poor (the practical application of research to develop new tools, skills and ways of working)</p> <p>Participatory plant breeding: A participatory plant breeding (PPB) approach to sweet potato previously developed in Uganda with funding by the Crop Protection Programme of DFID was validated. PPB is a particularly appropriate tool for developing new crop varieties for marginal agro-ecologies and for poorer farmers, especially women. This, the first ever PPB of sweet potato, therefore represented a potential major breakthrough. Varietal attributes (53) were identified as particularly important for sweetpotato farmers. Data were collected with mainly women farmers [the majority of sweetpotato farmers] belonging to the Tusetukire wamu Kabulanaka Farmers' Association (TUKAFA) in Luwero District to examine how the new variety selected by PPB, the main local variety and the main conventionally bred variety fitted these farmer criteria. The PPB-bred variety best fitted the broad range of farmer criteria. Papers describing the process and outcome have been published in international journals. In a film, farmers, again mainly women, explain how the new variety has improved their lives, sales of planting material and higher prices for the roots paying school fees, clothes and even building land. The new variety, NASPOT 11 was released in Uganda in late 2010. Of further relevance to the project is that we have shown it possesses a well developed ability to maintain itself free from virus infection, probably based on RNA silencing.</p> <p>Reversion from infection by SPFMV: Sweetpotato genotypes with an ability to maintain themselves free from infection with viruses particularly SPFMV provide a way by which low input farmers, of which women are a major component, can obtain virus-free planting material. Such genotypes tend to have an unusually low virus titre. The use of ELISA or qPCR to detect plants which have a low virus titre has been developed and is starting to be used at NaCRR funded by the Bill & Melinda Gates Foundation.</p>

New scientific collaborations involving developing country partner(s) established during the reporting period (collaborations consisting of at least one day per week)

The CIP-led 'Sweetpotato Action for Security and Health in Africa (SASHA)' project was funded by the Bill & Melinda Gates Foundation in 2009. It includes an East African sweetpotato seed systems research component which funded Dr Barker and Dr Kreuze, Dr Gibson. This additional collaboration enabled a Ugandan PhD student at Makerere University to be supervised by Dr Mukasa and capacity building at NaCCRI for the Ugandan Sweetpotato program including greenhouses, PCR and qPCR, vital for extending project outputs. As well as enabling Dr Gibson to spend more time in East Africa with project partners, valuable additional crop samples have been collected and the Ugandan student's research builds on the ability of RNA-silencing based resistance in local Ugandan varieties to eliminate virus infection. Another project funded Dr. Kreuze and Dr. Cuellar during the no-cost extension period of the project through the BREAD (Basic Science to Enhance Agricultural Development) program by the Bill and Melinda Gates Foundation and the National Science Foundation was initiated by CIP and the Boyce Thomson Institute enabled collaboration with scientist from 10 African countries to determine the pan-African sweetpotato 'virome' using siRNA deep-sequencing and assembly.

Publications - production of research information (e.g. journal papers, book, book chapter, conference paper, policy brief, in-house publication¹, in-house published products²)

Publications in peer reviewed international journal

Cuellar, W.J., De Souza, J., Barrantes, I., Fuentes, S., Kreuze, J.F. **2011**. Distinct cavemoviruses interact synergistically with Sweet potato chlorotic stunt virus (Genus Crinivirus) in cultivated sweet potato. *Journal of General Virology* **92**:1233-1243.

Cuellar, W.J., Cruzado, K.R., Untiveros, M., Fuentes, S., Soto, M., Kreuze, J.F. **2011**. Genome characterization of a Peruvian isolate of Sweet potato chlorotic stunt virus (SPCSV): further variability and a model for p22 acquisition. *Virus Research* **157**:111-115.

De Souza, J., Cuellar, W.J. **2011**. Sequence analysis of the replicase gene of 'sweetpotato caulimo-like virus' suggests that this virus is a distinct member of the genus Cavemovirus. *Archives of Virology* **156**:535-537.

Gibson, R.W., Mpembe, I., Mwanga, R.O.M., 2011. The role of participatory plant breeding as exemplified by the release of the sweetpotato variety NASPOT 11 in Uganda in 2010. *Aspects of Applied Biology* **107**, Systems improvements to crop improvement, pp7 -76.

Mwanga, R.O.M., Niringiye, C., Alajo, A., Kigozi, B., Namakula, J., Mpembe, I., Tumwegamire, S., Gibson, R.W. & Yencho, G.C. 2011. "NASPOT 11", a sweetpotato cultivar bred by a participatory plant-breeding approach in Uganda. *Hortscience* **46**: 317-321

Gibson, R.W., Mpembe, I., Mwanga, R.O.M., 2011. Benefits of participatory plant breeding (PPB) as exemplified by the first-ever officially released PPB-bred sweet potato cultivar. *Journal of Agricultural Science* **149**: 625 - 632

P. Wasswa, B. Otto, M. N. Maruthi, S. B. Mukasa, W. Monger and R. W. Gibson 2011. [First identification of a sweet potato begomovirus \(sweepovirus\) in Uganda: characterization, detection and distribution](#) *Plant Pathology* **60**: 1030 – 1039

C. A. Clark, Davis, J. A., Abad, J. A., Cuellar, W. J., Fuentes, S., Kreuze, J. F., Gibson, R. W., Mukasa, S. B., Tugume, A. K., Tairo, F. D. & Valkonen, J. P. T. 2011. Sweetpotato viruses: 15 years of progress on understanding and managing complex diseases. *Plant Disease* **96**: 162 – 185

¹ Including working papers, newsletter, internal series.

² Including toolkits in CD form; videos

Other publications

Mwanga, R.O.M., Kigozi, B., Namakula, J., Mpembe, I., Niringiye, C., Tumwegamire, S., Gibson R. W., Yencho, C. 2010. Submission to the Variety Release Committee for release of sweetpotato varieties 2009. National Agricultural Research Organization (NARO). 41pp

Gibson, R.W., Mpembe, I., Mwanga, R.O.M., 2011. The role of participatory plant breeding as exemplified by the release of the sweetpotato variety NASPOT 11 in Uganda in 2010. *Aspects of Applied Biology* **107**, Systems improvements to crop improvement, pp7 -76.

Papers read:

Cuellar, J. Wilmer (2009) Molecular studies on the Sweetpotato virus disease (SPVD). 15th Triennial Symposium of the International Society for Tropical Root Crops. 2-6 November 2009.

Mwanga, R.O.M., G. Ssemakula, C. Niringiye, S. Tumwegamire, Yencho, C. and Gibson R.W. 2010. Release of NKA 1081L, the first sweetpotato cultivar in Sub-Saharan Africa developed using PPB approach. Presented at: 11th International Society of Tropical Root Crops – African Branch Symposium, in Kinshasa, DR Congo, October 4-8, 2010

Gibson, R.W., Mpembe, I., Mwanga, R.O.M., 2011. The role of participatory plant breeding as exemplified by the release of the sweetpotato variety NASPOT 11 in Uganda in 2010. Presented at: Association of Applied Biologists at Rothamsted, 14-15 April 2011.

De Souza, J., Fuentes, S., Gálvez, M., Kreuze, J., Cuellar, W.J. 2011. Genome characterization of two new cavemoviruses infecting sweet potato (*Ipomoea batatas* (L.) Lam.) and its synergistic interaction with *Sweet potato chlorotic stunt virus* (SPCSV). (*In Spanish*). Presentations at the XXX Colombian and XVI Latinamerican Congress of Phytopathology

Flores, M., Silvestre, R., Kreuze, J., Cuellar W.J. 2011. Evaluation of virus indexed plant material by deep sequencing. (*In Spanish*) Presentations at the XXX Colombian and XVI Latinamerican Congress of Phytopathology

Cuellar, W.J. 2010. Advances in the characterization of viruses affecting root and tuber crops. Presented at the International Symposium: Plant Breeding in Postgenomic Era: Trends and Perspectives. November 23rd. Bogota, Colombia

Film:

Richard Gibson & Isaac Mpembe. Tomulabula: The first ever sweetpotato variety bred by participatory plant breeding in Uganda. <http://www.nri.org/work/tomulabula.html>

All authors who are from a developing country are in red

Infomedia – requests for research information (infomedia is the means used to share knowledge, e.g. newspaper, TV, radio, mobile phones, websites, magazines). This indicator is about measuring outreach in line with spend on research communications. It measures the **requests** for research information as opposed to the production of research information.

Record any infomedia you have used during the reporting period to disseminate information directly related to this project.

Data	Number & Details
Keyword/thematic area/headline statements from research appearing in infomedia	Total number of places where the keyword/thematic area/headline statements appears as a result of requests
actual radio interviews	NASPOT 11 (Tomulabula) was mentioned in local Ugandan newspapers. Dr Gorrettie Ssemakula is

actual television interviews	planning to write a more extensive article on it.
actual features in newspapers, magazines, other similar publications	
infomedia websites that provide links to research programme ³	2
Other - please state	A film at: http://www.nri.org/work/tomulabula.html

Training (knowledge/skills-based short courses; PhD; research fellowships; workshops; exchange visits; mentoring; knowledge-based networks/communities of practice; on the job training; self-study/guided reading)

A course on Deep sequencing, data analysis for virus identification and characterization was provided at Makerere University, Kampala, Uganda. May 2011. The course consisted of laboratory training in plant RNA purification and computer sessions on data analyses and visualization of results.

Participants: 6 students from Makerere University, 1 Postdoctoral fellow from NRI, 1 postdoctoral fellow from Cambridge University, 1 Postdoctoral fellow from Mikochei Laboratory, 1 postdoctoral fellow from Makerere University, 2 Graduate students from NaCRRI. *[Capacity building grant BB/H531743/1]*

Mentoring

Peter Wasswa. NRI, UK and Makerere University, Uganda. Graduate thesis work in progress: Sweet potato viruses in Uganda: identification of a new virus, a mild strain of an old virus and reversion.

Joao De Souza. Universidad Nacional Agraria. Lima, Peru. Undergraduate thesis completed: Characterization of a new pararetrovirus from sweet potato. Graduate thesis work in progress: Characterization of viruses infecting root and tuber crops in South America.

³ To find which websites link to your site, use the 'link' function in Google. Type an entry in Google search: Link:www.link:www.yourwebsite.ac.uk -site:www.yourwebsite.ac.uk. This will return the number of links currently indexed by Google that point to your website minus the number of links that arise from the site itself.