



**Contributions of CIALCA
to Technical and Scientific
Knowledge Ecosystem of
Agriculture-based Livelihoods
in the Great Lakes Region**



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Executive Summary

Since 2016, The Consortium for Improving Agriculture-based Livelihoods in Central Africa (CIALCA) has been conducting research, generating information and scientific and practical knowledge about different parts of the agricultural sectors in Burundi, Eastern Democratic Republic of Congo (DRC) and Rwanda and to a lesser extent in Uganda and Tanzania. In addition, due to its continuity and intensive capacity development efforts, the knowledge and the science generated by CIALCA has been spreading for more than a decade and currently being utilized by many researchers working in the Great Lakes Region.

Up to now, the CIALCA team has not had an opportunity to systematically study the science and knowledge contribution of CIALCA. The unique continuity of CIALCA in the Great Lakes Region and the diversity of the aspects it studied, made the CIALCA team realize that a study on the contributions of CIALCA to science and knowledge generation can not only inform the ongoing activities, but also contribute to better designing next phases of CIALCA and drive important lessons for interventions aiming to improve the science and knowledge base of agricultural sectors in the Great Lakes Region.

This report is a product of this realization and aims to provide insights about the structure of the information, knowledge and science networks in the Great Lakes Region as a whole and individual countries in the region. It investigates the structures with a temporal lense and studies how the structures and the contribution of CIALCA has evolved since 2006. It uses a social network analytics approach, and provides visualizations and statistical analysis.

The research conducted for preparing the report found that CIALCA has gone through 4 major and 6 minor phases and had field sites in 4 countries, control sites or comparison sites from 5 countries in the Great Lakes Region. CIALCA has influenced 110 publications from 379 authors since 2006. Number of CIALCA influenced publications and journal articles have an overall upward trend since 2006 and in time journal articles have become the priority for CIALCA researchers. The CIALCA influenced publication network was 4% less clustered and had 9% more dissemination efficiency than the overall technical and scientific knowledge network. Between 2006 and 2020, CIALCA influenced publications constituted 11 to 36% of all empirical technical and scientific publications about agricultural livelihoods in the Great

Lakes Region as a whole as well the individual countries in the region. On average, the largest share was in Burundi, Great Lakes Region as a whole with some 25%. Overall, network formation in CIALCA influenced networks was stronger than network deformation and the knowledge network grew over time.

The research showed that CIALCA was born from collaboration and partnership and it is an evolving entity that adapts to the needs and realities of the Great Lakes Region. It also indicated that CIALCA made an increasing contribution to the generation of technical and scientific knowledge about agricultural livelihoods in the Great Lakes Region, disseminated it more efficiently, influenced researchers who are not funded by CIALCA, improved empirical knowledge base significantly, and supported a growing research community.

The research report concluded that CIALCA has contributed to the generation and dissemination of technical and scientific knowledge about agricultural livelihoods in the Great Lakes Region across its lifespan, made significant contributions to sustaining it. It also increased inclusivity in quantitative terms and helped create a sustainable international and regional knowledge community. However, it could not fully realize its full potential in making the technical and scientific knowledge ecosystem significantly more robust and inclusive yet. Focusing on technical and scientific knowledge about agricultural livelihoods in the Great Lakes Region as an ecosystem of multi-actor and multi-stakeholder networks and targeting capacity, inclusivity and resilience of the networks can be an optimum next strategy for achieving CIALCA's full potential..

Introduction

A brief history of CIALCA

CIALCA was born out of integrating multiple interventions working in the Great Lakes Region. Having operated in overlapping areas and partnering with same national and international organizations, three interventions, 'Sustainable and Profitable Banana-based Systems for the African Great Lakes Region', 'Building Impact Pathways for Improving Livelihoods in Musa-based Systems in Central Africa', 'Enhancing the Resilience of Agro-ecosystems in Central Africa: A Strategy to Revitalize Agriculture through the Integration of Natural Resource Management Coupled to Resilient Germplasm and Marketing Approaches', came together to coordinate their activities between 2006 and 2008. After a successful collaboration period, with the guidance of the Belgian Government, the projects were merged as a single project in 2009 and merged intervention took the name of CIALCA. Since its inception in 2006, CIALCA has always been a collaborative effort of international and national organizations working in the agricultural sector.

In the first phase between 2006 and 2008, CIALCA focused on understanding the characteristics of the farming systems in the countries in the Great Lakes Region. Specifically, cassava-based and banana-based cropping system characteristics have been researched. Several technical products that target the needs of the small scale farmers such as improved banana and legume germplasm, an improved cassava-legume system, and integrated pest management approaches for bananas have been co-developed with the collaboration with international and national partners and have been started to be delivered to small scale farmers in the region.

In the second phase between 2009 and 2012, CIALCA has prioritized the promotion and dissemination of CIALCA knowledge products and innovations through collaboration with national extension services and international NGOs. It has established a Knowledge Resource Centre in Bujumbura, Burundi. CIALCA was the flag bearer of science capacity development in the Great Lakes Region and led the training of more than 50 PhD and MSc students. CIALCA also organized an international scientific conference entitled 'Challenges and Opportunities for Agricultural Intensification of the Humid-Highland Systems of sub-Saharan Africa in 2011. In 2012, CIALCA restructured itself and became an integral part of the Humidtropics CGIAR Research Program (CRP). In line with the Humidtropics philosophy, agro-ecological

intensification became the priority research and education approach.

In the third phase between 2013 and 2017, CIALCA became a key operating platform for the CGIAR Research Program on Integrated Systems for the Humid Tropics (Humidtropics) in Central Africa. By building on a decade of partnerships, CIALCA was able to jumpstart activities and mobilize multi-stakeholder networks in Burundi, Rwanda, and the eastern Democratic Republic of Congo. It adopted an integrated systems approach, which studied and developed an understanding of livelihood diversity, gender, value chains, nutrition, markets, natural resource improvement, institutional innovation, and the scaling of successful innovations through multi-stakeholder partnerships. The extension of CIALCA has led to the synthesis of critical lessons learned and contributed to redefining the Belgian Research for development agenda for the Great Lakes regions. CIALCA has started to realign itself with the upcoming Belgian government 'strategic note on agriculture and food security'.

In the fourth phase between 2018 and 2021, CIALCA excelled leveraging its historical partnership assets and started to broker co-investment, co-development and co-delivery initiatives between Belgian donor and science organizations, regional and national system research organizations



Beans in Burundi

in the Great Lakes Region, international research for development organizations from and outside of the region, and leading private sector organizations in the agricultural sector. CIALCA has adopted a complementary science partner approach to national research systems, international NGOs and private sector companies and addressed their agricultural knowledge and science gaps by providing support in advanced science skill-intensive areas such as entrepreneurial research, big data science and integrated agricultural system for nutrition and health research.

As we briefly presented in this section, CIALCA is an evolving entity that adapts to the needs and realities of the Great Lakes Region. In its 15 years journey, it formulated, implemented and reformulated various management visions, research and education, and innovation approaches (TABLE 1) to make the best contribution to improving agricultural-based livelihoods in the Great Lakes region especially in Burundi, DRC and Rwanda.

Research Questions Studied in the Report

This research report focuses on three key research questions on the information, knowledge and science contributions of CIALCA to the Great Lakes Region. Specifically, it studies

- **What was the CIALCA contribution to the overall technical and scientific knowledge about agricultural livelihoods in the Great Lakes Region?**
- **Did CIALCA contribute to the inclusivity of technical and scientific knowledge generation about agricultural livelihoods?**
- **Did CIALCA enhance the sustainability of technical and scientific knowledge generation about agricultural livelihoods?**

Method

Description of the CIALCA Locations

CIALCA has generated and influenced technical and scientific knowledge about agricultural livelihoods in various locations in different ways. The first group of locations is the CIALCA field areas. CIALCA field areas are located in CIALCA focus countries, i.e. Burundi, DRC and Rwanda, and Uganda, which served as comparison sites. In these sites, CIALCA has generated primary data. The primary data, among others, included agroecological, socio-economic, organizational and institutional characteristics.

The second group is cross learning areas. These locations are similar to the first group in terms of multiple characteristics. The knowledge generated in the field areas can be extrapolated to these areas to a certain extent. Some of these areas have been used in several CIALCA funded studies to compare and contrast findings in the field areas. Also, some researchers who are not involved in CIALCA but working in the region cited CIALCA findings in their studies in the cross-learning areas.

The third and fourth groups are other areas in CIALCA countries and other areas in the Great Lake countries. The locations in these groups share some of the characteristics such as legislative frameworks but also significantly differ in terms of others such as agroecological or socio-economic characteristics. CIALCA involved researchers have completed work in the locations in the third and fourth groups and translated their learning from CIALCA implicitly to work in these locations. However, no publication uses the CIALCA generated data with data from these locations directly.

Description of the Study Methodology

Description of Data Sources

This research uses technical and scientific publications to study technical and scientific knowledge about agricultural livelihoods in the Great Lakes Region and the contributions of CIALCA to this knowledge. Publications are considered technical and scientific if they can be retrieved from major academic reference databases and the speciality reference databases maintained by the international CGIAR partners of CIALCA. Specifically, all the CIALCA related references in

- Web of Science Core Collection
- Scopus
- CGIAR MEL
- CG Space
- Repositories of International Institute of Tropical Agriculture
- Repositories of Bioversity International
- Repositories of the International Center in the Tropical Areas are considered eligible for the study.

Data Retrieval

Since 'CIALCA' is a specific term, it has been used to identify CIALCA related publications. If CIALCA is included in the following items in the meta-data of the publication, the publication is retrieved for curation and analysis.

- Title
- Abstract
- Author keywords
- Database assigned keywords
- Funding statement and acknowledgements
- Bibliography

Since both direct and indirect influence of CIALCA on the generation of technical and scientific knowledge are considered in the research, i) publications with direct references to CIALCA generated knowledge (title, abstract, author keywords, database assigned keywords), with ii) funding from CIALCA, (funding and acknowledgement statements) and iii) publications citing a CIALCA generated or funded publications are included in the scope of the research. The publications from these three groups are classified as *CIALCA influenced publications*.

To study the role of CIALCA influenced publications in the overall context of technical and scientific knowledge about agricultural livelihoods, another group of publications, *publications of CIALCA authors*, has been created. CIALCA authors are defined as all the researchers who are either the lead author or a co-author in a CIALCA influenced publication between 2006 and 2020. The publications of CIALCA authors between 2006 and 2020 are used to create a set of CIALCA author publications.

The set of CIALCA author publications is considered a proxy for the universal technical and scientific knowledge about agricultural livelihoods in the Great Lakes region. Another option is to identify the universal set of technical and scientific knowledge about agricultural livelihoods by using an ontology of locations in the reference databases. This option was not selected since this approach would overestimate the

number of publications relevant for agricultural references in the absence of a tested ontology of agricultural-based livelihood terms. Since such a tested ontology is not available, the set of CIALCA author publications was used.

Data Curation

The metadata was downloaded as research information system (RIS) files from the academic and professional reference databases listed above in curation. RIS format has been used since it is compatible with various academic reference management software, i.e. Mendeley, Paperpile and Zotero, used in the study. These reference management software were used to remove duplicates, identify and fix incomplete metadata, and fix misclassification errors. The references with incomplete metadata have been searched by Google Scholar. Google Scholar results were used to update metadata. The publications with complete metadata were analyzed. The ones without complete data were omitted from the analysis.

Data Analysis

Publications with complete metadata were analyzed using social network analysis. Separate networks for CIALCA influenced publications, and CIALCA author publications were created to compare structural characteristics of CIALCA influenced networks and overall technical and scientific knowledge publication network about agricultural livelihoods in the Great Lakes region. To compare the evolution of CIALCA influenced networks over time, a separate network consisting of publications from each year was generated. Since CIALCA has extended 15 years, 15 annual networks have been generated. Adding the combined 2006-2017 networks for CIALCA influenced publications, and the 2006-2017 network of CIALCA authors publication led to 17 total networks for the analysis. A comprehensive list of network characteristic measures (TABLE 2) has been used to characterize these 17 networks.

Phase (Major)	Phase (Minor)	Period	Management Vision	Research and Education Approach	Innovation Approach
1	1	2006 - 2008	Regional Integration	Agro-ecological, socio-economic and farming system analysis	Develop and deliver
2	2a	2009 - 2011	One CIALCA for the Great Lakes	Science capacity building with graduate education and knowledge exchange in the international conference	Disseminate and build capacity
2	2b	2012	Transition to Central and East African Orientation	Agroecological intensification	Integrate and scale-out
3	3a	2013 - 2015	CIALCA for Central and East Africa	Integrated systems approach	Co-prioritize and co-develop
3	3b	2016	Consolidation and re-alignment	Innovation systems research	Document and disseminate
4	4	2017 - 2021	CIALCA as a broker for solving great challenges	Entrepreneurial farming, ICT for agriculture and integrated agricultural systems for nutrition	Digitalize, broker and co-invest

TABLE 1: Basic Characteristics of CIALCA across its Lifespan Method

Measure	Definition
Number of Publications	Total number of publications
Network Size	Total number of authors
Number of Links	Number of author pairs co-publishing together (Repetitions counted multiple times)
Network Density	The ratio of the number of author pairs co-publishing together to the number of maximum possible author pairs co-publishing together
Average Degree	The average author pairs co-publishing together for all authors
Number of Weak Components	Maximal subgraph in which each author pair is connected (direction insensitive)
Number of Strong Components	Maximal subgraph in which each author pair is connected (direction sensitive)
Reciprocity (Arc)	The ratio of the number of author pairs co-publishing together which are a part of reciprocal relations to the total number of author pairs co-publishing together
Reciprocity (Dyad)	The ratio of the number of reciprocated author pairs to the number of connected node pairs
Transitivity	The ratio of the total number of transitive triads to the total number of transitive and intransitive triads
Clustering Coefficient	Percentage of the author pairs co-publishing together that are present for an author and its alters,
Network Connectedness	The ratio of pairs can be reached mutually each other
Network Efficiency	The share of the author pairs co-publishing together that are efficient

TABLE 2: Measures Used for Studying the Network Characteristics of CIALCA networks

Results

1 CIALCA generated technical and scientific knowledge about agricultural livelihoods in four countries in the Great Lakes Region and provided knowledge to five countries

CIALCA has created field data in the intervention groups in Burundi, Democratic Republic Congo, Rwanda and Burundi. In these four countries, 15 first sub-county administrative unit areas were covered and supported by the interventions. CIALCA has also collected information as a control group or influenced knowledge about five

countries in more than 60 first sub-county administrative unit areas. CIALCA generated knowledge and can inform more than 50 other first sub-county administrative unit areas covered and supported by the interventions in Burundi, Democratic Republic of Congo, Rwanda, Tanzania and Rwanda.

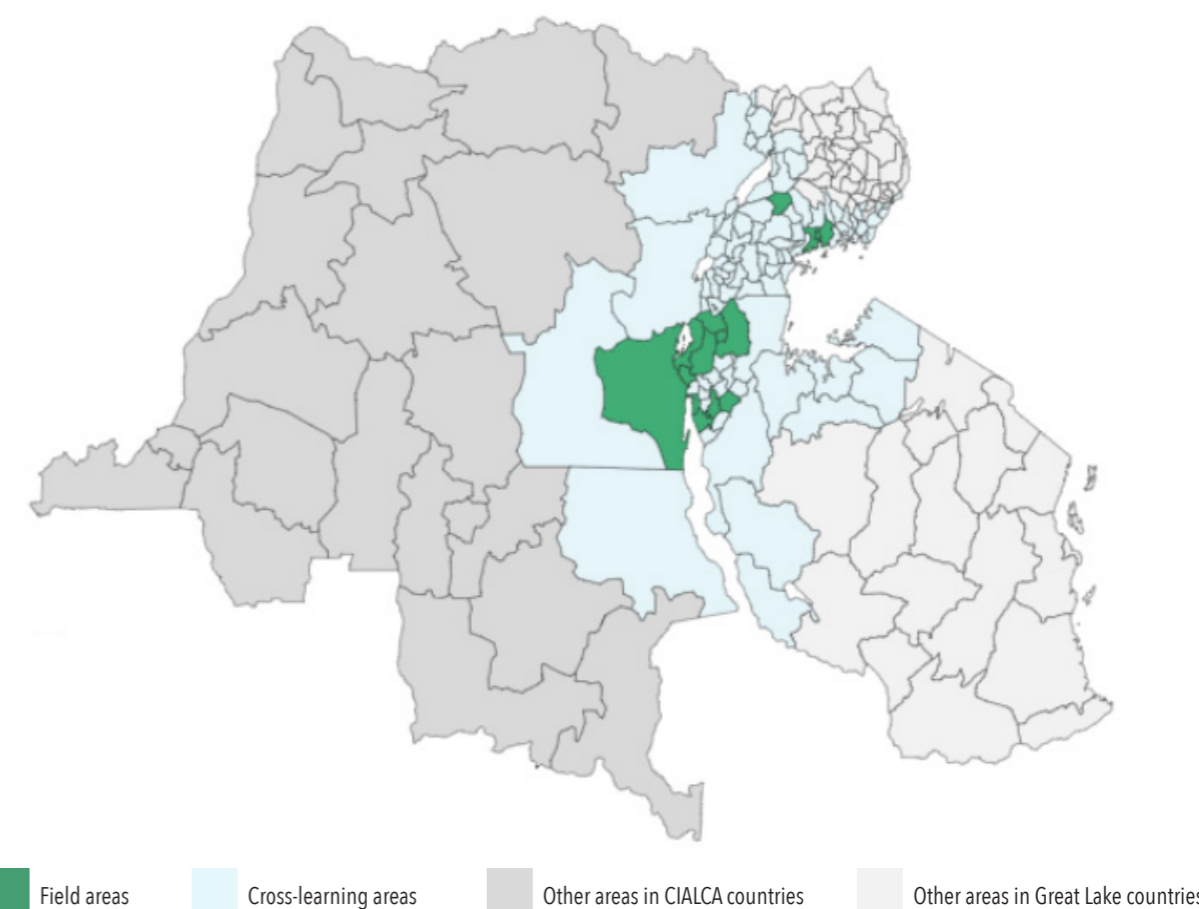


FIGURE 1: Map of CIALCA Technical and Scientific Knowledge Locations

The map includes Burundi, the Democratic Republic of Congo, Rwanda, Tanzania and Uganda and shows the first sub-level administrative units of each country. The dark green colour shows the areas CIALCA influenced publications that reported primary data as intervention sites (field areas). Light blue colour shows the areas in which CIALCA influence publications reported primary data as control sites or the publications extrapolating CIALCA findings as relevant (cross-learning areas). Dark Gray shows all the areas not belonging to field and cross-learning areas but in Democratic Republic Congo. Light Gray shows all the areas not belonging to field and cross-learning areas but in Tanzania and Uganda.

2 CIALCA has influenced overall technical and scientific knowledge generation about agricultural livelihoods in the Great Lakes Region beyond the generation of the researchers it has funded

CIALCA has influenced 110 publications from 379 authors since 2006. About 300 (79%) of these authors were part of the main CIALCA author cluster (FIGURE 2 - Blue group). However, several other clusters did not publish together with the main cluster authors (They do not have a link or a publication with the cluster). These 79 authors

were scattered around 13 other clusters. 11 of these clusters were single publications, and 2 had more than one publication. In other words, the influence of CIALCA beyond its funded authors was scattered in multiple independent publications and did not lead to sustained influence on another research theme.

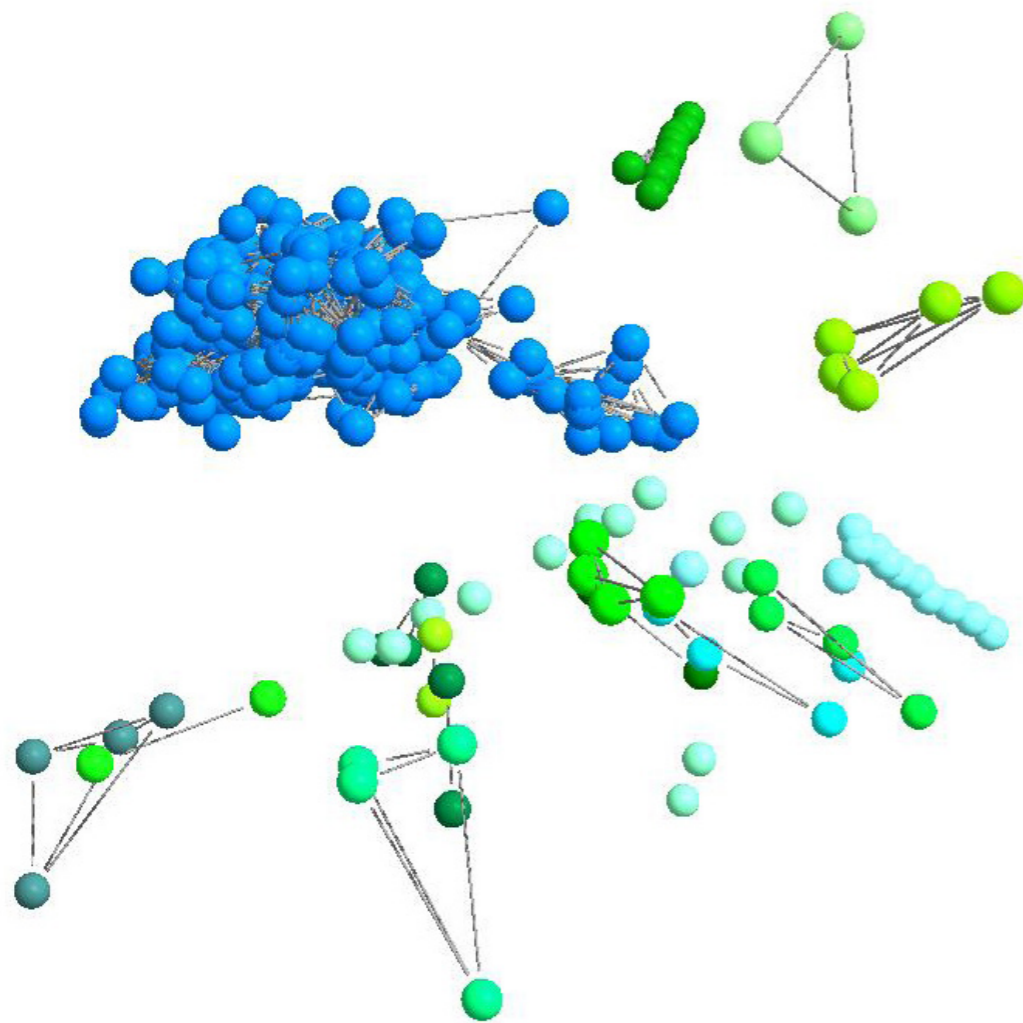


FIGURE 2: Network Map of CIALCA Influenced Publication Networks
The blue colour represents the main cluster of authors who are connected to each other as co-authors. Different shades of green coloured smaller clusters show the clusters of publications not co-authoring with the authors in the blue group.

3 CIALCA has increased its overall technical and scientific knowledge generate capacity about agricultural livelihoods in the Great Lakes Region across the years

The number of CIALCA influenced publications has presented upward trends in journal articles and overall technical and scientific publications. Although journal article publications came after the first phase, the number increased continuously across the phases. The average number of publications in each consecutive phase surpassed the previous one (FIGURE 3).

from stage 3, the number of non-journal article publications decreased significantly, indicating a clear shift towards prioritizing journal articles in overall technical and scientific knowledge generation. During phases 2b and 3a, in which CIALCA oriented itself to a broader Central and East African role, the overall technical and scientific knowledge generation sustained its previous level without increasing.

In phases 1 and 2, non-journal article publications were not less than the number of journal articles. Starting

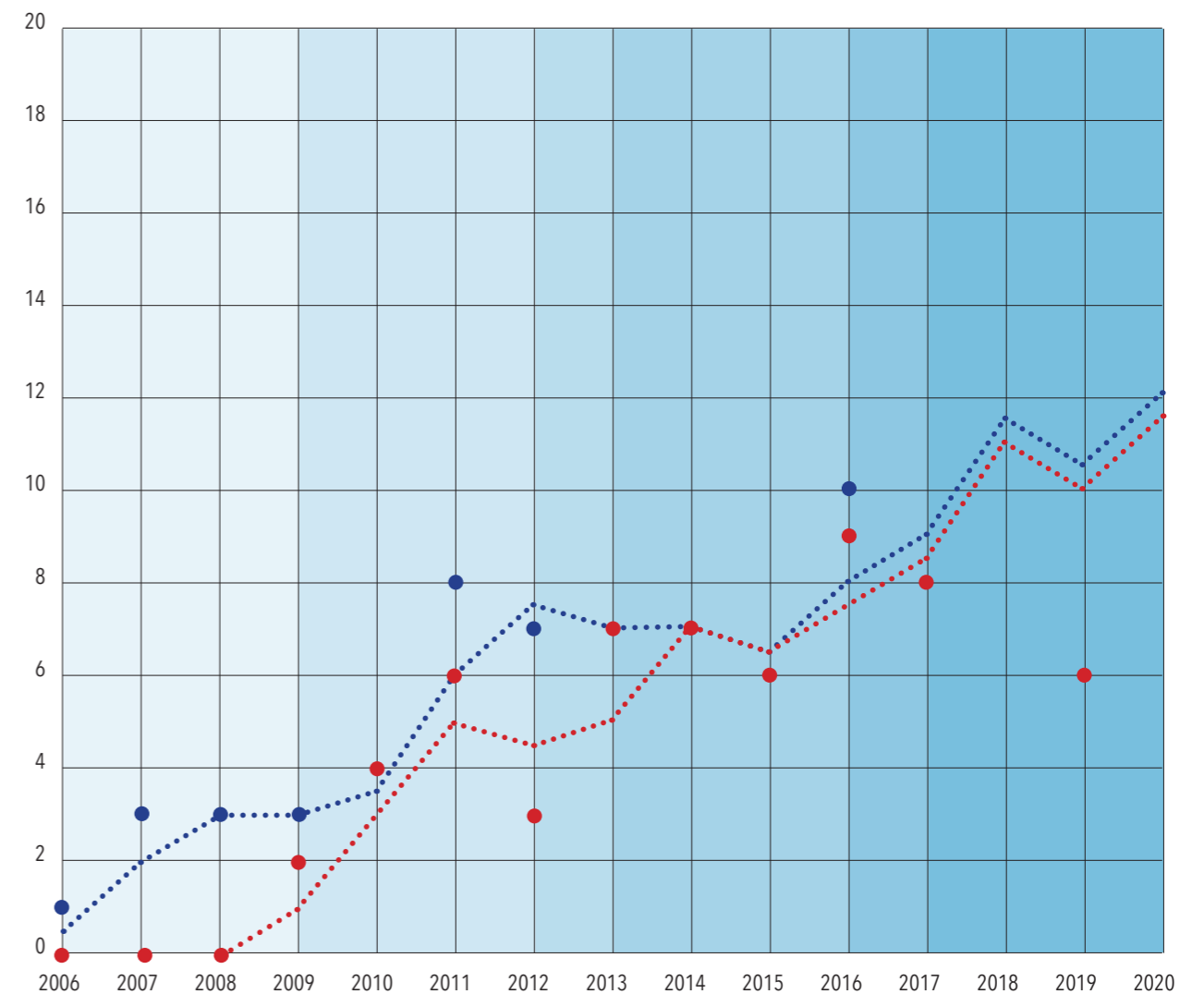


FIGURE 3: Trends in the Number of Overall (Blue) and Journal Article (Orange) publications since 2006
The lines present moving averages for two year periods. The shaded background shows different major and minor phases.

4 CIALCA contributions to overall technical and scientific knowledge generation about agricultural livelihoods in the Great Lakes Region was proportional to the resources it invested

The size of CIALCA influenced the overall technical and scientific knowledge network in the Great Lakes Region constituted 1,38% of overall technical and scientific knowledge generation about agricultural livelihoods in the Great Lakes Region (Table 3)². Although it appears small, it is in parallel with the ratio of CIALCA invest-

ments to overall investments in technical and scientific knowledge generation about agricultural livelihoods in the Great Lakes region. The number of authors per publication for CIALCA influenced publications was almost identical to the overall technical and scientific knowledge generation networks ratio.

	CIALCA Influenced Publications	Publications of CIALCA Authors	Ratio
Number of authors	369	26816	1.38%
Number of publications	110	7978	1.38%
Authors per publication	3.35	3.36	1.00

TABLE 3: Comparison of Network Size Characteristics of CIALCA Influenced Publications and Publications of CIALCA Authors.



Cacao

² See data retrieval subsection at page 9 for the details about the rationality of the interpretation.

5 CIALCA generates a substantial share of empirical technical and scientific knowledge about agricultural livelihoods in the Great Lakes Region

Since 2006, CIALCA has generated between 11 to 36% of all empirical technical and scientific knowledge about agricultural livelihoods in the Great Lakes Region (FIGURE 5). While the average contribution of CIALCA to empirical publications about agricultural livelihoods in Burundi was 25%, it was 16% in DRC and 15% in Rwanda.

CIALCA influenced publications were also critical among publications in the Great Lakes Region. It constituted 21% of all empirical cross country publications between Burundi, DRC and Rwanda and 24% of all empirical cross country publications between Burundi, DRC, Rwanda, Tanzania and Uganda.

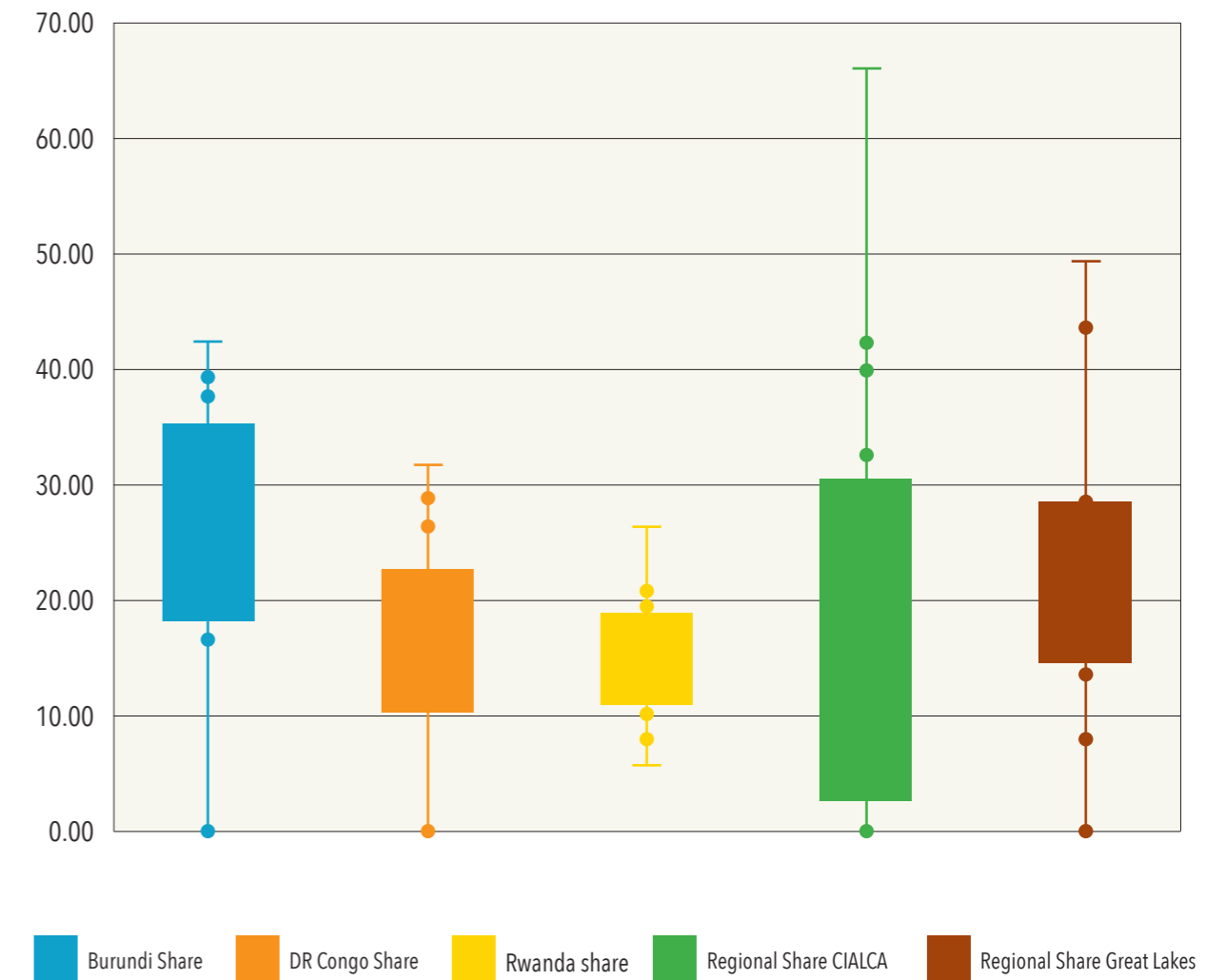


FIGURE 5: Contribution of CIALCA Influenced Publications to Overall Empirical Technical and Scientific Publications in the Great Lakes Region

6 CIALCA has contributed to sustaining a core knowledge cluster and integration of different clusters of researchers producing technical and scientific knowledge about agricultural livelihoods in the Great Lakes Region

The CIALCA influenced publication network has been very dynamic since 2006. The network structure has been in flux, and the changes between the phases did not present a clear pattern (FIGURE 6). However, network formation among the researchers generating technical and scientific knowledge about agricultural livelihoods in the Great Lakes Region dominated network deformation over the years. Except for 2007 and 2014, the clusters in the networks have grown either by increasing the number of authors in the group or merging with other clusters. A core cluster sustained itself below a minimum threshold from its foundation in 2012 until 2020. A second minor cluster was visible for most of the years. In some years, it joined the major one via one or two authors and left again.



In 2008, deformation pressure was higher. The larger cluster deformed while, the smaller cluster sustained itself. In 2009, the authors in the larger cluster increased their co-publications while the smaller cluster deformed. In 2010, both of the clusters increased their size. In 2011, there was a major network formation. The existing cluster grew, and four other 1-publication clusters were added. In 2012, the two major clusters merged, and one of the 1-publication clusters sustained itself and became the other cluster. In 2013, network formation continued, and all the existing clusters were merged into one network. In most of the years, the major cluster was accompanied by another minor one joining and leaving the main cluster along the years.

In 2014, the network disintegrated into seven clusters due to the loss of two key authors who integrated different subclusters into the network. In 2015, several clusters merged again, decreasing the number of clusters to three. In 2016, the network mostly sustained itself, but a major new cluster joined it. In 2017, the major cluster disappeared from the network, but the rest was sustained. In 2018, there was major network formation. The subclusters connected to the main one became more extensive and denser; other multiple-publication and 1-publication clusters joined the network. In 2019, although the major cluster mostly sustained itself, the density of the second-largest cluster decreased, and the 1-publication cluster disappeared. Finally, in 2020, two major clusters merged again, and a few 1-publication clusters joined.

Testing soil health in Western Kenya.

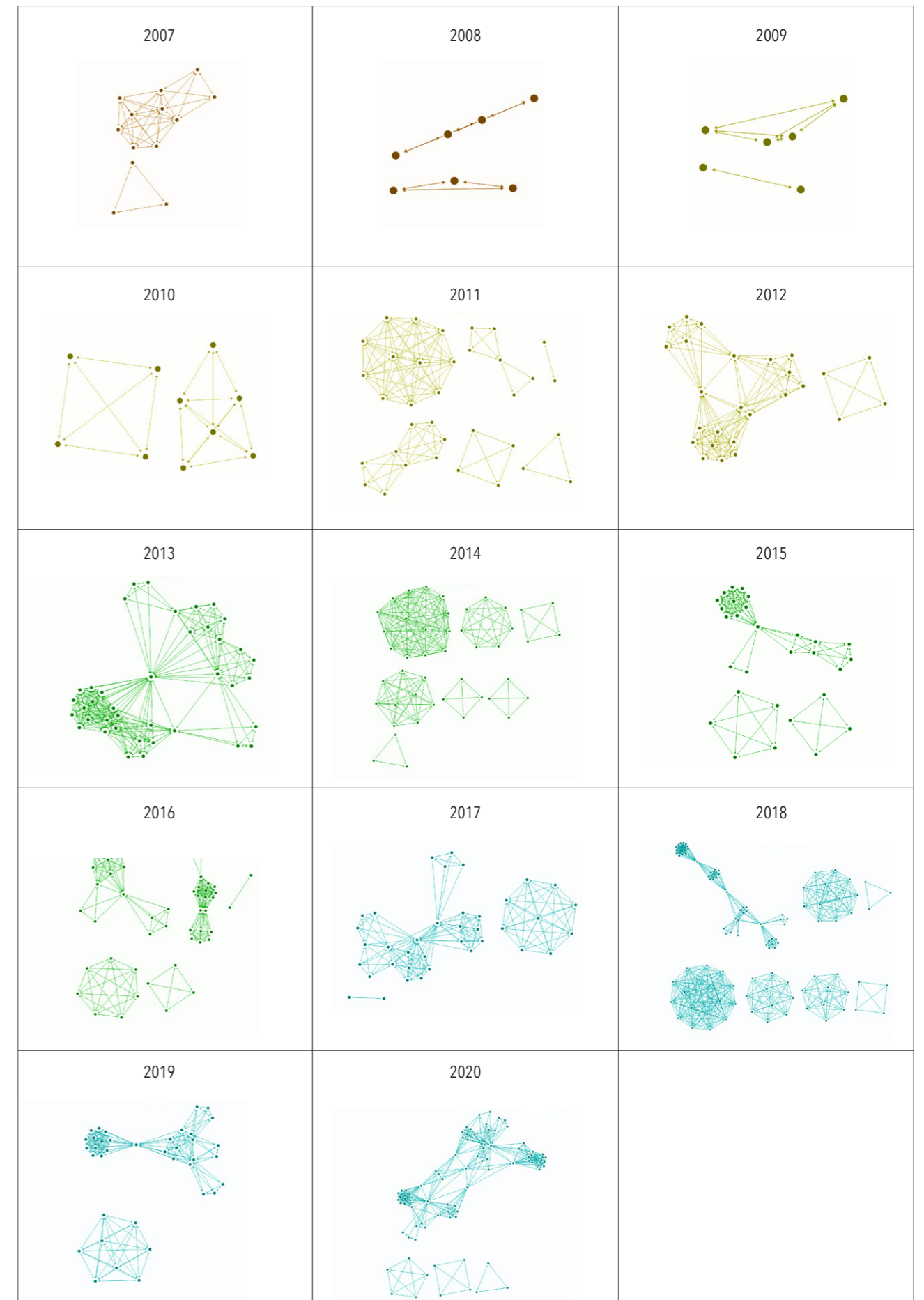


FIGURE 6: Network Maps of CIALCA Influenced Networks across CIALCA Lifespan. Colours present the phases

Conclusions

What was the CIALCA contribution to the overall technical and scientific knowledge about agricultural livelihoods in the Great Lakes Region?

CIALCA has contributed to overall technical and scientific knowledge about agricultural livelihoods in the Great Lakes Region through knowledge generation and dissemination. The knowledge generation capacity of CIALCA has increased over the years with some short periods of slowdowns. The knowledge was not limited to the authors it funded. The technical and scientific knowledge CIALCA has generated benefited the technical and scientific community working on agricultural livelihoods beyond the CIALCA funded authors.

In relative terms, the contribution of CIALCA to knowledge generation was proportional to the resources it invested. CIALCA neither failed nor bested other initiatives in terms of its quantitative performance. However, CIALCA was very important for generating empirical technical and scientific knowledge about agricultural livelihoods in the Great Lakes Region. In addition, CIALCA was more efficient than the average of other initiatives in disseminating the knowledge.

Did CIALCA contribute to the inclusivity of technical and scientific knowledge generation about agricultural livelihoods in the Great Lakes Region?

CIALCA has enabled many authors to produce technical and scientific knowledge about agricultural livelihoods in the Great Lakes Region. The number of authors in the overall CIALCA generation increased consistently. However, the contributions to overall technical and scientific knowledge generation about agricultural livelihoods in the Great Lakes Region were led by a few CIALCA champions. There has been no clear trend for decentralization of CIALCA contributions, and the champions did not change significantly over time. In other words, although CIALCA contributed to the inclusivity in terms of quantity, it could not create a qualitative difference by empowering the new authors to play a major role in the generation of technical and scientific knowledge generation about agricultural livelihoods in the Great Lakes Region.

Did CIALCA enhance the sustainability of technical and scientific knowledge generation about agricultural livelihoods in the Great Lakes Region?

CIALCA has contributed to sustaining a core international and interregional technical and scientific agricultural livelihood related knowledge community working in the Great Lakes Region for almost a decade. Although CIALCA management vision, research and education and innovation approach have changed dramatically across the years, the community sustained itself without major disruptions. Across the years, the community interacted with other knowledge groups for short periods via a few key brokers. Some members of these other communities joined the core community making the community larger.

Glossary

Technical and scientific knowledge is the information provided in *publications* such as journal articles, books, book chapters, technical reports and factsheets. They are not necessarily peer reviewed but have to be indexed in high quality publication databases. In this report, technical and scientific knowledge is used to determine the *documentation scope* or sources of verification.

Agricultural livelihoods is the categorical name used to describe the combination of different aspects of agriculture such as agronomy, socio-economics, ecology, water engineering etc. In this report, agricultural livelihoods is used to determine the *thematic scope*.

The Great Lakes Region is the region located in Central and Eastern Africa. It includes parts of Democratic Republic Congo and Tanzania and the whole of Burundi, Rwanda and Uganda. In some definitions, the region also includes part of Kenya. However, in this report, Kenya is not considered a part of the region. In this report, the Great Lakes Region is used to determine the *geographical scope*.

Node is the representation of the *authors* in the study.

Link is the representation of *co-authorship* between two authors. If a publication has more than 2 authors, for each 2-author subset of all authors a link is generated.

The Network is the combination of the nodes (authors) and links (publication co-authorships). In the report, networks concept is critical in studying the *characteristics of publications* across years.

Cluster is a subset of the network in which all the authors have at least one link with the other authors included in the subset. In this report, cluster concept is critical for studying the *publication subgroups* and their changes across the years.

CIALCA Influenced Publications is the set of publications that mentions CIALCA in the titles, keywords, abstracts, funding and acknowledgement states and the bibliography. In the report, CIALCA influenced publications are used to present the collection of direct and indirect *influence domains* of CIALCA as an intervention.

Publications of CIALCA authors is the collection of publications of the authors who was an author or a co-author of CIALCA influenced publications at least once between 2006 and 2020. In the report, publications of CIALCA authors are used to define a universal set for *benchmarking* CIALCA influence publications and thereby the influence of CIALCA on technical and scientific knowledge.

