



IMPROVING LIVES THROUGH  
AGRICULTURAL RESEARCH

HQ/003/17

# R & D *in* AGRICULTURE



ISSUE 16  
August 2017

## A Bulletin on Information Resources



### **HOW TO OBTAIN PUBLICATIONS LISTED:**

For copies of documents cited or further information on an institution or event listed, visit the web address or contact details provided



*Improving Lives Through Agricultural Research*

**Caribbean Agricultural Research and Development Institute (CARDI)**  
P.O. Bag 212, Frederick Hardy Building,  
University of the West Indies,  
St. Augustine Campus,  
St Augustine  
Trinidad and Tobago W.I

**Tel:** 1-868- 645-1205-7  
**Fax:** 1-868-645-1208  
**Email:** [infocentre@cardi.org](mailto:infocentre@cardi.org)  
**Website:** [www.cardi.org](http://www.cardi.org)  
**Facebook:** CARDI - Caribbean  
Agricultural Research and  
Development Institute  
**You Tube:** CARDIcaribbean

## ***R&D in Agriculture: a bulletin on information resources***

### **AIMS AND SCOPE**

The **R&D in Agriculture: a bulletin on information resources** aims to guide CARDI staff and other agricultural stakeholders in the Caribbean Community (CARICOM) and abroad to articles, journals, books, audio-visual materials, institutions and events on the following:

#### ***Commodities***

- Roots & tubers (cassava, sweet potatoes)
- Cereals & grain legumes
- Hot peppers
- Bananas and Plantains
- Coconuts
- Fruits & vegetables
- Small ruminants

#### ***Thematic Areas***

- Protected agriculture
- Emerging issues (agro-energy, herbals, ICTs, organics, value chains)
- Soil & water management
- Risk management (climate change, invasive species)
- Germplasm
- Biotechnology
- Feeds and feeding systems

These are the priority commodities and thematic areas in the Medium-Term Plan (2014/2016) of the Caribbean Agricultural Research and Development Institute (CARDI). They were identified after consultation with our CARICOM member states and contribute to the implementation of the Jagdeo Initiative and the Regional Transformation Programme (RTP) for Agriculture.

Short bibliographic references to publications, brief descriptions of the research and services of relevant institutions, as well as lists of events are presented in this publication. Where possible a web address (URL) is provided so that readers may visit the webpage / website and access the full abstract, summary, document, or details for the acquisition of the resource.

Issues of this publication are available on our website, [www.cardi.org](http://www.cardi.org), under the Publications section.

***Frequency:*** 3 times a year - April, August, December

## TABLE OF CONTENTS

<b>COMMODITIES</b>	<b>3</b>
<b>Roots and Tubers</b>	<b>3</b>
<b>Hot Peppers</b>	<b>4</b>
<b>Fruits &amp; Vegetables – Bananas</b>	<b>4</b>
<b>Biological Control</b>	<b>5</b>
<b>Livestock</b>	<b>6</b>
<i>Small Ruminants</i>	<b>7</b>
<b>THEMATIC AREAS</b>	
<b>Agroenergy</b>	<b>10</b>
<b>Soil and Water Management</b>	<b>10</b>
<i>Vermiculture</i>	<b>11</b>
<i>Biochar</i>	<b>12</b>
<b>Natural Resource Management - Climate Change</b>	<b>12</b>
<b>Information and Communications Technology</b>	<b>13</b>
<b>OTHER AGRICULTURAL ASPECTS</b>	
<i>Agricultural Development</i>	<b>13</b>
<i>Agricultural Supply Chains and the Tourism Sector</i>	<b>14</b>
<i>Innovation</i>	<b>15</b>
<i>Agricultural research for development: Assessing Impact</i>	<b>16</b>

## COMMODITIES: Roots and Tubers

### **Investment Guide for the Sweet Potato Sector in the CARIFORUM Region for Financial Institutions**

Basil G.F. Springer, PhD, GCM.

2017. The Technical Centre for Agricultural and Rural Cooperation / Finance Alliance for Sustainable Trade (CTA/FAST). The Netherlands

[https://publications.cta.int/media/publications/downloads/CTA\\_FAST\\_GUIDE.pdf](https://publications.cta.int/media/publications/downloads/CTA_FAST_GUIDE.pdf)

This guide aims at introducing financial institutions to the world of sweet potato farming in the CARIFORUM region by showing the potential for investment that exists in the fields of the Caribbean, and at promoting responsible investment that can help the region access export markets. It presents the cycles of production and investment to help potential investors understand the financial and operational requirements associated with sweet potato production, and when a farmer would start to earn the income required to repay a loan.

The guide also presents the risks associated with investment in the Caribbean sweet potato sector and basic recommendations for how they could be addressed

### **Research for innovation and impact. RTB [CGIAR Research Program on Roots, Tubers and Bananas] Annual Report 2016**

2017. CGIAR Research Program on Roots, Tubers and Bananas (RTB), Lima: Peru

<http://www.rtb.cgiar.org/2016-annual-report/>

“... 2016 brought continued successes for our program. We saw major scientific breakthroughs in genomic research that will accelerate the breeding process for banana, and lead to the development of improved crop varieties including disease-resistant cassava, and biofortified potato high in iron and zinc. The World Food Prize was awarded to three scientists from our lead center, the International Potato Center, in recognition of their successful efforts to reduce micronutrient malnutrition by enabling millions of families in sub-Saharan Africa to grow and consume vitamin A-rich orange-fleshed sweetpotato.

Over the past year, we estimate that nearly 1.8 million households adopted new technologies as a result of RTB research, and our team made strong progress on gender while also enhancing our emphasis on scaling – all critical steps towards ensuring we achieve lasting impact..”

*Source: RTB 2016 Annual Report: Research for Innovation and Impact*

<http://www.rtb.cgiar.org/blog/2017/08/21/rtb-2016-annual-report-research-innovation-impact/>

### **Drought effects on root and tuber production: A meta-analysis**

Stefani Daryanto, Lixin Wang, Pierre-André Jacinthe

2016. *Agricultural Water Management* 176:122-131

#### Abstract

Roots and tubers such as potatoes and cassava rank within the top six among the world’s most important food crops, yet the extent to which their global production has been adversely affected by drought remains unclear. Greater uncertainties exist on how drought effects co-vary with: (1) root and tuber species, (2) soil texture, (3) agro-ecological region, and 4) drought timing. It is often assumed that potato is drought-sensitive whereas cassava and sweet potato are resistant to drought, but this assumption has not been quantitatively tested. To address these uncertainties, we collected literature data between 1980 and 2015 that reported monoculture root and tuber yield responses to drought under field conditions, and analyzed this large data set using meta-analysis technique. Our results showed that the amount of water reduction was positively related with yield reduction, but the extent of the impact varied with root or tuber species and the phenological phase during which drought occurred. In contrast to common assumptions regarding drought resistance of certain root and tuber crops, we found that yield reduction was similar between potato and species thought to be drought-resistant such as cassava and sweet potato. Here we suggest that drought-resistance in cassava and sweet potato could be more related to survival rather than yield. All root or tuber crops, however, experienced greater yield reduction when drought struck during the tuberization period compared to during their vegetative phase. The effect of soil texture on yield reduction was less obvious, and

similarly we did not find any significant effects of region (and related climatic factors) on either yield reduction or drought sensitivity. Our study provides useful information that can inform agricultural planning, and influence the direction of research for improving the productivity and resilience of these under-utilized crops in the drought-prone regions of the world.

**Keywords:** Drought; Potato; Sweet potato; Cassava; Root; Tuber

<http://www.sciencedirect.com/science/article/pii/S0378377416301810>

## COMMODITIES: Hot Peppers

### **Fruit volume and width at harvest can be used to predict shelf life in pepper (*Capsicum chinense* Jacq.)**

W. Elibox, C. P. Meynard and P. Umaharan

2017. Trop. Agric. (Trinidad) 94:122- 131

#### Abstract

Fifteen morphophysiological fresh fruit characteristics were evaluated in purelines derived from 24 accessions of *Capsicum chinense* (Jacq.) to determine the association of these attributes with shelf life. The accessions were planted under field conditions (Elibox et al., 2015) in a randomized complete block design with three replications; and replicate fruits collected from the fifth harvest were evaluated for color (CIE L\*a\*b\*), weight, length, width, volume, surface area, surface area to volume ratio, epicuticular wax content and thickness of cuticle, exocarp, mesocarp, endocarp, and pericarp. Differences between accessions for all the morphophysiological characteristics were significant at  $P < 0.001$ . When the characteristics were subjected to Pearson's correlation with shelf life parameters viz. weight loss, days to 20% pedicel necrosis and days to incipient pericarp necrosis (Elibox et al., 2015), nine (initial color lab space a\*, b\*, L\*; weight, width, volume, surface area, surface area to volume ratio and exocarp thickness) were positively or negatively associated with shelf life. Accessions with wide fruits were generally heavier, had a larger volume, larger surface area, smaller surface area to volume ratio and took longer time to attain 20% pedicel and incipient pericarp necrosis (had longer shelf lives). Accessions with greener, darker fruit colors at physiological maturity had longer shelf lives and those with heavier fruits and possessing thicker exocarps had lower rates of weight (water) loss. Of the characteristics that were associated with shelf life, three, viz. fruit volume, width and surface area to volume ratio were highly autocorrelated and were found to be able to reliably predict shelf life on the day of harvest. As fruit volume and width are easy to measure and showed the strongest correlations with shelf life parameters, they could be used as reliable indicators of shelf life in pepper breeding.

**Keywords:** Fruit dimensions, pedicel necrosis, pericarp necrosis, postharvest storage, water loss

<https://journals.sta.uwi.edu/ta/index.asp?action=viewPastAbstract&articleId=5375&issueId=468>

<https://journals.sta.uwi.edu/ta/index.asp?action=abstractPermaLink&articleId=5375>

## COMMODITIES: Fruits & Vegetables

### **BANANAS:**

#### **Bacterial Diseases of Bananas and Enset: Current State of Knowledge and Integrated Approaches Toward Sustainable Management.**

Blomme G, Dita M, Jacobsen KS, Pérez Vicente L, Molina A, Ocimati W, Poussier S and Prior P

2017. Front. Plant Sci. 8:1290. doi: 10.3389/fpls.2017.0129

Bacterial diseases of bananas and enset have not received, until recently, an equal amount of attention compared to other major threats to banana production such as the fungal diseases black leaf streak (*Mycosphaerella fijiensis*) and Fusarium wilt (*Fusarium oxysporum* f. sp. *cubense*). However, bacteria cause significant impacts on bananas

globally and management practices are not always well known or adopted by farmers. Bacterial diseases in bananas and enset can be divided into three groups: (1) *Ralstonia*-associated diseases (Moko/Bugtok disease caused by *Ralstonia solanacearum* and banana blood disease caused by *R. solanacearum* subsp. *celebesensis*); (2) *Xanthomonas* wilt of banana and enset, caused by *Xanthomonas campestris* pv. *musacearum* and (3) *Erwinia*-associated diseases (bacterial head rot or tip-over disease *Erwinia carotovora* ssp. *carotovora* and *E. chrysanthemi*), bacterial rhizome and pseudostem wet rot (*Dickeya paradisiaca* formerly *E. chrysanthemi* pv. *paradisiaca*). Other bacterial diseases of less widespread importance include: bacterial wilt of abaca, Javanese vascular wilt and bacterial fingertip rot (probably caused by *Ralstonia* spp., unconfirmed). This review describes global distribution, symptoms, pathogenic diversity, epidemiology and the state of the art for sustainable disease management of the major bacterial wilts currently affecting banana and enset.

**Keywords:** bacterial disease, banana, ensete, *Ralstonia*-associated, *Xanthomonas* wilt, *Erwinia*-associated  
[https://www.bioversityinternational.org/fileadmin/user\\_upload/Bacterial\\_disease\\_of\\_bananas\\_and\\_enset\\_Blomme.pdf](https://www.bioversityinternational.org/fileadmin/user_upload/Bacterial_disease_of_bananas_and_enset_Blomme.pdf)

### **Golden bananas in the field: elevated fruit pro-vitamin A from the expression of a single banana transgene**

Jean-Yves Paul, Harjeet Khanna, Jennifer Kleidon, Phuong Hoang, Jason Geijskes, Jeff Daniells, Ella Zaplin, Yvonne Rosenberg, Anthony James, Bulukani Mlalazi, Pradeep Deo, Geoffrey Arinaitwe, Priver Namanya, Douglas Becker, James Tindamanyire, Wilberforce Tushemereirwe, Robert Harding and James Dale

2017. *Plant Biotechnology Journal* 15:520-532

#### Summary

Vitamin A deficiency remains one of the world's major public health problems despite food fortification and supplements strategies. Biofortification of staple crops with enhanced levels of pro-vitamin A (PVA) offers a sustainable alternative strategy to both food fortification and supplementation. As a proof of concept, PVA-biofortified transgenic Cavendish bananas were generated and field trialed in Australia with the aim of achieving a target level of 20 µg/g of dry weight (dw) β-carotene equivalent (β-CE) in the fruit. Expression of a Fe'i banana-derived phytoene synthase 2a (*MtPsy2a*) gene resulted in the generation of lines with PVA levels exceeding the target level with one line reaching 55 µg/g dw β-CE. Expression of the maize phytoene synthase 1 (*ZmPsy1*) gene, used to develop 'Golden Rice 2', also resulted in increased fruit PVA levels although many lines displayed undesirable phenotypes. Constitutive expression of either transgene with the maize polyubiquitin promoter increased PVA accumulation from the earliest stage of fruit development. In contrast, PVA accumulation was restricted to the late stages of fruit development when either the banana 1-aminocyclopropane-1-carboxylate oxidase or the expansin I promoters were used to drive the same transgenes. Wild-type plants with the longest fruit development time had also the highest fruit PVA concentrations. The results from this study suggest that early activation of the rate-limiting enzyme in the carotenoid biosynthetic pathway and extended fruit maturation time are essential factors to achieve optimal PVA concentrations in banana fruit.

<http://onlinelibrary.wiley.com/doi/10.1111/pbi.12650/full>

## **BIOLOGICAL CONTROL**

### **A baseline study using Plantwise information to assess the contribution of extension services to the uptake of augmentative biological control in selected low- to lower- middle- income countries.**

Julien Dougoud, Matthew J. W. Cock, Steve Edgington, Ulrich Kuhlmann

2017. *BioControl: Journal of the International Organization for Biological Control*. First Online: [21 June 2017](#)

#### Abstract

The uptake of augmentative biological control agents (BCAs) is still limited, particularly in many low- to lower-middle- income countries. This study focuses on factors that affect the uptake of BCAs for arthropod pests by national extension partners (NEPs) in Plantwise—an agricultural development programme facilitating the establishment of plant clinics where farmers can obtain diagnosis and plant health advice. Using data generated by

NEPs, BCA recommendations in extension material and given by extension workers in Ghana, Kenya, Zambia, India, Nepal and Pakistan were analysed. The rate of BCA recommendation ranged from 13.0 (Zambia) to 61.1% (India) in extension materials and from 0.0 (Zambia) to 18.2% (India) in recommendations given by extension workers. Knowledge, availability and price were identified as the main factors affecting the uptake of BCAs by NEPs. This baseline study gives novel insight into the potential of NEPs to facilitate the use of BCAs.

**Keywords:** Africa Asia Plant clinics Technology dissemination Pest management Biological control agents

DOI:10.1007/s10526-017-9823-y

<https://link.springer.com/article/10.1007/s10526-017-9823-y>

## COMMODITIES: Livestock

**United Nations High-Level Forum on Sustainable Development Special Event: The Role of Livestock in Achieving the SDGs, Friday, 14 July, 2017, Institute of International Education (IIE)**

<https://news.ilri.org/2017/07/14/achieving-the-sdgs-with-livestock/>

### **Achieving the Sustainable Development Goals—the roles of livestock**

Posted on **14 Jul 2017** by **Peter Ballantyne**

Today, 14 July 2017, the role of livestock in achieving the SDGs was the focus of a special event at the High-Level Forum on Sustainable Development. Organized by the [International Livestock Research Institute](#), [Heifer International](#), the [Livestock Global Alliance](#) and the [Global Agenda on Sustainable Livestock](#), the session explored why livestock are essential for Agenda 2030...

Program of the event:

#### **Opening Session**

- Welcome and [remarks by Chair/Moderator](#) Mr. Jimmy Smith, director general, International Livestock Research Institute (ILRI)
- Remarks by H.E. Ms. Amira Gornass, Ambassador of Sudan to Italy, Permanent Representative of Sudan to the Rome Based Agencies & Chairperson, UN Committee on Food Security (CFS) “[mixed farming allows farmers to create a more profitable and sustainable farming system](#)”
- Remarks by Deirdre McGrenra, Chief, Americas Liaison Office, Partnership and Resource Mobilization International Fund for Agricultural Development (IFAD) “[a single pregnant cow can empower a woman. A calf, some milk and it can be the start of a new livelihood](#)”

#### **Panel Discussion – “Livestock and its critical intersection with achieving Agenda 2030”**

- Franck C. J. Berthe, World Bank and Livestock Global Alliance “[the virtuous circle between knowledge and operations to unleash the potential of sustainable livestock to deliver on the 2030 Agenda](#)”
- Akoto Osei, Nutrition Director, Heifer International “[smallholder livestock interventions can improve diet and early childhood outcomes if we focus on nutrition in the programs](#)”
- Laura Sommer, Swiss Federal Office for Agriculture “[Switzerland is a key donor supporting livestock and the SDGs to move forward the Global Agenda for Sustainable Livestock](#)”

#### **Discussion/Question and Answer Period**

#### **Summary and Wrap-up**

- Closing remarks by Chair/Moderator, Mr. Jimmy Smith (ILRI)

## Can Biochar Covers Reduce Emissions from Manure Lagoons While Capturing Nutrients?

Brian Dougherty, Myles Gray, Mark G. Johnson and Markus Kleber

2017. Journal of Environmental Quality 46:659-666

### Abstract

The unique physical and chemical properties of biochars make them promising materials for odor, gas, and nutrient sorption. Floating covers made from organic materials (biocovers) are one option for reducing odor and gas emissions from livestock manure lagoons. This study evaluated the potential of floating biochar covers to reduce odor and gas emissions while simultaneously sorbing nutrients from liquid dairy manure. This new approach has the potential to mitigate multiple environmental problems. Two biochars were tested: one made via gasification of Douglas fir chips at 650°C (FC650), and the other made from a mixture of Douglas fir [*Pseudotsuga menziesii* (Mirb.) Franco] bark and center wood pyrolyzed at 600°C (HF600). The HF600 biocover reduced mean headspace ammonia concentration by 72 to 80%. No significant reduction was found with the FC650 biocover. Nutrient uptake ranged from 0.21 to 4.88 mg N g<sup>-1</sup> biochar and 0.64 to 2.70 mg P g<sup>-1</sup> biochar for the HF600 and FC650 biochars, respectively. Potassium ranged from a loss of 4.52 to a gain of 2.65 mg g<sup>-1</sup> biochar for the FC650 and HF600 biochars, respectively. The biochars also sorbed Ca, Mg, Na, Fe, Al, and Si. In a separate sensory evaluation, judges assessed odor offensiveness and odor threshold of five biocover treatments including four biochars applied over dairy manure. Reductions in mean odor offensiveness and mean odor threshold were observed in three treatments compared with the control. These results show that biochar covers hold promise as an effective practice for reducing odor and gas emissions while sorbing nutrients from liquid dairy manure.

doi:10.2134/jeq2016.12.0478

<https://dl.sciencesocieties.org/publications/jeq/abstracts/46/3/659>

## SMALL RUMINANTS:

### Factors affecting conception rate of hair ewes after laparoscopic insemination with chilled semen under tropical conditions

Jesús Ricardo Aké-Villanueva, Jesús Ricardo Aké-López, José Candelario Segura-Correa, Juan Gabriel Magaña-Monforte, Narda Yanerit Aké-Villanueva

2017. Small Ruminant Research 153:114-117

### Abstract

The objective was to evaluate the effect of some factors on the conception rate of hair ewes using laparoscopic intrauterine insemination with chilled semen under tropical conditions. Data on 1200 inseminations carried out in Pelibuey, Blackbelly, Katahdin and Dorper ewes from 19 farms were used. Estrous was synchronized using vaginal sponges or a controlled intravaginal drug release (CIDR) device by 12 days. At the withdrawal of the device (sponge/CIDR) 200 or 250 IU of equine chorionic gonadotropin (eCG) was applied. Insemination was carried out 54–56 h after withdrawal of the device using chilled semen with 150 million spermatozoa per dose. Ultrasound conception diagnosis was carried out 35–40 d after insemination. The effects of ewe breed, age of ewe (1–4 years), body condition score (low, middle and high), type of device (sponge and CIDR), dose of eCG (200 and 250 IU), year of insemination (2010–2012), season (hot-dry, hot-humid; fresh-humid), inseminator (5 inseminators) and simple interactions on conception rate were determined using binary logistic regression. The overall conception rate was 66.4%. There was not significant interactions of main effects. Only breed, body condition score (BCS) and year of insemination influenced ( $P < 0.05$ ) conception rate. Blackbelly (73.1%) and Pelibuey (68.9%) ewes had the highest conception rates as compared to Dorper (61.4%) and Katahdin breeds (62.4%). The conception rate was better in the ewes of middle body condition (68.1%) than ewes of low BCS (64.2%). Under the conditions of this study, the conception rate of ewes, using laparoscopic intrauterine insemination with chilled semen was influenced by ewe breed, BCS and year of insemination.

**Keywords:** Artificial insemination; Hair sheep; Breed; Age; BCS; Device type; eCG dose; Season

<http://www.sciencedirect.com/science/article/pii/S0921448817301645>

**A study of the apparent digestibility of phytochemical factors in diets of grass legume and crop by-product concentrate mixtures fed to young goats, *Capra hircus* L1758: Saponin, tannin, phytate, oxalate and hydrocyanide. a.**

A.M. Ogungbesan, A.M. Akanji, O.E. Fasina and O.C. Eniolorunda

2017. Trop. Agric. (Trinidad) Volume 94 Number 3

Abstract

Twenty (20) West African Dwarf Does of average weight of  $5\pm 0.58$  kg aged between 3 and 6 months were used to determine the effect of varying proportions of *Andropogon gayanus* kunth (Ag) and *Gliricidia sepium* Wacq.) Walp (Gs) fed with cassava offal based diets on the apparent digestibility. The five (5) treatments were I (Gs0); 100% Ag + 0% Gs; II (Gs25) 75% Ag + 25% Gs; III (Gs50); 50% Ag + 50% Gs; IV (Gs 75); 25% Ag + 75% Gs; V (Gs100); 0% Ag + Gs100. Saponin digestibility (%) was lowest in Gs100 (99.61) and highest ( $P>0.05$ ) in Gs0 (99.79). Gs100 had lowest (98.63) and Gs 25 ( $P<0.05$ ) had highest ( $P<0.05$ ) Tannin digestibility (99.39). Phytate digestibility was lowest in Gs75 (98.26) and highest ( $P>0.05$ ) in Gs50 (99.51) while Oxalate digestibility was lowest in Gs100 (97.32) and highest ( $P<0.05$ ) in Gs 100 (99.20) and highest ( $P<0.05$ ). HCN digestibility occurred in Gs0 (100) and lowest in Gs 75 and 100 (99.94). No definite pattern of digestibility was established in relation to levels of these factors consumed but it was evident the goats (does) utilized all the phytochemical (antinutritional) factors satisfactorily.

**Keywords:** Grass-legume, cassava- offal, W.A.D.-Does, metabolites-digestibility

Perma link for the abstract is: <https://journals.sta.uwi.edu/ta/index.asp?action=abstractPermaLink&articleId=6391>

**A study of the apparent digestibility of phytochemical factors in diets of grass legume and crop by-product concentrate mixtures fed to young goats, *Capra hircus* L1758: Saponin, Tannin, Phytate and Oxalate. b.**

A.M. Ogungbesan, A.M. Akanji, O.E. Fasina and S.E. Akinboye

2017. Trop. Agric. (Trinidad) Volume 94 Number 3

Abstract

Sixteen (16) west African Dwarf Goats (8 bucks and 8 does) balanced for age, sex and weight (average of  $5.79\pm 0.60$ kg), to test for plant digestibility (%) of secondary compounds or metabolites in *Tephrosia bracteolata* Guill et perr. (Tb) *Panicum maximum* Jacq (Pm). Concentrate vig: I (20%, 60%, 20% Tb 20) as control, II (40%, 40%, 20%, Tb 40), III (60%, 20%, 20%, Tb 60) and IV (80%, 0%, 20%, Tb 80). Tannin was highest ( $P>0.05$ ) in TB 40 and 80 (99.90) and lowest ( $P>0.05$ ) in TB 20 (99.70), Saponin was highest ( $P>0.05$ ) in TB 40 (99.70) and lowest in TB 20 (99.50), Oxalate was highest ( $P>0.05$ ) in TB 80 (99.70) and lowest in TB 20, 40 and 60 (99.50) while Phytate was highest ( $P>0.05$ ) in TB 40 (99.30) and lowest in TB 60 (98.09). The intake of the entire bioactive compound increased linearly with the level of T.bracteolata. There was no significant difference ( $P>0.05$ ) in the digestibility of all the assayed anti-nutritional factors. The results were not attributable to various combinations but it could be seen that *Tephrosia bracteolata* can be solely fed to growing goats with A.I.B. (Agro industrial byproducts) for optimal performance with or without grass supplement despite its inherent anti-nutrient factors.

**Keywords:** Antinutrients-digestibility, concentrate, forage, goats

Perma link for the abstract is: <https://journals.sta.uwi.edu/ta/index.asp?action=abstractPermaLink&articleId=6392>

**Effect of changes in the nutritional status on the performances of growing Creole kids during an established nematode parasite infection**

W. Ceï; H. Archimède; R. Arquet; Y. Félicité; D. Feuillet; A. Nepos; P. Mulciba; T. Etienne; G. Alexandre; J. C. Bambou

2017. Tropical Animal Health and Production 49:765–770

Abstract

In this study, we evaluated the effect of changes in the nutritional status on the performances of growing Creole kids during an established experimental gastrointestinal nematode (GIN) infection. Eighteen 6-month-old Creole kids were distributed in two main groups infected (I) and non-infected (NI) and were placed for a period of 4 weeks on each of three diets differing in their nutritional values: (1) fresh grass (FG, 6.7 MJ/kg dry matter (DM) and 7.9% crude protein (CP)) non-supplemented, (2) FG supplemented with a commercial concentrate (CC, 12.2 MJ/kg DM and 20.6% of CP), and (3) FG supplemented with dried banana (Ban, 11.1 MJ/kg DM and 4.3% CP). The experiment was designed as a split-plot with experimental infection (I and NI) as the main plot and the diets (FG,

CC, and Ban) as the subplots with three replicates. We showed a significant effect of the diet changes on the fecal egg counts. A higher dry matter intake, digestibility, and growth rate were observed with the CC diet but together with a slight but significant increase of the intensity of the GIN infection. These data suggest that the improvement of the protein nutritional status during an establish GIN infection would improve the animal performance at the expense of the mechanism involved in the control of the infection.

**Keywords:** Nutrition; Parasitism; Small ruminant; Growth performance; Infection

<https://link.springer.com/article/10.1007/s11250-017-1258-z>

### **Assessment of lifetime performance of small ruminants under different feeding systems**

Amole, T., Zijlstra, M., Descheemaeker, K., Ayantunde, A. and Duncan, A.J.

2017. *Animal* 11:881-889

#### Abstract/Description

Evaluation of lifetime productivity of individual animals in response to various interventions allows assessment of long-term investment opportunities for farmers. In order to gain a better understanding of promising feed interventions for improvement of small ruminant production in Southwestern Nigeria, a dynamic modelling approach was used to explore the effect of different feeding strategies on the lifetime productivity of West African Dwarf (WAD) goats. Modifications were made to the current version of Livestock Simulator developed for cattle production to simulate goat production systems particularly for WAD goats. Effects of changes in input parameters (quality of feed and potential adult weight) confirmed the sensitivity of the modelled weight development and reproductive performance. The values of simulated model outputs corresponded well with observed values for most of the variables, except for the pre-weaning mortality rate in the cut-and-carry system where a wide discrepancy between simulated (2.1%) and observed (23%) data was found. The scenario analysis showed that simulated goats in the free grazing system attained sexual maturity and kidded much later than those in the grazing with supplementation and the cut-and-carry systems. The simulated results suggested that goats require supplementation with protein and energy sources, in order to promote lifetime productivity, early sexual maturity and higher birth weight. In terms of economic returns based on feed cost alone, the moderately intense system produced the most profit. We therefore conclude that grazing with adequate supplementation using farm-generated feed resources offers an opportunity for improving smallholder goat production systems in West Africa.

<https://www.cambridge.org/core/journals/animal/article/assessment-of-lifetime-performance-of-small-ruminants-under-different-feeding-systems/A5AD7FC8CB158953F7C3276C310D4D94>

<https://cgspace.cgiar.org/handle/10568/81214>

### **Cortisol and triiodothyronine (T3) concentrations in West African dwarf and Kalahari red goats as affected by rainy season**

O.O. Shittu, T.A. Amole, D.P. Toviesi, O. Gazal, O. Gazal, B.O. Oluwatosin, O.A. Osinowo and O.F. Smith

2017. *Trop. Agric. (Trinidad)* Volume 94 Number 3

#### Abstract

The cortisol and triiodothyronine (T3) concentrations of West African Dwarf (WAD) goats purchased from a local market in Abeokuta, indigenous to the humid climate of West Africa and progenies of parent stock of the Kalahari Red (KR) goat introduced to the humid zone of South-Western Nigeria from the semi-arid sub-tropical zone of South Africa were investigated in the rainy season. Twelve goats consisting of 6 WAD and 6 KR goats of healthy status free of internal and external parasites, aged between 8 and 9 months were housed in a well ventilated concrete-floored pen. The animals were raised semi-intensively throughout the duration of the experiment. They were allowed to graze on pasture mainly (*Chloris gayana* kunth) and supplemented with concentrate feed at 4 % body weight, on a dry matter basis daily for six months in the rainy season (May – October). Blood was collected twice a month via jugular venipuncture to determine cortisol and triiodothyronine (T3) concentrations. Breed, season and breed by season interaction had no significant effect ( $P > 0.05$ ) on cortisol. Also, breed had no significant effect ( $P > 0.05$ ) on triiodothyronine (T3) concentration. However, season and breed by season interaction had a highly significant effect ( $P < 0.001$ ) on triiodothyronine (T3) concentration, with triiodothyronine (T3) concentration higher in the West African Dwarf goats ( $128.36 \pm 7.64$  ng/dl) than the Kalahari Red goats ( $107.94 \pm 9.08$ ) in the month of August. It can be concluded from the study that there was no difference in the cortisol concentration in the

West African Dwarf and Kalahari Red goat breeds in the rainy season while triiodothyronine concentration (T3) was higher in the West African Dwarf goats in the month of August in the rainy season.

**Keywords:** Cortisol, triiodothyronine, West African Dwarf, Kalahari Red, rainy season

Perma link for the abstract is: <https://journals.sta.uwi.edu/ta/index.asp?action=abstractPermaLink&articleId=6393>

## THEMATIC AREAS: AGROENERGY

### **A review of the sustainability of *Jatropha* cultivation projects for biodiesel production in southern Africa: Implications for energy policy in Botswana**

Donald L. Kgathi, Gagoitsoepe Mmopelwa, Raban Chanda, Keotshephile Kashe, Mike Murray-Hudson  
2017. *Agriculture, Ecosystems & Environment* 246:314-324

#### Abstract

*Jatropha curcas* L. biofuel development is considered a strategy for achieving energy security, climate change mitigation, foreign exchange savings and economic development. This paper reviews the experiences of some southern African countries with the impacts of *Jatropha* biofuel development on sustainability, with a view to providing lessons for biofuel development policy for Botswana. The review has shown that most of the large commercial plantations planned to produce *jatropha* seed for home consumption and export were not economically viable mainly due to low seed yield, high cost of production, delayed production and uncompetitive feedstock prices. On the other hand, smallholder-based *jatropha* biofuel projects were economically viable due to their low input costs. Analysis of social impacts showed that *jatropha* production has been associated with loss of rights to land, low compensation levels, and compromised food security where land and other production inputs were diverted from food crops to *jatropha* production. Positive social impacts in some countries included increased employment opportunities and incomes. *Jatropha* production is associated with environmental impacts such as loss of biodiversity, high water requirements and high carbon debts resulting from conversion of land. Positive environmental impacts included high energy return on investment and high GHG savings when *Jatropha* is cultivated on abandoned agricultural fields as revealed by research in some parts of West Africa. Policy considerations for the Government of Botswana include: providing support to biofuel projects at their early stage of development, discouraging large plantation business models until such time that research in Botswana produces high seed-yielding *Jatropha* varieties, introducing legal safeguards for protection of land rights of local communities, and ensuring that land-use change and high carbon debts are minimized as they have adverse impacts on biodiversity and climate change.

**Keywords:** Southern Africa; Sustainability; *Jatropha* projects; Biodiesel production; Energy policy; Botswana  
<http://www.sciencedirect.com/science/article/pii/S0167880917302578>

## THEMATIC AREAS: SOIL AND WATER MANAGEMENT

### **Global synthesis of drought effects on cereal, legume, tuber and root crops production: A review**

Stefani Daryanto, Lixin Wang, Pierre-André Jacinthe  
2017. *Agricultural Water Management* 179: 18-33

#### Abstract

As a result of climate change, drought is predicted to pose greater pressure on food production system than in the past. At the same time, crop yield co-varies with both environmental (e.g., water, temperature, aridity) and agronomic variables (i.e., crop species, soil texture, phenological phase). To improve our quantitative understanding on the effects of these co-varying factors on agricultural productivity, we synthesized previous *meta*-analysis studies summarizing the results of numerous independent field experiments on drought and its effect on the production of cereal, legume, root and/or tuber (root/tuber) crops. We also included new crops species that were not covered in previous *meta*-analyses and the effects of heat stress. Our results indicated that cereals tended to be more drought

resistant than legumes and root/tubers. Most crops were more sensitive to drought during their reproductive (i.e., grains filling, tuber initiation) than during their vegetative phase, except for wheat, which was also sensitive during vegetative phase. Recovery from drought impact at reproductive phase was either: (i) unfeasible for crops experiencing damage to their reproductive organs (e.g., maize, rice) or (ii) limited for root/tuber crops, provided that water was abundant during the subsequent root/tuber bulking period. Across soil texture, the variability of yield reduction for cereals was also lower in comparison to legume or root/tuber crops, probably due to the extensive and deep rooting system of cereal crops. As crop species, plant phenology, and soil texture were important co-varying factors in determining drought-induced crop yield reduction, no single approach would be sufficient to improve crop performance during drought. Consequently, a combination of approaches, particularly site-specific management practices that consider soil conditions (i.e., intercropping, mulching, and crop rotation) and selection of crop varieties adjusted to the local climate should be adopted in order to improve the sustainability of agricultural production in a changing climate.

**Keywords:** Drought; Cereal; Legume; Tuber; *Meta-analysis*; Climate change  
<http://www.sciencedirect.com/science/article/pii/S0378377416301470>

## **Improving Agricultural Water Productivity to Ensure Food Security under Changing Environments**

Overseen by: Brent Clothier. Edited by ShaoZhong Kang, Lu Zhang and Thomas Trout

2017. *Agricultural Water Management* 179:1-412. **Special Issue**

<http://www.sciencedirect.com/science/journal/03783774/179/supp/C?sdsc=1>

This special issue of *Agricultural Water Management* is mainly based on presentations from three workshops entitled “Water and Food Security under Changing Environments”, “Irrigation in Action”, “Agricultural Hydrology and Water Resources” organized by the Center for Agricultural Water Research in China, China Agricultural University in 2015.

Papers covering the following areas:

- National and regional scale agricultural water productivity
- Measurement and estimation of crop water consumption
- Water productivity and optimal water and agronomic management practices.
- Effects of irrigation and fertilizer scheduling on yield and water use efficiency
- Improved irrigation technology and equipment.
- Multiscale agro-hydrological modeling and decision support system in agricultural water management.

## **VERMICULTURE:**

### **Creating Wealth from Waste: Resource Use Efficiency in Climate-Smart Agriculture**

Abigail Smith, Tam Thi Le

2017. CCAFS Info Note. Wageningen, The Netherlands: CGIAR Research

Program on Climate Change, Agriculture and Food Security (CCAFS)

[Abstract/Description](#)

This brief provides an assessment of the economic and ecological benefits associated with vermiculture as a climate-smart practice. Using data from interviews with farmers in My Loi, Vietnam, this article highlights the productivity and adaptation benefits which can result from vermiculture practice. An economic analysis showcases significant anticipated returns for farmers in the initial year of vermiculture establishment. This assessment evaluates initial labor and materials, maintenance, system inputs, worm sales, and worms as a supplemental protein source for poultry. Qualitative metrics are also included for soil and productivity, with vermiculture linked to improvements in crop health, soil fertility and moisture levels. Because the initial investment and space requirements are minimal, vermiculture is ideal for broader adoption in diverse farm systems.

<https://cgspace.cgiar.org/bitstream/handle/10568/83007/Creating%20Wealth%20from%20Waste%20Info%20Note.pdf?sequence=1&isAllowed=y>

<https://cgspace.cgiar.org/handle/10568/83007>

## BIOCHAR:

### **Biochars Reduce Mine Land Soil Bioavailable Metals**

Ippolito, J. A., C. M. Berry, D. G. Strawn, J. M. Novak, J. Levine, and A. Harley  
2017. *Journal of Environmental Quality* 46:411-419

#### Abstract

Biochar has been proposed as an amendment to remediate mine land soils; however, it could be advantageous and novel if feedstocks local to mine land sites were used for biochar production. Two different feedstocks (pine beetle-killed lodgepole pine [*Pinus contorta*] and tamarisk [*Tamarix* spp.]), within close proximity to mine land-affected soils, were used to create biochars to determine if they have the potential to reduce metal bioavailability. Four different mine land soils, contaminated with various amounts of Cd, Cu, Pb, and Zn, received increasing amounts of biochar (0, 5, 10, and 15% by wt). Soil pH and metal bioavailability were determined, and the European Community Bureau of Reference (BCR) sequential extraction procedure was used to identify pools responsible for potential shifts in bioavailability. Increasing biochar application rates caused increases in soil pH (initial, 3.97; final, 7.49) and 55 to 100% (i.e., no longer detectable) decreases in metal bioavailability. The BCR procedure supported the association of Cd with carbonates, Cu and Zn with oxyhydroxides and carbonates, and Pb with oxyhydroxides; these phases were likely responsible for the reduction in heavy metal bioavailability. This study proved that both of these feedstocks local to abandoned mining operations could be used to create biochars and reduce heavy metal bioavailability in mine land soils.

<https://dl.sciencesocieties.org/publications/jeq/abstracts/46/2/411>

## THEMATIC AREAS: NATURAL RESOURCE MANAGEMENT

## CLIMATE CHANGE:

### **Caribbean Agro-climatic Bulletin of the CariSAM, August 2017**

<http://www.cardi.org/wp-content/uploads/downloads/2017/09/Caribbean-Agro-climatic-Bulletin-of-the-CariSAM-August-2017.pdf>

The [August 2017 issue](#) of the **Caribbean Agro-climatic Bulletin of the CariSAM**, a joint bulletin of the Caribbean Agricultural Research and Development Institute ([CARDI](#)) and the Caribbean Institute for Meteorology and Hydrology ([CIMH](#)) is now available.

#### KEY MESSAGES

By the end of October 2017, a short-term drought situation could evolve over Haiti, due to rainfall deficits in May and June, and a long-term drought situation is possible, by the end of November in central Bahamas.

There could possibly be elevated heat stress during August to October, which would in turn affect plants, and small livestock.

### **Adoption of climate technologies in the agrifood sector: Methodology**

2017. Food and Agriculture Organization of the United Nations, Rome

A joint product of FAO and the EBRD

“Provides a practical methodology to enable a country or funding agency to assess and monitor the market penetration of sustainable climate technologies and practices in agrifood chains. Market penetration is defined as a measure of the adoption of an agrifood technology or practice in a specific market. The guidelines are useful not only to estimate the current market penetration, but also – and more importantly – to assess the potential for further adoption and to reduce GHG emissions efficiently. The methodology therefore takes into consideration important features of each technology including: market potential, technical and non-technical barriers to adoption and unit cost in terms of US dollars per tonnes of carbon dioxide equivalent (USD/tCO<sub>2</sub>eq).

<http://www.fao.org/3/a-i7022e.pdf>

## **Special issue on climate-smart agriculture (CSA)**

Campbell B M, Dinesh D, (Eds.)

2017. Agriculture for Development no. 30. Special issue on climate-smart agriculture (CSA)

### Abstract/Description

CSA strategies, policies, partnerships and investments; 'CSA-Plan': strategies to put CSA into practice; The mitigation pillar of CSA; Agricultural diversification as an adaptation strategy; Climate services and insurance: scaling; CSA Closing the gender gap in agriculture under climate change; How can the Data Revolution contribute to climate action?; Climate change and CSA in the current political climate

<https://cgspace.cgiar.org/handle/10568/81017>

## **INFORMATION AND COMMUNICATIONS TECHNOLOGY**

### **An ICT agripreneurship guide: A path to success for young ACP entrepreneurs**

2017. Technical Centre for Agricultural and Rural Cooperation (CTA): Wageningen, The Netherlands

<https://publications.cta.int/en/publications/publication/1984/>

This Handbook provides a step-by-step roadmap designed to equip aspiring ICT entrepreneurs, with the information and knowledge they need to start an ICT-based business in the agricultural sector, outlining key opportunities and challenges that will be encountered along the way. Using real-life examples, it provides strategies and pathways for averting common mistakes faced by early-stage entrepreneurs. Topics covered include agricultural value chains and their stakeholders, ICT business challenges, effective business plans and models for designing, funding and scaling ventures.

## **OTHER AGRICULTURAL ASPECTS**

### **AGRICULTURAL DEVELOPMENT:**

**Advancing Sustainable Growth. Sectoral Presentation by Honourable Karl Samuda, CD, MP, Minister of Industry, Commerce, Agriculture and Fisheries.** Houses of Parliament, Tuesday, May 9, 2017

2017. Jamaica. Ministry of Industry, Commerce, Agriculture and Fisheries

<http://www.moa.gov.jm/Speeches/data/2017%20Sectoral%20Presentation%20by%20HM%20Karl%20Samuda.pdf>

#### Partial Contents

Sugar Transformation Programme

Growth in Agriculture

The Marriage – Agriculture and Industry

Agro-Parks

Praedial Larceny Prevention Programme

### **Investment and Transformation in the ACP Agriculture Sector: A new approach to ACP Group support for the development of agriculture value chains**

2017. ACP Group, Brussels April 2017

<http://www.acp.int/sites/acpsec.waw.be/files/New%20approach%20to%20Commodities.pdf>

#### Contents

III From reactive support for the commodities sector to an active value chain inclusion policy

IV Policy options: Finance, Capacity Building, Trade and Investment, Mitigating Climate Risks

V Policy recommendations for capitalising and scaling up

VI Articulating new responses

## **Trends and Policy Innovations for Agriculture in Light of the 2030 Sustainable Development Agenda**

Arias, Joaquín

2017. Inter-American Institute for Cooperation on Agriculture: Washington, United States

<http://www.iica.int/sites/default/files/publications/files/2017/BVE17058870i.pdf>

### **Summary**

This publication is a collection of ideas, proposals and reflections presented during a series of seven online seminars on agricultural policies, which included those of the United States, Brazil, Canada, Chile, Central America, the European Union and China. Government officials, academics and private sector representatives from those countries or regions participated, together with commentators from Argentina, Costa Rica, Mexico, Spain and Belgium who offered their contributions.

Topics: Market oriented agricultural policies; Regional integration and market development; Sustainable management of natural resources in agriculture; Efficient use of inputs, and factors of production.

<http://www.iica.int/en/publications/trends-and-policy-innovations-agriculture-light-2030-sustainable-development-agenda>

## **AGRICULTURAL SUPPLY CHAINS AND THE TOURISM SECTOR:**

### **Souvenir Food Packaging: a training resource for food processors and artisans.**

Rolle, R. and Enriquez, O.

2017. FAO: Rome

<http://www.fao.org/3/a-i7353e.pdf>

#### **Contents**

**Chapter 2 Food product attributes that are important to tourists**

**Chapter 3 Role and function of packaging in marketing food as tourist merchandise**

**Chapter 4 Materials and systems for the packaging of food products**

**Chapter 5 Labelling of food products**

**Chapter 6 Tapping into the tourist market – product positioning and graphic design**

**Chapter 7 Labelling systems**

**Chapter 8 The use of local handicraft as secondary packaging**

**Chapter 9 Selling the product – visual merchandising**

### **Linking Farmers and Agro-processors to the Tourism Industry in the Eastern Caribbean**

Hans Jansen; Adam Stern; Eli Weiss

2015. World Bank

This study identifies opportunities to reinforce linkages between domestic agricultural supply chains and the tourism sector and describes interventions with the greatest potential to strengthen those linkages.

Countries: Antigua & Barbuda, Dominica, Grenada, St. Kitts & Nevis, St. Lucia, and St. Vincent & the Grenadines

<http://documents.worldbank.org/curated/en/261991467997876693/pdf/ACS16280-WP-REPLACEMENT-Linking-Farmers-and-Agro-processors-to-the-Tourism-Industry-in-the-Eastern-Caribbean.pdf>

## **INNOVATION:**

### **Guidelines for Innovation Platforms in Agricultural Research for Development. Decision support for research, development and funding agencies on how to design, budget and implement impactful Innovation Platforms**

Schut, M., Andersson, J.A., Dror, I., Kamanda, J., Sartas, M., Mur, R., Kassam, S., Brouwer, H., Stoian, D., Devaux, A., Velasco, C., Gramzow, A., Dubois, T., Flor, R.J., Gummert, M., Buizer, D., McDougall, C., Davis, K., Homann-Kee Tui, S., Lundy, M.

2017. International Institute of Tropical Agriculture (IITA) and Wageningen University (WUR) under the CGIAR Research Program on Roots Tubers and Bananas (RTB)

[https://cgispace.cgiar.org/bitstream/handle/10568/82550/schut\\_guidelines\\_IP\\_2017.pdf?sequence=2&isAllowed=y](https://cgispace.cgiar.org/bitstream/handle/10568/82550/schut_guidelines_IP_2017.pdf?sequence=2&isAllowed=y)  
<https://www.bioversityinternational.org/e-library/publications/detail/guidelines-for-innovation-platforms-in-agricultural-research-for-development/>

### **Global Innovation Index 2017: Innovation Feeding the World**

Cornell University, INSEAD, WIPO

2017. Cornell University: Ithaca, Fontainebleau, and Geneva

The Global Innovation Index provides detailed metrics about the innovation performance of 127 countries and economies around the world. Its 81 indicators explore a broad vision of innovation, including political environment, education, infrastructure and business sophistication. This year's report reviews the state of innovation in agriculture and food systems across sectors and geographies. Chapters of the report provide more details on this year's theme from academic, business, and particular country perspectives from leading experts and decision makers.

<http://www.wipo.int/publications/en/details.jsp?id=4193>;  
[http://www.wipo.int/edocs/pubdocs/en/wipo\\_pub\\_gii\\_2017.pdf](http://www.wipo.int/edocs/pubdocs/en/wipo_pub_gii_2017.pdf)

#### Contents

#### **Chapter 2: The Potential of a Global Diagnostic Tool for Agricultural Innovation Systems**

[http://www.wipo.int/edocs/pubdocs/en/wipo\\_pub\\_gii\\_2017-chapter2.pdf](http://www.wipo.int/edocs/pubdocs/en/wipo_pub_gii_2017-chapter2.pdf)

**Chapter 3 The Role of Private-Sector R&D in Agricultural Innovation: Improving Yields, Equipment Productivity, and Sustainability.** BARRY JARUZELSKI and VOLKER STAACK, PwC's Strategy & TOM JOHNSON, PwC, Chap 3 IN: Cornell University, INSEAD, and WIPO (2017): The Global Innovation Index 2017: Innovation Feeding the World, Ithaca, Fontainebleau, and Geneva.

[http://www.wipo.int/edocs/pubdocs/en/wipo\\_pub\\_gii\\_2017-chapter3.pdf](http://www.wipo.int/edocs/pubdocs/en/wipo_pub_gii_2017-chapter3.pdf)

#### **Chapter 4: Innovation in Agriculture and Food Systems in the Digital Age**

[http://www.wipo.int/edocs/pubdocs/en/wipo\\_pub\\_gii\\_2017-chapter4.pdf](http://www.wipo.int/edocs/pubdocs/en/wipo_pub_gii_2017-chapter4.pdf)

#### **Chapter 5: Digital Technologies Transforming Indian Agriculture**

[http://www.wipo.int/edocs/pubdocs/en/wipo\\_pub\\_gii\\_2017-chapter5.pdf](http://www.wipo.int/edocs/pubdocs/en/wipo_pub_gii_2017-chapter5.pdf)

#### **Chapter 6: Innovations in Food Distribution: Food Value Chain Transformations in Developing Countries**

and their Implications for Nutrition [http://www.wipo.int/edocs/pubdocs/en/wipo\\_pub\\_gii\\_2017-chapter6.pdf](http://www.wipo.int/edocs/pubdocs/en/wipo_pub_gii_2017-chapter6.pdf)

#### **Chapter 7: Policies and Institutions Fostering Innovation and Agriculture Technologies in Brazil**

[http://www.wipo.int/edocs/pubdocs/en/wipo\\_pub\\_gii\\_2017-chapter7.pdf](http://www.wipo.int/edocs/pubdocs/en/wipo_pub_gii_2017-chapter7.pdf)

#### **Chapter 8: Mobilizing Science, Technology, and Innovation to Transform Japanese Agriculture**

[http://www.wipo.int/edocs/pubdocs/en/wipo\\_pub\\_gii\\_2017-chapter8.pdf](http://www.wipo.int/edocs/pubdocs/en/wipo_pub_gii_2017-chapter8.pdf)

#### **Chapter 9: Technological Future of the Agriculture and Food Sector in Russia**

[http://www.wipo.int/edocs/pubdocs/en/wipo\\_pub\\_gii\\_2017-chapter9.pdf](http://www.wipo.int/edocs/pubdocs/en/wipo_pub_gii_2017-chapter9.pdf)

**Chapter 10: Innovation in the Agri-Food Sector in Latin America and the Caribbean**

[http://www.wipo.int/edocs/pubdocs/en/wipo\\_pub\\_gii\\_2017-chapter10.pdf](http://www.wipo.int/edocs/pubdocs/en/wipo_pub_gii_2017-chapter10.pdf)

**Chapter 11: Enhancing Innovation in the Ugandan Agri-Food Sector: Progress, Constraints, and Possibilities**

[http://www.wipo.int/edocs/pubdocs/en/wipo\\_pub\\_gii\\_2017-chapter11.pdf](http://www.wipo.int/edocs/pubdocs/en/wipo_pub_gii_2017-chapter11.pdf)

**SPECIAL SECTION: CLUSTERS Identifying and Ranking the World's Largest Clusters of Inventive Activity**

## **AGRICULTURAL RESEARCH FOR DEVELOPMENT: Assessing Impact**

**Conference on Impacts of International Agricultural Research: Rigorous Evidence for Policy, 6–8 Jul 2017, Nairobi, Kenya - World Agroforestry Centre**

organized jointly by the CGIAR Independent Science and Partnership Council (ISPC) Standing Panel on Impact Assessment (SPIA) and the CGIAR Research Program on Policies, Institutions, and Markets (PIM)

The objectives of the conference are to present and discuss rigorous evidence from recent studies on how and how much agricultural research has contributed to development outcomes related to CGIAR goals of reduced poverty, improved nutrition and health, and improved natural resource management, and to consider the implications for how CGIAR and others set research priorities.

Special attention will be paid to the methodological challenges of assessing impacts of research and to the political challenges of using evidence in decision making.

<http://ispc.cgiar.org/meetings-and-events/conference-impacts-international-agricultural-research-rigorous-evidence-policy>

**Presentations** <http://ispc.cgiar.org/meetings-and-events/conference-impacts-international-agricultural-research-rigorous-evidence-policy/presentations>