

## IITA and BIOVERSITY RWANDA CALL FOR MSC THESIS RESEARCH 2019

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### Introduction:

IITA and Bioversity International Rwanda **call for MSc thesis research students** affiliated with:

- Catholic University of Leuven (KUL), Belgium;
- Ghent University (UGhent), Belgium;
- Université Catholique de Louvain (UCL), Belgium;
- The Leibniz Institute of Agricultural Development in Transition Economies (IAMO), Germany;
- Wageningen University (WUR), Netherlands.

The call is open for students to conduct their MSc thesis research under our research for development projects in Rwanda. As we have only limited amount of space and capacity, students will be selected using a **competitive process** through which students submit their proposals.

Shortlisted students will be pitching their proposal online to a panel of IITA and Bioversity researchers after which between 2 or 3 students will be selected for 2019. Student projects will have a budget of **\$2500**, which includes stipend and research costs.

### Terms and conditions:

- Students can only put 1 application per person;
- Students apply for an individual project (group applications are not allowed);
- Applications must be online using the Google Forms website (applications through email will not be considered);
- Applications must be in English;
- The Google Form can be accessed here: <https://goo.gl/forms/OKShF18WfjATkf422>.
- Students will identify a university supervisor who has agreed on student supervision;
- Students can only commence their research with an approved research proposal by their university supervisor;
- Students receive a **fixed stipend of \$300 per month**, for a max period of 6 months;
- Students have access to **~\$700 research budget** (approx. \$120 per month); Research budget needs to be agreed with the IITA supervisor and needs to be accounted for;
- European students cover their own return ticket costs (home-base – Kigali);
- Students have access to IITA Rwanda office facilities (desk, internet), but agree to use their own laptop or PC;
- Students agree to comply with general IITA research and student policies.

For general questions please contact Mrs Speciose Kantengwa ([S.Kantengwa@cgiar.org](mailto:S.Kantengwa@cgiar.org)).

## Topics:

Applicants respond to 1 of the below 4 Topics. The Topics correspond with the research topics that should be selected on the Google Form.

### TOPIC 1

#### ICT4BXW: Spatial dynamics of Banana Xanthomonas Wilt (BXW) Disease in Rwanda

<b>Project context</b>	<p><a href="#">ICT4BXW</a> is a project launched in 2018 with funding from Germany's Federal Ministry for Economic Cooperation and Development <a href="#">BMZ</a>. ICT4BXW studies how citizen Science and (mobile) ICT technologies can be used to advance the control and prevention of Banana Xanthomonas Wilt (BXW) disease in East and Central Africa. ICT4BXW is led by the International Institute of Tropical Agriculture (IITA) and partners with <a href="#">Bioversity International</a>, the Leibniz Institute of Agricultural Development in Transition Economies (<a href="#">IAMO</a>), and the Rwanda Agriculture Board (<a href="#">RAB</a>). The project is implemented together with the Consortium for Improving Agriculture-based Livelihoods in Central Africa (<a href="#">CIALCA</a>) and falls under the CGIAR Research Program on Roots, Tubers and Bananas (<a href="#">RTB</a>).</p>
<b>Background on the research topic</b>	<p>The spread of disease pathogen is largely driven by underlying contagion process, host suitability, and environmental conditions, which can vary over space and time. When conditions are favourable at new locations and at specific time, diseases pathogens expand their spatial coverage of attack thereby resulting in observation of new incidence. Hitherto, no research has reported on underlying spatial contagion of BXW at relevant scales, while the dynamics of potential driving factors remains poorly understood. However, given the symptomatic expression of BXW attack on banana stands and the potential to capture this at the canopy level, the use of remote-sensing and GIS tool can enhance rapid assessment of severity at varying scales within [and beyond] hotspot corridors. Therefore, the increasing availability of spatial data at improved resolution, and proliferation of geospatial tools and methods offer new possibilities for linking BXW incidence and severity to biophysical and socioeconomic variables over space and time.</p>
<b>Objectives</b>	<ol style="list-style-type: none"> <li>(1) To map the extent of banana land-area (possibly by types) in Rwanda, using different geospatial [and related] techniques, including kriging, machine learning, and spatial species modelling.</li> <li>(2) To assess space-time dynamics of BXW incidence/severity and relationship with potential driving factors (covariates) at field and different scales.</li> </ol>

	(3) To map ecological suitability domains and assess changes in ecological suitability as climatic conditions or land-use changes relative to climate change scenarios.
<b>Guiding research questions</b>	<p>(1) What geospatial techniques, tools, and products (including covariates) can enable accurate and rapid mapping of banana land-cover at varying scales?</p> <p>(2) (a) What are the dynamics of BXW contagion/spread and what are the strongest driving factor(s) at district/national levels? (b) At what spatial and temporal scale do driving factors influence infection severity and frequency? (c) How can remote-sensing technology be leveraged for rapid spatially-explicit assessment of severity at scale?</p> <p>(3) What are the potential implications of changing climate conditions (especially temperature) for BXW spread regionally and how can this inform control strategies in space and time?</p>
<b>Location</b>	Rwanda
<b>Student background and experiences</b>	<ul style="list-style-type: none"> <li>• The student needs to have a background in Geospatial sciences (GIS, Remote Sensing, and Geostatistics) and Agriculture with strong interest for multi- and interdisciplinary research.</li> <li>• We are looking for highly motivated MSc-students who have finalized their coursework and are looking for an interesting thesis opportunity, and meet the following criteria for success: <ul style="list-style-type: none"> <li>○ An interest in quantitative analytics, geospatial analyses, and plant disease mapping</li> <li>○ Willingness to conduct fieldwork with farmers and other actors in rural areas.</li> <li>○ Ability to be pro-active, flexible, and independent.</li> <li>○ Motivated to work in an interdisciplinary and intercultural environment.</li> <li>○ Eagerness to learn new skills and take on challenges</li> <li>○ Enthusiasm for developing, testing, and using different research approaches.</li> <li>○ High level of written and oral English language skills.</li> </ul> </li> </ul>
<b>Crucial background reading</b>	<ul style="list-style-type: none"> <li>• Bouwmeester, H.; Heuvelink, G.B.M.; Stoorvogel, J.J. <a href="#">2016</a>. Mapping crop diseases using survey data: The case of bacterial wilt in bananas in the East African highlands. Access through - <a href="http://library.wur.nl/WebQuery/wurpubs/497246">http://library.wur.nl/WebQuery/wurpubs/497246</a></li> <li>• <a href="#">Bouwmeester H., Abele S., Manyong V.M., Legg C., Mwangi M., Nakato V., Coyne D., Sonder K. (2010). The Potential Benefits of GIS Techniques in Disease and Pest Control: An Example Based on a Regional Project in Central Africa. Proc. IC on Banana &amp; Plantain in Africa</a></li> </ul>
<b>Contact person</b>	<ul style="list-style-type: none"> <li>• Dr Julius Adewopo (<a href="mailto:j.adewopo@cgiar.org">j.adewopo@cgiar.org</a>)</li> </ul>

## TOPIC 2

### ICT4BXW: ICT and citizen science for control and prevention of Xanthomonas Wilt of Banana (BXW) disease

<b>Project context</b>	<p>ICT4BXW is a project launched in 2018 with funding from Germany's Federal Ministry for Economic Cooperation and Development <a href="#">BMZ</a>. ICT4BXW studies how citizen Science and (mobile) ICT technologies can be used to advance the control and prevention of Banana Xanthomonas Wilt (BXW) disease in East and Central Africa. ICT4BXW is led by the International Institute of Tropical Agriculture (IITA) and partners with <a href="#">Bioversity International</a>, the Leibniz Institute of Agricultural Development in Transition Economies (<a href="#">IAMO</a>), and the Rwanda Agriculture Board (<a href="#">RAB</a>). The project is implemented together with the Consortium for Improving Agriculture-based Livelihoods in Central Africa (<a href="#">CIALCA</a>) and falls under the CGIAR Research Program on Roots, Tubers and Bananas (<a href="#">RTB</a>).</p>
<b>Background on the research topic</b>	<p>The ICT4BXW project seeks to combat <a href="#">Xanthomonas Wilt of Banana (BXW)</a> in Rwanda, a bacterial disease that affects millions of farmers throughout East and Central Africa. ICT4BXW develops and pilots a citizen science platform to crowd-source and exchange data on BXW incidence and severity in Rwanda. By using digital information and communication technologies (ICT), especially mobile phones, and geospatial technology the project engages and builds on the expertise of local extension agents in Rwanda to (1) provide advise on how to best control BXW in a cost-effective way, and (2) collect data on disease severity and spread for more effective prevention of BXW. ICT is used in three ways: (1) collecting contextual, local data on BXW incidence; (2) providing on-demand access to information to empower and connect different types of farmers; and (3) supporting targeted disease prevention and control through affordable, interactive and up-to-date information. This way extensionists can provide higher quality services at lower cost, engagement between farmers and other stakeholders improves, and BXW management becomes more timely, effective, and demand-driven.</p>
<b>Objectives</b>	<ol style="list-style-type: none"> <li>(1) Develop typologies and personas of farmers and extension service providers that can provide input for PITD and other project activities</li> <li>(2) Gain understanding about tangible and intangible needs of next and end users of the project platform</li> <li>(3) Learn about possible incentive systems that may enhance likeliness of a sustainable and scalable ICT platform</li> <li>(4) Find out how information presentation affects its accessibility, affordability, and actionability for receivers and in response decisions to either adopt or reject that information.</li> </ol>
<b>Guiding research questions</b>	<ol style="list-style-type: none"> <li>(1) What can we learn from differences between farmers and extension service providers in various types of banana production environments in</li> </ol>

<b>(pick one or two)</b>	<p>Rwanda in terms of e.g. socio-economic status, BXW knowledge and knowhow, and use of mobile technologies?</p> <p>(2) What are the BXW related information and knowledge needs of farmers and extension service providers, and how could these needs translate to functions of a phone-based platform?</p> <p>(3) What forms of financial and non-financial incentives should be provided to users of the tool and platform to increase initial use and guarantee long-term sustainability?</p> <p>(4) How does the form in which information is presented to farmers influence their behavioral decisions around crop management?</p>
<b>Location</b>	Rwanda
<b>Student background and experiences</b>	<ul style="list-style-type: none"> <li>• The student needs to have a background in social science (e.g. international development studies, innovation studies, communication studies), or environmental science (e.g. geo-information sciences, spatial sciences) or agricultural science (e.g. plant sciences, agronomy) with strong interest for multi- and interdisciplinary research.</li> <li>• We are looking for highly motivated MSc-students who have finalized their coursework and are looking for an interesting thesis opportunity, and meet the following criteria for success: <ul style="list-style-type: none"> <li>○ An interest for socio-technical and participatory research, agricultural innovation systems, and ICT for agriculture.</li> <li>○ Willingness to conduct fieldwork with farmers and other actors in rural areas.</li> <li>○ Ability to be pro-active, flexible, and independent.</li> <li>○ Motivated to work in an interdisciplinary and intercultural environment.</li> <li>○ Eagerness to learn new skills and take on challenges</li> <li>○ Enthusiasm for developing, testing, and using different research approaches.</li> <li>○ High level of written and oral English language skills.</li> <li>○ Previous experience in Africa or developing countries.</li> </ul> </li> <li>• Students can conduct their thesis fieldwork (3-6 months data collection) or a research-based MSc internship on the project.</li> </ul>
<b>Crucial background reading</b>	<ul style="list-style-type: none"> <li>• McCampbell et al. 2018: <a href="https://www.sciencedirect.com/science/article/pii/S1573521418300381">https://www.sciencedirect.com/science/article/pii/S1573521418300381</a></li> <li>• Project's ResearchGate page: <a href="https://www.researchgate.net/project/ICT4BXW-Citizen-Science-and-ICT-for-advancing-the-prevention-and-control-of-Banana-Xanthomonas-Wilt-BXW-in-East-and-Central-Africa">https://www.researchgate.net/project/ICT4BXW-Citizen-Science-and-ICT-for-advancing-the-prevention-and-control-of-Banana-Xanthomonas-Wilt-BXW-in-East-and-Central-Africa</a>.</li> </ul>
<b>Contact person</b>	<ul style="list-style-type: none"> <li>• Ms. Mariette McCampbell (<a href="mailto:m.mccampbell@cgiar.org">m.mccampbell@cgiar.org</a>)</li> </ul>

### TOPIC 3

#### **CIALCA: Understanding and exploiting farm-household heterogeneity to strengthen agricultural and rural development**

<b>Project context</b>	<p>The Consortium for Improving Agriculture-based Livelihoods in Central Africa (CIALCA – <a href="http://www.cialca.org">www.cialca.org</a>) is an innovative research-for-development partnership operating in Burundi, DR Congo and Rwanda, and supported by the Belgian Directorate General for Development Cooperation and Humanitarian Aid (DGD). Embedded within the CGIAR Research Program on Roots, Tubers and Bananas, CIALCA uses integrated systems research and unique collaboration platforms for better impact on poverty and eco-systems integrity. By building on 12 years of investments and partnership, CIALCA is able to jump-start activities and mobilize networks to boost farmers’ incomes from integrated systems intensification, while preserving their land for future generations. There is focus on value-chains and entrepreneurial farming, nutrition, natural resource improvement and the scaling of successful technologies and approaches. CIALCA is implemented under the CGIAR Research Program on Roots, Tubers and Bananas (<a href="#">RTB</a>).</p>
<b>Background on the research topic</b>	<p>An increasing number of scientific studies documents heterogeneity across farmers in relation to the impact of agricultural and rural development programs. The landscape of smallholder farmers is diverse, and one needs to move away from one-size-fits-all type of policies and programs to support rural development, poverty reduction and food security. The critical question in development research is moving from ‘What works best?’ to ‘What works best for who?’ The science of farm-household typology as well as the inclusion of heterogeneity in impact evaluation have made significant advances in the last decade and can help address this question. However, using the knowledge of typologies and impact heterogeneity in guiding and optimising public and private sector investment and development initiatives is still very limited. In the framework of the Sustainable Development Goals, where multiple objectives are targeted simultaneously, translating this contextual knowledge into action is even more important to achieve meaningful development outcomes and impact for different groups of farmers.</p>
<b>Objectives</b>	<p>The overall objective is to investigate whether and how knowledge on farm-household typology and impact heterogeneity can increase efficiency and return on investment from public and private sector development initiatives in food and agriculture. The student will focus on (i) understanding heterogeneity in smallholder banana- and cassava-based agrifood systems in Central Africa, and (ii) experimenting with how approaches that exploit this heterogeneity contribute to better development outcomes. This project will have an initial focus on Rwanda.</p>

<p><b>Guiding research questions</b></p>	<p>Students are invited to work around one or multiple of the below research questions:</p> <ol style="list-style-type: none"> <li>(1) What are meaningful tangible (e.g. farm size, resource endowment) and intangible (e.g. willingness to experiment, ability to take risks) characteristics to better understand the heterogeneity in farmers' adoption, use and impact of agricultural innovations (e.g. use of fertilizer, planting practices)?</li> <li>(2) How may these farmer characteristics be different in relation to different types of innovations (e.g. how important is land ownership when proposing innovations in perennial versus seasonal cropping systems)?</li> <li>(3) What are the actual value and benefits (e.g. for food, income or nutrition security) of agricultural technologies for different types of farm-households;</li> <li>(4) How to best develop a farm-household typology to guide development program design and implementation? What determines heterogeneous impacts and matters most for adoption and profitability of specific agricultural innovations?</li> <li>(5) How can government, public and private development organizations use this information to better target their programs? How much diversity can practically be handled in large-scale development programs?</li> <li>(6) What are the various advantages (e.g. increase in return on investment?) and disadvantages (e.g. larger initial investment? Increased program complexity?) when using a client-tailored approach instead of a 'one-size-fits-all' approach?</li> </ol>
<p><b>Location</b></p>	<p>Rwanda</p>
<p><b>Student background and experiences</b></p>	<ul style="list-style-type: none"> <li>• The student needs to have a background in agricultural economics or social science with strong interest for multi- and interdisciplinary research.</li> <li>• We are looking for highly motivated MSc-students who have finalized their coursework and are looking for an interesting thesis opportunity, and meet the following criteria for success:             <ul style="list-style-type: none"> <li>○ An interest for rural development and understanding complexity at household level.</li> <li>○ Willingness to conduct fieldwork with farmers and other actors in rural areas.</li> <li>○ Ability to be pro-active, flexible, and independent.</li> <li>○ Motivated to work in an interdisciplinary and intercultural environment.</li> <li>○ Eagerness to learn new skills and take on challenges</li> <li>○ Enthusiasm for developing, testing, and using different research approaches.</li> <li>○ High level of written and oral English language skills.</li> </ul> </li> <li>• Students can conduct their thesis fieldwork (3-6 months data collection) under the project.</li> </ul>

<b>Crucial background reading</b>	<ul style="list-style-type: none"><li>Hammond et al., 2017: <a href="https://www.sciencedirect.com/science/article/pii/S0308521X16301172">https://www.sciencedirect.com/science/article/pii/S0308521X16301172</a>.</li></ul>
<b>Contact person</b>	<ul style="list-style-type: none"><li>Dr Marc Schut (<a href="mailto:m.schut@cgiar.org">m.schut@cgiar.org</a>)</li></ul>



## TOPIC 4

### **CIALCA: ICT for Agriculture: Success and sustainability of the development and use of ICT tools in the agricultural sector?**

<p><b>Project context</b></p>	<p>The Consortium for Improving Agriculture-based Livelihoods in Central Africa (CIALCA – <a href="http://www.cialca.org">www.cialca.org</a>) is an innovative research-for-development partnership operating in Burundi, DR Congo and Rwanda, and supported by the Belgian Directorate General for Development Cooperation and Humanitarian Aid (DGD). Embedded within the CGIAR Research Program on Roots, Tubers and Bananas, CIALCA uses integrated systems research and unique collaboration platforms for better impact on poverty and eco-systems integrity. By building on 12 years of investments and partnership, CIALCA is able to jump-start activities and mobilize networks to boost farmers’ incomes from integrated systems intensification, while preserving their land for future generations. There is focus on value-chains and entrepreneurial farming, nutrition, natural resource improvement and the scaling of successful technologies and approaches. CIALCA is implemented under the CGIAR Research Program on Roots, Tubers and Bananas (<a href="#">RTB</a>).</p>
<p><b>Background on the research topic</b></p>	<p>The use of Information and Communication Technology (ICT) in agricultural research and rural development has increased significantly over the past years. ICT seems to be the new buzz word that is supposed to provide the solution to a wide range of problems and provide new opportunities for farmers and other rural actors. With this study we would like to get a better understanding in where, and how the use of ICT4Agriculture has been successful in achieving development impacts, and also how sustainable investments have been beyond the scope and timelines of agricultural development projects and programs.</p>
<p><b>Objectives</b></p>	<ul style="list-style-type: none"> <li>• Develop an inventory of existing ICT4Agriculture investments in Rwanda.</li> <li>• Develop a framework for assessing the success and sustainability of ICT4Agriculture investments in Rwanda.</li> <li>• Gather evidence to identify key factors that determine the success of the use of ICT in Agriculture.</li> <li>• Develop a checklist that can enhance the sustainability of new ICT4Agriculture investments in Rwanda.</li> </ul>
<p><b>Guiding research questions</b></p>	<p>Students are invited to work around one or multiple of the below research questions:</p> <ol style="list-style-type: none"> <li>(1) What are existing ICT4Agriculture investments in Rwanda?</li> <li>(2) What are key factors that determine the success and sustainability of ICT4Agriculture investments in Rwanda?</li> <li>(3) What are key factors that determine the sustainability of ICT4Agriculture investments in Rwanda?</li> </ol>

	(4) How would a functional checklist for successful and sustainable ICT4Agriculture projects look like
<b>Location</b>	Rwanda
<b>Student background and experiences</b>	<ul style="list-style-type: none"> <li>• The student needs to have a background in agricultural economics or social science with strong interest for multi- and interdisciplinary research.</li> <li>• We are looking for highly motivated MSc-students who have finalized their coursework and are looking for an interesting thesis opportunity, and meet the following criteria for success:             <ul style="list-style-type: none"> <li>○ An interest for rural development and agricultural extension using ICT at household level.</li> <li>○ Willingness to conduct fieldwork with farmers and other actors in rural areas.</li> <li>○ Ability to be pro-active, flexible, and independent.</li> <li>○ Motivated to work in an interdisciplinary and intercultural environment.</li> <li>○ Eagerness to learn new skills and take on challenges</li> <li>○ Enthusiasm for developing, testing, and using different research approaches.</li> <li>○ High level of written and oral English language skills.</li> </ul> </li> <li>• Students can conduct their thesis fieldwork (3-6 months data collection) under the project.</li> </ul>
<b>Crucial background reading</b>	<ul style="list-style-type: none"> <li>• 10 Years of e-Agriculture Success and Learning:  <a href="https://www.agrilinks.org/post/looking-back-looking-forward-e-agriculture-10-year-review-report">https://www.agrilinks.org/post/looking-back-looking-forward-e-agriculture-10-year-review-report</a></li> </ul>
<b>Contact person</b>	<ul style="list-style-type: none"> <li>• Dr Marc Schut (<a href="mailto:m.schut@cgiar.org">m.schut@cgiar.org</a>)</li> </ul>