



UPSCALE

UPSCALING THE BENEFITS OF PUSH-PULL TECHNOLOGY FOR
SUSTAINABLE AGRICULTURAL INTENSIFICATION IN EAST AFRICA



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Upscale Kick-Off Conference Proceedings

23rd To 26th November 2020, Kisumu Hotel
Maseno University (MU)
Kisumu-Kenya



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Abstract:	<p>UPSCALE conducted its kick-off conference virtually, coordinated from Maseno University's (MU) Kisumu Hotel, where a total of 64 participants logged in successfully through an online conference link, together with 24 in-person attendants. In addition to the members of the UPSCALE Consortium and linked stakeholders, the conference was also attended by CEOs of some of the partner organizations (MU and <i>icipe</i>), together with the project's advisory committee members, EU delegation from Brussels and Kenya, and partners in associated H2020 projects. Many presentations were made that elucidated composition of the Consortium, objectives, implementation framework, and work packages and their interconnectedness.</p> <p>UPSCALE comprises transdisciplinary (TD) research that operates at the national and regional multi-actor community (MACs) of practice platforms. MACs are thus a critical feature and structure within UPSCALE and act as the unifying 'glue' that brings together the various elements of the TD research, sciences and disciplines, partners and their ambitions, goals, etc. MACs are designed to provide a platform for self-reflection and co-learning on the transdisciplinary efforts and to enable optimal flow of information between stakeholders. Because of the need for a common understanding of the TD nature of UPSCALE, a presentation that also served as part one of training was made at the conference. Consortium members were also taken through the legal and operational requirements and obligations, project management and organizational frameworks covered within the Grant and Consortium Agreements, management strategy and financial management, reporting and documentation. Notably, eligibility of costs was stressed to be of critical importance, and therefore the need to ensure compliance. Eligible costs included direct personnel costs and direct costs of subcontracting. There was also the need to ensure best value for money, verifiability and no conflict of interest. Beneficiaries were urged to keep records and supporting documentation for 5 years after payment of the balance in compliance with EU audit requirements.</p> <p>UPSCALE comprises three critical components (i) 'How to do it' that focusses on elucidating social, ecological and agronomic determinants of push-pull success, together with associated resilience dimensions; functional mapping for mechanistic prediction, mainly chemical remote sensing of crops and host plants, and creation of functional maps for dynamic prediction of insect distribution; socio-ecological and socio-economic impacts of enhancing push-pull across scales; and knowledge synthesis for targeted upscaling under a changing climate, modelling resilience under climate change; and impacts of climate change on sustainable intensification potential. (ii)</p>

'Make it work' that focusses on barriers to adoption and opportunities for improvement across scales, with focus on co-identifying barriers to adoption and strategies to address them; increasing value chain integration through transdisciplinary exchange; and co-developing policy guidelines in collaboration with MACs. (iii) 'Go beyond' that focuses on co-construction of transdisciplinary push-pull expansion pathways, seeking to co-design pathways for push-pull improvement and expansion; improve existing push-pull systems; expand to other crops, systems and value chains; explore synergies with other sustainable intensification practices; and assess socio-economic impact of push-pull innovations. (iv) 'Make it happen' that aims to disseminate and implement push-pull across regions; and project management and coordination.

UPSCALE has a Project Management Plan that entails among other aspects meeting schedule, procedures for quality review and risk management, and with templates for regular financial status reporting by all partners every 6 months, regular management status reports by coordination team, monthly video conferences, as well as reporting of activities, and helpdesk-function throughout the project. There are two types of reporting, submitted via the participant portal, Periodic Reporting and Continuous Reporting. Periodic reporting, including cost statements, will take place within 60 calendar days after end of reporting period. These include technical and financial reports. Continuous reporting includes deliverables, milestones and list of publishable summary. There are also ethical requirements that the project must comply with, largely on the part of the key beneficiary of the grant, including appointment of a Data Protection Officer (DPO); and detailed information to demonstrate that fair benefit-sharing arrangements with stakeholders from low and lower middle income countries are ensured, and information on the measures to minimize the risks to research participants and staff involved in this project, submitted as deliverables.

The conference was also treated to 'field visit' videos that exposed participants to push-pull farming and enhanced understanding of the potentials of the technology on farming communities. In terms of the way forward, key coordination support issues were discussed; a need for institutional collaboration in acquisition, access and management of laboratory space and materials, field sites and material inputs; coordination of trainings; local engagement of MACs as well as coordination and facilitation of MAC meeting (with major discussion on payment of travel and accommodation cost for meeting for external stakeholders); The two critical important reports highlighted were a report on identity and structure of MACs, and one on selected field sites. All partners (primarily national coordinators-*icipe*, RAB, ISD, NARO, and TARI) were to submit lists of their networks of partners by December 15th 2020.

There was a side meeting on MAC formation as there were emerging issues on MAC facilitation, where partners were informed that travel reimbursement by EU for non-UPSCALE partners was not approved by EU. Partners were therefore advised to adapt meetings to make

	<p>participation as easy as possible, for example holding one-day meetings, conducting meetings on UPSCALE activity sites, 'shuttle' service, contribution from ministries, or seeking external funds and other existing mechanisms. At the end of the conference the participants expressed need for site selection follow-up using push-pull location information together with soil databases, training on financial and project management including reporting, ethics deliverables and harmonized guidelines.</p>
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Dissemination Level		
PU	Public Deliverable	XX
PP	Restricted to other programme participants (including the Commission Services)	
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential, only for members of the Consortium (including the Commission Services)	

UPSCALE Consortium			
No	Participant Organisation Name	Short Name	Country
1	LEIBNIZ UNIVERSITAET HANNOVER	LUH	DE
2	THE INTERNATIONAL CENTRE OF INSECT PHYSIOLOGY AND ECOLOGY LBG	ICIPE	KE
3	BAYERISCHE FORSCHUNGSALLIANZ BAVARIAN RESEARCH ALLIANCE GMBH	BayFOR	DE
4	EASTERN AFRICA FARMERS' FEDERATION SOCIETY	EAFF	KE
5	JOMO KENYATTA UNIVERSITY OF AGRICULTURE AND TECHNOLOGY	JKUAT	KE
6	KENYA AGRICULTURAL AND LIVESTOCK RESEARCH ORGANISATION	KALRO	KE
7	MASENO UNIVERSITY	MU	KE
8	FH ASSOCIATION	FH	CH
9	RWANDA AGRICULTURE AND ANIMAL RESOURCES DEVELOPMENT BOARD	RAB	RW
10	INOSENS DOO NOVI SAD	INOSENS	RS
11	UNIVERSITY OF KWAZULU-NATAL	UKN	ZA
12	LUNDS UNIVERSITET	ULUND	SE
13	SVERIGES LANTBRUKSUNIVERSITET	SLU	SE
14	UNIVERSITAT ZURICH	UZH	CH
15	TANZANIA AGRICULTURAL RESEARCH INSTITUTE	TARI	TZ
16	NATIONAL AGRICULTURAL RESEARCH ORGANISATION	NARO	UG
17	INSTITUTE FOR SUSTAINABLE DEVELOPMENT	ISD	ET
18	JULIUS-MAXIMILIANS-UNIVERSITAT WUERZBURG	UWUE	DE

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Preface

Upscale is a Horizon 2020 (H|2020) project focusing on increasing production efficiency of smallholder farmers in East Africa. The project applies transdisciplinary approaches to research and innovation through Multi-Actor Community (MAC) engagements which is likely to enable smallholder farmers cope with climatic changes while ensuring sustainability and resilience. Upscale is an EU-funded project which aims at scaling up the understanding and applicability of push-pull technology from individual fields, farm, landscape and regional scales; and from cereal to other crops and cultivation systems. By determining the factors influencing push-pull technology success across the scales, this project is to realise targeted implementation and prediction of push-pull effectiveness and its resilience under current and future climate conditions.

The programme links to national programmes with leverage effect, involves the industry and strengthens cross-border collaboration. It brings together three separate initiatives namely: coupling research to innovation – from research to retail, all forms of innovation; focus on societal challenges. UPSCALE Project is a Consortium of eighteen (18) Institutional partners drawn from 10 European and African Countries and focusing its implementation in 5 East African Countries (Ethiopia, Kenya, Uganda, Rwanda and Tanzania).

This Project is a transdisciplinary program drawing from several basic, applied and social scientific inputs, and diverse agro-chain participating stakeholders' experiences through a 'Multi-actor' approach which follows a logic that, practicable solutions to the most challenging development problems are **'not within the means of one actor alone'**, but requires transdisciplinarity, inclusivity, co-designing/co-creation and information sharing framework.

Acknowledgement

We would like to sincerely thank The EU for funding the UPSCALE Project; which by its innovative focus has immense potential for controlling Stem-borer and fall armyworm Pests, controlling *Striga* weed, improving soil fertility and moisture conservation, enhancing the yields, promoting food security and providing means of diversifying agro-production. On the same vain we acknowledge the Project Proposal developers for putting together well selected and refined chain of views, thoughts and knowledge bases on which implementable functions are drawn, milestones are set and deliverables are sequenced for goal realization. We appreciate every team member all who have remained resilient and focused in implementing the project through innovative ways in the face of the current Covid-19 pandemic; which has limited movements within countries and across borders and continents. We thank the technical experts who have so far assisted in enabling sustainable Internet connectivity for the virtual meetings and interactions.

List of Abbreviations and Acronyms	
ADOPT	Adaptation and Dissemination of the 'Push-Pull' Technology
Art.	Article
AU	African Union
BayFOR	Bayerische Forschungsallianz Bavarian Research Alliance GmbH
CA	Consortium Agreement
CAPI	Computer-Assisted Personal Interviews
CBO	Community Based Organisation
CET	Central European Time
CFS	Certificate on Financial Statements
CoMuC	Certificate on the methodology for unit cost
COVID-19	Novel Corona Virus Disease-2019
D	Deliverable
DPO	Data Protection Officer
EAB	Expert Advisory Board
EAFF	Eastern Africa Farmers' Federation Society
EAT	East African Time
EC	European Commission
EIAR	Ethiopia Institute of Agricultural Research
EU	European Union
FAIR	Findable, Accessible, Interoperable, Reusable
FAO	Food and Agriculture Organisation
FH	Food for Hungry Association
FNSSA	Food and Nutrition Security and Sustainable Agriculture
GA	Grant Agreement
GDPR	General Data Protection Regulation
GIZ	The Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH
H2020	Horizon 2020
IBCARP	Integrated Biological Control Applied Research Programme
<i>icipe</i>	The International Centre of Insect Physiology And Ecology
ICT	Information and Communication Technologies
INOSENS	Inosens Doo Novisad
IPM	Integrated Pest Management
IPR	Intellectual Property Rights
ISD	Institute For Sustainable Development
JKUAT	Jomo Kenyatta University of Agriculture and Technology
KALRO	Kenya Agricultural And Livestock Research Organisation
KEH	Knowledge Exchange Hub
KPI	Key Performance Indicators
LUH	Gottfried Wilhelm Leibniz Universitaet Hannover
M	Month
MAC	Multi-Actor Community of practice
MDA	Ministries, Departmental and Agencies
MSc	Master of Science
MU	Maseno University
NARO	National Agricultural Research Organisation
NGO	Non-Governmental Organisation
OGW	Order of Golden Warrior
PC	Project Coordinator

PhD	Doctor of Philosophy
PO	Project Officer
POPD	Processing of Personal Data
PPT	Push-Pull Technology
Q&A	Question and Answer
R&D	Research and Development
RAB	Rwanda Agriculture And Animal Resources Development Board
REA	Research Executive Agency
RP	Reporting Period
SLU	Sveriges Lantbruks Universitet
SME	Small and Medium Enterprise
TARI	Tanzania Agricultural Research Institute
TD	transdisciplinary
UKN	University Of Kwazulu-Natal
ULUND	Lunds Universitet
UPSCALE	UPScaling the Benefits of Push-Pull Technology for Sustainable Agricultural Intensification in East Africa
UWUE	Julius-Maximilians-Universitat Wurzburg
UZH	Universitat Zurich
VC	Vice Chancellor
WHO	World Health Organisation
WP	Work Package

1 Introduction

Production of cereals in sub-Saharan Africa (SSA) is severely affected by stemborers, fall armyworm, parasitic weeds and poor soil fertility, resulting in significant yield losses. Closing the yield gap in smallholder agriculture is therefore a critical challenge which must be met in order to achieve food security goals for millions of farmers. This challenge is compounded by the need to adapt cultivation practices to extreme dryness and climate change, and by the recognition that conventional methods of agricultural intensification are environmentally costly, unsustainable, and poorly adapted to low-income farming. Nature-based solutions that harness benefits of biodiversity and the environment for productive, low-input and climate-resilient agriculture are increasingly suggested as promising avenues for sustainable intensification of agriculture in SSA and beyond.

One such solution is the systems approach offered by push-pull in mixed livestock-cereal farms in SSA. It is an integrated cropping system that involves driving pests away from the main crop using a repellent intercrop (push) while attracting them to trap plants (pull). Adoption of the technology has led to maize yields more than tripling, from 1 t/ha to an average of 3.5 t/ha. Push-pull also improves soil health and water retention, provides economic and high-value livestock fodder, and a recently developed climate-smart variant increases system resilience to climate change.

Crops grown with current push-pull technology show yield increases of 10% to 360% compared to monocultures. Push-pull is a mixed cropping system that diversifies conventional cereal cultivation by including perennial, intercropped fodder plants that are well adapted to the traditional mixed and livestock farming. Push-pull supports higher levels of biodiversity and lower pest damage than conventional monocultures, while also improving soil moisture and fertility and effectively controlling striga weeds. In addition to a range of other benefits, push-pull is particularly suited to traditional farming managed by women and has been shown to empower women farmers to build livelihoods, pursue careers, and act as leaders and models for their communities.

To harness its potential as key to sustainable intensification in African farming, push-pull must be brought beyond its limitations to the next level. Currently, push-pull shows large, unexplained variability in yield increases across regions of over an order of magnitude. Understanding is limited to the scale of fields or households, and adoption is restricted to maize and sorghum. Few attempts have been made to scale up understanding and applicability of push-pull at the level of farms, landscapes and regions with different water, soil, climate, land use and socioeconomic conditions, and attempts to expand push-pull to cropping systems outside cereal are in their infancy.

UPSCALE, a Horizon 2020 project of the EU, is being implemented in Kenya, Uganda, Tanzania, Rwanda and Ethiopia. It brings together 18 organizations, 11 of which are African and 7 are European; in addition to the target countries, other countries involved are South Africa, Germany, Sweden, Switzerland and Serbia. This consortium comprises universities, research institutes, government boards, non-governmental organizations, small and medium enterprises and farmers' association. UPSCALE will take key steps to realize the transformative potential of push-pull by expanding its scope and applicability from individual fields to whole landscapes and regions, and from cereal to other important crops and cultivation systems. In close collaboration with stakeholders, it will evaluate cross-scale impacts of push-pull expansion, improve, expand and integrate push-pull principles across cropping systems, and identify pathways to overcome barriers to its adoption. Its overall goal is to address food security, livelihoods and climate change resilience in SSA, while reducing the environmental impact of agricultural practices. For this, it will foster the design, adaptation and adoption of strategies for integrated agro-ecological management based on push-pull for wide-spread and climate-resilient sustainable intensification.

2 UPSCALE Project Proceedings, Day 1 (23rd November 2020)

2.1 Virtual Registration of Participants (Log in)

The conference link was opened for all participants from 8.00am EAT (6.00am CET). Participants logged in to the conference through the **online conference link** <https://maseno-ac.ke.zoom.us/j/91873410354?pwd=UGIPVWJsQWxpWjRsNDVTUFdWaHpSQT09>. Participants had the option to **join manually** <https://zoom.us/join> with **conference ID: 918 7341 0354** **Passcode: 534688**. For **technical issues**, participants were requested to contact Mr. Jerry Owango jerry@maseno.ac.ke or Mr. James Muhoma jmuhoma@maseno.ac.ke. Participants were requested to upload **their flyers, posters or logo materials** at <https://drive.google.com/drive/folders/1JHFwkRuiugFccXzK5-tnpIFzJ0fZ7Fk6?usp=sharing>. A total of 64 participants successfully logged in at the start of the Kickoff Conference.

2.2 Introduction of Participants

Prof. Dr. Emily Poppenborg Martin (Project Coordinator) introduced the participants on behalf of the UPSCALE Consortium. The consortium comprises of 18 partners/organizations: 11 African and 7 European, the composition of which includes universities, research institutes, government boards, NGOs, SME, and farmers' association. The representation by country is as follows: Germany 3, Sweden 2, Switzerland 1, Serbia 1, Kenya 5, Rwanda 2, South Africa 1, Tanzania 1, Uganda 1, and Ethiopia 1 (Table 1 below).

Table 1: The UPSCALE Consortium

N o.	Name	Short name	Country	Principal investigator(s)
1	GOTTFRIED WILHELM LEIBNIZ UNIVERSITAET HANNOVER	LUH	Germany	Prof. Emily Poppenborg Martin
2	THEINTERNATIONALCENTREOFINSECTPHYSIOLOGYANDECOLOGYLBG	<i>icipe</i>	Kenya	Prof. Zeyaur Khan
3	BAYERISCHE FORSCHUNGSALLIANZ BAVARIAN RESEARCH ALLIANCE GMBH	BayFOR	Germany	Carolin Schuback, Melanie Schulte, Gudrun Lampart
4	EASTERN AFRICA FARMERS' FEDERATIONSOCIETY	EAFF	Kenya	Norbert Tuyishime
5	JOMO KENYATTA UNIVERSITY OF AGRICULTURE AND TECHNOLOGY	JKUAT	Kenya	Dr. Shem Kuyah
6	KENYA AGRICULTURAL AND LIVESTOCK RESEARCH ORGANISATION	KALRO	Kenya	Dr. Alice Murage
7	MASENO UNIVERSITY	MU	Kenya	Prof. George Odhiambo, Dr. Benjamin Ombok
8	FH ASSOCIATION	FH	Switzerland	Alice Kamau
9	RWANDA AGRICULTURE AND ANIMAL RESOURCES DEVELOPMENT BOARD	RAB	Rwanda	Dr. Priscille Ingabire
10	INOSENS DOO NOVISAD	INOSENS	Serbia	Vladimir Mrkajic, Tajana Medaković
11	UNIVERSITY OF KWAZULU-NATAL	UKN	South Africa	Dr. Sileshi Weldesemayat
12	LUNDS UNIVERSITET	ULUND	Sweden	Prof. Yann Clough
13	SVERIGES LANTBRUKS UNIVERSITET	SLU	Sweden	Dr. Mattias Jonsson
14	UNIVERSITAT ZURICH	UZH	Switzerland	Prof. Meredith Schuman
15	TANZANIA AGRICULTURAL RESEARCH INSTITUTE	TARI	Tanzania	Dr. Everina Lukonge
16	NATIONAL AGRICULTURAL RESEARCH ORGANISATION	NARO	Uganda	Dr. Abubaker Muwonge
17	INSTITUTE FOR SUSTAINABLE DEVELOPMENT	ISD	Ethiopia	Ghebremedhin Belay
18	JULIUS-MAXIMILIANS-UNIVERSITAT WURZBURG	UWUE	Germany	Prof. Ingolf Steffan-Dewenter, Dr. Michael Thiel

2.3 The conference participants included

1. Prof. Julius O. Nyabundi, PhD, OGW, Vice Chancellor, Maseno University
2. Dr. Segenet Kelemu, Director General of *icipe*, represented by Prof Zeyaur Khan, *icipe*
3. UPSCALE Expert Advisory Board members
4. EU Delegation, Brussels and Kenya
5. Partners in H2020 projects of the same call, Scope A and B
6. Regional and national stakeholders

2.4 UPSCALE Expert Advisory Board

1. Dr. Mel Oluoch, Sasakawa Africa Association, Ethiopia
2. Mr. Andreas Sicks, Biovision Foundation, Switzerland
3. Mr. Berthold Wohlleber, GIZ, Germany
4. Prof. Dr. Nagothu Sekhar, Norwegian Institute of Bioeconomy Research, Finland
5. Prof. Dr. Julia Leventon, Czechglobe, Czech Republic
6. Prof. Dr. Bernard Slippers, University of Pretoria, Future Africa, South Africa

2.5 EU Delegation and REA Office

1. Mrs. Katrin Hagemann, EU Kenya Delegation
2. Mrs. Alina Kozacenko, Project Officer, Brussels
3. Mrs. Marta Iglesias, Policy Officer, Brussels

3 Welcome Remarks

The Project Coordinator having clarified practical considerations such as use of two screens and gallery view recommended keeping microphones OFF and requested participants to send/save their questions and comments to www.slido.com with code 24997. She reminded them that the Q & A session was scheduled on 25 Nov 10 am (EAT). She thereafter made the following key highlights in the Kickoff Conference Programme:

1. That all participants were free to attend sessions open for all. However, some sessions such as Details of Project Management and Organizational Framework; Data Management in UPSCALE; Insights from REA: Project Management and Monitoring were restricted to UPSCALE Consortium members as well as EAB members.
2. That the Opening Ceremony was open to all and highlighted the key note speakers.
3. That the technical aspects of the project organized in work packages (WP) were scheduled for day 2 of the conference (24th November 2020) and invited all participants to attend.
4. That Stakeholder Q&A session was scheduled for day 3 of the conference (25th November 2020) and encouraged questions and comments to be sent to www.slido.com with code 24997.
5. That breakout sessions were scheduled for day 3 (25th November 2020) to discuss the work packages. Four meeting rooms were planned, namely: Meeting Room 1 led by Maseno University; Meeting Room 2 led by SLU/KALRO; Meeting Room 3 led by UKN and Meeting Room 4 led by BayFor.
6. That a virtual field visit and prerecorded videos would be presented by *icipe* on day 3 (25th November 2020).

4 Transdisciplinary Research for Development: preliminary announcement

Prof. Dr. Julia Leventon of Czechglobe, Czech Republic, who is a leader in the field of sustainability, governance and transdisciplinarity, offered a preliminary training on transdisciplinary research for development titled 'An Introduction to Transdisciplinary (TD) Research'. This was a scheduled presentation, a part series with the overall aim of bringing all UPSCALE stakeholders to a common understanding of TD to allow for effective implementation of the project. Key highlights of her lecture are summarized here below.

Aim: Broad introduction to TD and the format of the course. Topics covered included the following

1. Principles of TD vs methods of TD
2. TD through projects vs TD through process
3. Individual TD researchers' vs TD as a team

TD Research crosses disciplinary boundaries, calls for radical interdisciplinarity, moves beyond disciplines and engages with broader actors. It is about exploring the splats, not arguing for a circle.

Principles vs Methods

The methods matter. But more important is how the methods are used. Are they exploring the splat? This is a three step process:

1. Societal problems and scientific problems are formulated into a common research object (problem transformation).
2. Societal discourse and scientific discourse emerge leading to production of new knowledge (interdisciplinary integration).
3. Results for societal praxis and the results for scientific praxis lead to transdisciplinary integration, i.e. evaluation of new knowledge for its contribution to societal and scientific progress.

It is essential that we probe ourselves, for example, by asking ourselves whether in deed we are following the principles of TD or are merely presenting our work and asking for consultation or contribution.

Project vs Process

1. How many of us feel like we have a long term relationship with a community or a project?
2. Would we call it transdisciplinary? Why or why not?

Individual vs Team

Guiding questions should include

1. Am I TD?
2. Are you TD?
3. Are they TD?
4. Is anyone TD?

Additionally

1. Who are you?
2. Do you understand your role?
3. Are you the leader, the facilitator, the disciplinarian, the interdisciplinarian? Something else?

Summary and Forward Plans

1. TD is a process, not 'just' running workshops
2. TD happens within a project, but projects are embedded within a longer relationship
3. TD researchers take a range of roles – being TD requires intentional thinking about how it fits together (exploring the splat)

What next?

Three short sessions

1. Matching methods to context
2. Working with different realities
3. Integrating knowledge

Big-group training workshop

1. Skills practice
2. Address challenges raised in earlier rounds
3. Tools and tricks for exploring the splat

4.1 Participant feedback to the question: “What would you want to be trained on?” (via Mentimeter)

In the set-up of the conference a deliberate system was put in place to allow for presenter-audience interaction through Mentimeter, an interactive presentation software. Through this system, participants highlighted areas they would like to be trained on within the TD research framework.

1. Communication, including scientific communication
2. Matching methods with the TD process
3. How to identify TD research being conducted correctly
4. Data integration
5. Qualitative data analysis
6. Getting people to follow agreed objectives in time
7. Creating an upbeat team in the TD research
8. Finding effective ways to operate the TD process AND the disciplinary work: Time management?
9. Matching, synchronizing methodologies in TD
10. Sociological methods
11. Stakeholder engagement
12. How to motivate everyone
13. Overcoming disagreements in TD
14. Establishing communication and lasting relationships with ‘people’
15. Template TD project flows and how to adopt them
16. How to move together without getting ahead of others
17. Finding a common language
18. Integration of social, economic and ecological expertise and people
19. Community mobilization, involvement & ownership for sustainable development
20. Moving on from inter-disciplinarity to transdisciplinarity
21. Integrating different disciplines into a common unit to undertake TD for development
22. What are the steps in implementing TD?
23. Integrating TD in small budget, short-period research projects
24. Multi-actor platforms as a facilitating mode of TD
25. Ontology- harmonize terminology between disciplines
26. Statistical analysis
27. Conflict on leadership
28. How to document case stories of projects as TD based on best practices with relevant data
29. How to evaluate the success of the TD process
30. Knowledge integration to present quality articles for publication
31. Correlation of different research aspects

5 Details of project management and organizational framework

This was presented by Gudrun Lampart of BayFor and was aimed at ensuring all Consortium members understood the requirements, legal and operational, for efficient implementation of the UPSCALE project. The topics covered were:

1. Introduction to the Legal Documents: Grant Agreement and Consortium Agreement, documents whose preparation and approval involved participation of all consortium members
2. Tasks of Work Package (WP) 9 on project management and coordination that includes participation of all consortium members
3. Timeline of WP9
4. Project management tool
5. Management strategy and financial management
6. Reporting and documentation

5.1 Introduction to the Grant Agreement

1. Terms and conditions
 2. Annex 1: Description of the action
 3. Annex 2: Estimated budget for the action
 4. Annex 3: Accession forms
 5. Annex 4: Model for the financial statements
 6. Annex 5: Model for the certificate on financial statements (CFS) [LUH, *icipe*, MU, ULUND, NARO, UWUE]
 7. Annex 6: Model for the certificate on the methodology (CoMUC)
- } Deemed to be the most important to the Consortium members

5.2 Terms and conditions: 7 Chapters comprising

1. General
2. Action
3. Grant
4. Rights and obligations of the parties
5. Division of beneficiaries' roles and responsibilities, relationship with complementary beneficiaries, relationship with partners of a joint action
6. Rejection of costs, reduction of the grant, recovery sanctions, damages, suspension, termination, Force Majeure
7. Final provisions

https://ec.europa.eu/research/participants/data/ref/h2020/grants_manual/amga/h2020-amga_en.pdf Annotated Model Grant Agreement

5.3 Important articles for management and finance

Key articles that were deemed crucial for management and finance were selected, presented and deliberated upon. These included

1. Article 6: Eligible and ineligible costs (costs connected with the action)
2. Article 10: Purchase of goods, works or services (need for at least three bidders and as stipulated in national procurement laws)
3. Articles 11 and 12: Use of in-kind contributions of third parties against payment/free of charge
4. Article 13: Implementation of tasks by subcontractors (only as stated expressly in the grant agreement)
5. Article 18: Keeping records and supporting documentation (for at least 5 years after the end of the project)
6. Article 20: Reporting and payment requests
7. Article 21: Payments and payment arrangements
8. Article 55: Amendments to the agreement

5.4 Article 6: Eligible and ineligible costs

Eligibility of costs was stressed to be of critical importance, and therefore the need to ensure anything charged on the project be counterchecked to ensure compliance. All eligible costs must be actually incurred in connection to an action set out in Annex 1 and indicated in Annex 2; must be identifiable and verifiable; must be reasonable, in line with sound financial management (usual cost accounting practices); and must comply with national law on taxes, social security, etc.

Eligible costs incurred for the respective cost categories of Annex 2 include

1. Direct personnel costs
2. Direct costs of subcontracting
3. Other direct costs
4. Indirect costs (25% overhead)

Some key rules

There is critical need to ensure

1. Best value for money
2. Costs are actually incurred and therefore verifiable
3. No conflict of interest
4. Normal practice

Calculation of personnel costs:

$$\text{Hourly rate} * \text{Hours worked} + \text{Additional remuneration (NPOs)}$$

Calculation of hourly rate: actual annual personnel costs/ number of annual productive hours.
Calculation of number of annual productive hours: Option 1: fixed number of hours: 1,720 hours per year, full-time. Option 2: individual annual productive hours. Option 3: standard annual productive hours.

5.5 Article 10: Purchase of goods, works or services

This should be executed only if necessary to implement the action following the principle of best value for money. It is cautioned that it must comply with the national procurement laws. Partners were requested to keep records of at least 3 offers you obtain and avoid conflict of interest. Beneficiaries must ensure that the Agencies can exercise checks, reviews, audits and investigations (Art. 22) or evaluations of the impact (Art. 23) towards the contractors. Examples of eligible items to be purchased include travel and accommodation costs, and catering and translation costs.

5.6 Article 11: Use of in-kind contributions provided by third parties against payment, and Article 12: Use of in-kind contributions provided by third parties free of charge

If necessary to implement the action, beneficiaries may use in-kind-contributions. However, these must be set out in Annexes 1 and 2. If not included in the Annexes, an amendment is needed in most cases. Beneficiaries must ensure that the Agencies can exercise checks, reviews, audits and investigations (Art. 22) or evaluations of the impact (Art. 23) towards the third parties. Against payment- costs for payment of equipment, infrastructure, seconded persons, other goods and services may be eligible. Free of charge- costs for seconded persons, contributed equipment, other goods and services etc. may be eligible. Caution is that there is always need to verify these for strict compliance and refer to relevant documentation or consult relevant bodies when in doubt.

5.7 Article 13: Implementation of tasks by subcontractors

Beneficiaries may (if necessary) subcontract tasks described in Annex 1. Subcontracting must be set out in Annex 1 and Annex 2. Amendments in most cases necessary if not included in Annex 1 and 2 already. Ensure best value for money. Avoid any conflict of interest (see Art. 35). Again, beneficiaries must ensure that the Agencies can exercise checks, reviews, audits and investigations (Art. 22) or evaluations of the impact (Art. 23) towards the subcontractors. Beneficiaries must ensure that their obligations under the following articles also apply to their subcontractors (Art. 35, 36, 38, 46).

5.8 Article 18: Keeping records and supporting documentation

Beneficiaries must keep records and supporting documentation for 5 years after payment of the balance. It is cautioned that beneficiary's national authorities may even ask for longer documentation. Records/documentation for all declared costs must be kept. Some examples include time sheets, receipts, pictures and presentations of your attendance to conferences, accounting statements, etc.

5.9 Article 20: Reporting and payment requests

Coordinator must submit technical and financial reports (including requests for payment): Periodic technical report; Periodic financial report; Final report at project end additionally (including the CFS). The project's reporting periods are: RP 1: from month 1 to month 18 (November 2020 to April 2022); RP 2: from month 19 to month 36 (May 2022 to October 2023); RP 3: from month 37 to month 54

(November 2023 to April 2025); RP 4: from month 55 to month 60 (May 2025 to October 2025). Your report is your request for payment. Submission by the Project Coordinator is within 60 days after the end of each reporting period. The Project Coordinator will receive payments and will transfer the shares to each beneficiary. One pre-financing payment of 2,679,459.12 Euros has been paid out, of which 382,779.88 Euros was retained for the Guarantee Fund (5% of total grant). Three interim payments along with requests for payments (RP 1, 2 & 3). One payment of the balance at project end (including amount retained for the Guarantee Fund).

5.10 Article 55: Amendments to the agreement

The Agreement may be amended by any of the parties via the electronic exchange system. Only possible if it does not change the core of the Agreement. The Project Coordinator submits and receives requests for amendments on behalf of the beneficiaries. The Amendment enters into force on the day of signature of the receiving party and takes effect on the date agreed by the parties or on the date of entering into force.

5.11 Consortium Agreement

Negotiated and concluded **before** signing the Grant Agreement (GA), the Consortium Agreement sets the framework for a successful project implementation (i.e. settle all issues that might hamper the smooth and seamless cooperation of the different actors for the different parts of the project). It complements the GA and must **NOT** contain any provision contrary to it. Full responsibility for the Consortium Agreement lies with the partners (no involvement of the EC). Typical issues: internal organization and consortium management (internal reporting, number of meetings, etc.), parties and involvement of third parties, project implementation and task division, internal budget management, intellectual property rights (exploitation and dissemination of results), confidential information management, liability, warranties, penalties. Note that **internal issues (not included in the GA) are usually regulated by the CA.**

6 Tasks of Work Package 9: Project Management and Coordination

The lead partner is Leibniz University Hannover (LUH). All Consortium members are involved in this work package. There are five main tasks in WP9, namely:

- 9.1. Implementation of efficient management and support structures / overall management (LUH, BayFOR, *icipe*)
- 9.2. Day-to-day project management and coordination including contractual issues and decision making management (LUH, all partners)
- 9.3. Reporting, support of financial management and controls (LUH, all partners)
- 9.4. Monitoring and ensuring progress as well as risk management through scientific coordination (LUH, *icipe*, all partners)
- 9.5. Data management (UWUE, all partners)

Deliverables

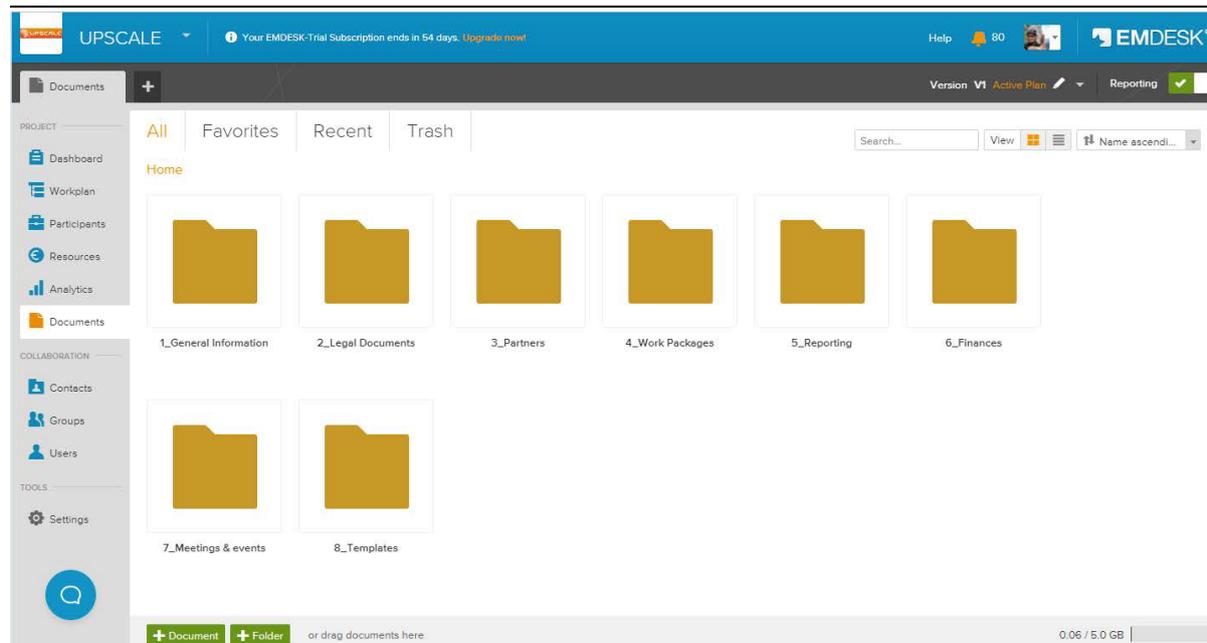
D9.1: Web-based Project Management Platform (BayFOR) Month 1 EMDESK (planned) / (formerly used: Projectron).

D9.2: Project Management Plan (LUH) Month 3 including risk management, procedures for quality review, meeting schedule, dealing with the online platform (See EMDESK below)

D9.3: Data Management Plan (UWUE) Month 6.

D9.4: Updated Data Management Plan (UWUE) Month 55

Work Package 9 Timeline



6.1 Management Strategy and Financial Management

General Management

The General Management is set out in D9.2. Project Management Plan (M3) with the following expectations: meeting schedule, dealing with project management platform, procedures for quality review, and risk management. Additionally, WP9 will provide templates (on repository by INOSENS and BayFOR), regular financial status report by all partners to project manager every 6 months, regular management status reports by coordination team, monthly video conferences every six months in person (due to COVID-19 development), meeting follow-ups and support for meeting organization, reporting of activities, and helpdesk-function throughout the project.

Example of financial status report

	Direct personal costs		Direct costs of subcontracting	Other direct costs		Indirect costs	Total costs
	Employees, natural persons, under direct contract, seconded persons			Travel, Equipment, Other goods and services		25% of direct costs (excluding subcontracting)	
	Actual	Unit					
Beneficiary							
TOTAL							

Example of resources monitoring table

Resources Monitoring Table

Instructions for use:
First use:
 Adapt the table to the corresponding number of beneficiaries (+ 3rd parties), Work Packages and periods in the Grant Agreement and DoW.
 Enter the project data at the top and the names of the beneficiaries. 3rd parties can be indicated after the last beneficiary.
 Enter the planned resources in person-months (P-M) from the DoW (part A) and in euros from the GPF forms.
At each reporting period:
 Enter the actual expenditure, for each past and present period, both in person-months and in euros.
 The percentages are automatically calculated, providing a quick indication of possible deviations compared to the original planning.
 Explain and justify separately any serious deviation, such as significant under-spending and lower/higher monthly rates. (Briefly explain in the column Comments, and in detail in the project periodic report)
 Adjustments to previous periods can be made as well. Enter the adjusted data in the resources monitoring table. Financial adjustments require an additional adjustment form C.
 This resources monitoring table, the explanations of serious deviations and the adjustments to previous reporting periods are part of the project periodic report.
 Details on personnel, travel, consumables, equipment, subcontracting and other major cost items should be reported in the cost reporting tool Force via the Participant Portal.

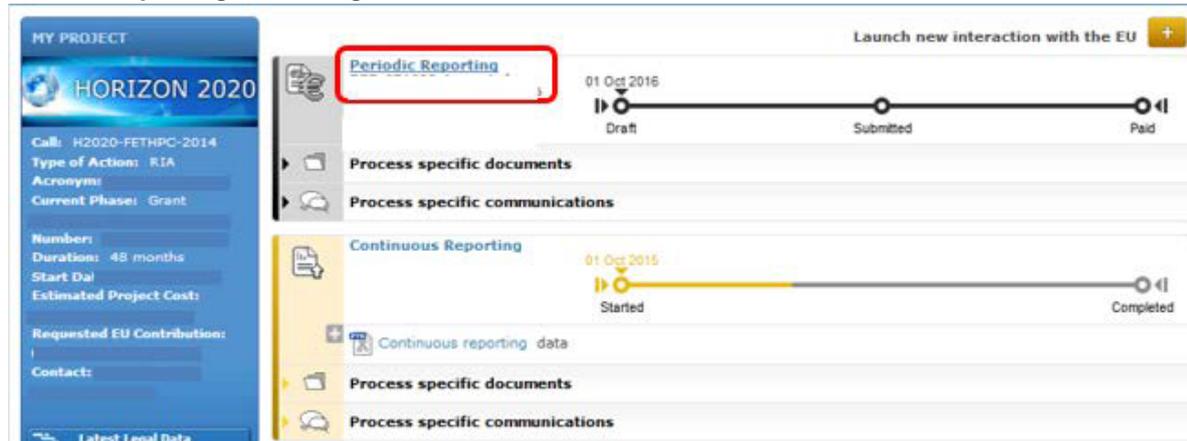
Contract N°:		Acronym:		Period:		Date:										
PARTICIPANTS	UNIT (PERSON-MONTHS or EUROS)	TYPE OF EXPENDITURE	PLANNED	ACTUAL EXPENDITURE						Pct. Spent					REMAINING RESOURCES	COMMENTS
				Period 1	Period 2	Period 3	Period 4	Adjustments	Total	P 1	P 2	P 3	P 4	TOTAL		
			f	a1	b1	c1	d1	e1	f1	a1f	a1+b1f	a1+b1+c1f	a1+b1+c1+d1f	a1f+b1f+c1f+d1f	f1f	
Beneficiary 3 BayFOR	P-M	Work Package 1	0,50	0,00	0,00	0,00	0,00		0,00						0%	0,50
	P-M	Work Package 2	0,00	0,00	0,00	0,00	0,00		0,00						0%	0,00
	P-M	Work Package 3	0,00	0,00	0,00	0,00	0,00		0,00						0%	0,00
	P-M	Work Package 4	0,00	0,00	0,00	0,00	0,00		0,00						0%	0,00
	P-M	Work Package 5	0,00	0,00	0,00	0,00	0,00		0,00						0%	0,00
	P-M	Work Package 6	0,00	0,00	0,00	0,00	0,00		0,00						0%	0,00
	P-M	Work Package 7	0,00	0,00	0,00	0,00	0,00		0,00						0%	0,00
	P-M	Work Package 8	0,50	0,00	0,00	0,00	0,00		0,00						0%	0,50
	P-M	Work Package 9	32,00	0,00	0,00	0,00	0,00		0,00						0%	32,00
	P-M	Total	33,00	0,00	0,00	0,00	0,00		0,00						0%	33,00
Euros	Personnel costs		245.955,60	0,00	0,00	0,00	0,00		0,00	0,00	0,00	0,00	0,00	0%	245.955,60	
Euros	Subcontracting		0,00	0,00	0,00	0,00	0,00		0,00	0,00	0,00	0,00	0,00	0%	0,00	
Euros	Other direct costs		22.000,00	0,00	0,00	0,00	0,00		0,00	0,00	0,00	0,00	0,00	0%	22.000,00	
Euros	Indirect Costs		66.988,90	0,00	0,00	0,00	0,00		0,00	0,00	0,00	0,00	0,00	0%	66.988,90	
Euros	Total Costs		334.944,50	0,00	0,00	0,00	0,00		0,00	0,00	0,00	0,00	0,00	0%	334.944,50	
Euros	Requested EU funding		334.944,50	0,00	0,00	0,00	0,00		0,00	0,00	0,00	0,00	0,00	0%	334.944,50	

6.2 Reporting and Documentation

Reporting

There are two types of reporting, Periodic Reporting and Continuous Reporting. Periodic reporting will take place within 60 calendar days after end of reporting period. These include technical and financial reports. There are four (4) reporting periods: M1-M18, M19-M36, M37-M54, M55-M60. Partners are required to make sure that all responsible persons are available at reporting times and to prepare the Certificate for Financial Statement (CFS) in time (if necessary; only for final report). Continuous reporting is always editable. They include Deliverables (which have deadlines), Milestones, and List of publishable summary (which should be edited continuously with every publication). Both reporting to be submitted via the participant portal.

Periodic reporting in Funding and Tender Portal



A template of the Technical Report (Part B) is provided by the Portal immediately after the last day of the Reporting Period (Day 1 of the 60 days) under https://ec.europa.eu/research/participants/data/ref/h2020/gm/reporting/h2020-tmpl-periodic-rep_en.pdf and will be stored in the repository.

Timeline for periodic reporting

Date	2020	2021												2022												2023												2024												2025												
Year	Year 1												Year 2												Year 3												Year 4												Year 5													
	I			II			III			IV			I			II			III			IV			I			II			III			IV			I			II			III			IV																
Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62
RP I	[Green]												[Green]												[Green]												[Green]												[Green]													
RP II	[Green]												[Green]												[Green]												[Green]												[Green]													
RP III	[Green]												[Green]												[Green]												[Green]												[Green]													
RP IV	[Green]												[Green]												[Green]												[Green]												[Green]													
Time to report																			PR I									PR II									PR III			PR IV & FR																						
Review meeting (planned)																			*									*						*			*																									

Periodic reporting contains Technical report. Part A (automatically created by grant management system out of continuous reporting data). Part B (free text: work carried out during the reporting period, progress overview respectively deviations from specifications in Annex I). The second report is the financial report.

6.3 Continuous reporting in Funding and Tender Portal

Continuous reporting starts on day 1 of the project (mail notification) and contains a summary for publication (should be updated each reporting period). It is continuously open for all beneficiaries for submission of deliverables and milestones. There is possibility to update dissemination activities, publications and critical risks.

6.4 Reporting management

Consortium members will receive a reminder to start with periodic reporting preparation 2 to 3 months before reporting time (including timeline and templates). Meeting in person or via video conference is envisaged to outline technical status of WPs. During periodic reporting time, it is required that one hands in their cost statements. Review draft reports before submission. Quality control (periodic and continuous reporting (deliverables)) is ensured in this order: WP Leader -> CO and *icipe* (see WP 9.4) -> submission to EC -> PO.

6.5 Documentation

Documentation for a minimum of 5 years after final payment (national regulations may even ask for longer documentation) has been made. Some practical tips/examples include: keep EVERY receipt, document your activities at events, get participants list signed as proof, make sure you have proofs that you and your co-workers are somehow assigned to the project for example by use of timesheets.

Example of a Timesheet

TIME RECORDING FOR A HORIZON 2020 ACTION – Minimum requirements								
Title of the action (acronym):						Grant Agreement No:		
Beneficiary's / linked third party's name:								
Name of the person working on the action:						Type of personnel (see Art. 6.2.A Grant Agreement)		
Month	[Month / Year]	...	Total					
Number of hours								
Work packages (of Annex 1) to which the person has contributed by the reported hours								
Date and signature of the person working for the action								
Name, date and signature of the superior								

D10.3: NEC - Requirement No. 3 [6]

Detailed information to demonstrate that fair benefit-sharing arrangements with stakeholders from low and lower middle income countries are ensured must be submitted as a deliverable. Also, details on the materials which will be imported to/exported from the EU must be submitted as a deliverable. In the event that export of insect samples to the EU occurs, copies of import/export authorisations, as required by national/EU legislation must be kept on file (to be specified in the grant agreement) and submitted to the Agency upon request. Finally, detailed information on the measures to minimise the risks to research participants and staff involved in this project must also be submitted as a deliverable.

8 Day 2: Opening Ceremony

8.1 Preliminary

The UPSCALE Project Coordinator, Emily P. Martin, welcomed members to the opening ceremony. The opening ceremony session Chair was Prof. George Odhiambo, with Dr. Scholastica Odhiambo being the rapporteur. The guest speakers during the opening ceremony were Prof. Emily P. Martin; Dr. Segenet Kelemu, Director-General *icipe*; Mrs. Katrin Hagemann, Deputy Head of European Union Delegation in Kenya; Mrs. Marta Iglesias, UPSCALE Policy Officer, EU AGRI; and Prof. Julius O. Nyabundi, PhD, OGW, Vice Chancellor, Maseno University.

Dr. Benson Nyambega, the Director, Partnership, Research and Innovations, Maseno University, introduced Prof. Joseph Sarima Chacha, the Deputy Vice Chancellor, Partnership, Research and Innovations, Maseno University, who welcomed all members across the globe who were participating in the Kick-off conference. He noted with great pleasure that the UPSCALE project had kicked off and reiterated that research is the core business of Maseno University. He showed much appreciation to the research project team from Maseno University for being a core team in the project.

Prof. Chacha introduced the Project Coordinator, Prof. Emily P. Martin, and gave her opportunity to introduce the project partners. Prof. Emily noted that it was a pleasure to be almost in Kisumu and hoped that if the Covid-19 pandemic situation improved then the team would visit Kisumu soon. She welcomed Dr. Segenet Kelemu (whose speech was read by Prof. Zeyaur Khan), Prof. Julius Nyabundi, Ms. Katrin Hagemann, Mrs. Marta Iglesias, and all members of the research project team to the blended (in-person and virtual) UPSCALE Kick-off Conference.

8.2 Dr. Segenet Kelemu, Director General *icipe*

She gave a brief history of *icipe* and its mission as aligned with the Sustainable Development Goals. *icipe* was founded in 1970 by Prof. Thomas R. Odhiambo and is headquartered in Nairobi. The mission of *icipe* as reported by Dr. Kelemu was to help alleviate poverty, ensure food security and improve the overall health status of the peoples of the tropics by developing and extending management tools and strategies for harmful and useful arthropods, while preserving the natural resource base through research and capacity building. Additionally, she noted that *icipe* had been in operation for 50 years with a presence in 13 countries worldwide. The organization was collaborating with over 300 partners worldwide. Some of the global partners included: WHO-AFRO Partner for Vector Management, FAO Reference Centre for Vectors and Vector-borne Animal Diseases, Stockholm Convention Regional Centre and World Organization for Animal Health and Collaborating Centre for Bee Health in Africa. She also noted that *icipe* was also a member of Association of International Research and Development Centers for Agriculture (AIRCA).

She further reported that the key thematic areas the *icipe* was involved in were human health, plant and animal health, environmental health as well capacity building and institutional development. The main goal of *icipe* was to develop robust and sustainable technologies through transdisciplinary research in which in 25 years push-pull technology was one of them. She noted that push-pull was a highly science based transformational agroecological technology that effectively combines control of multiple insect pests and weeds while improving soil health to achieve significant increases in farm

productivity without damaging the environment. She also noted that push-pull technology was *icipe's* major discovery and its aim was to improve food security and agricultural sustainability in smallholder farms.

Dr. Kelemu expressed her happiness to work with 18 African and European partners in the UPSCALE project to scale up understanding and applicability of push-pull from individual fields to farm, landscape and regional scales, from cereal to other crops and cultivation systems. She further noted that UPSCALE would explore the options to expand the use of push-pull for sustainable intensification in crops and systems outside cereal, and further intensify through incorporation of nutritious and high value crops. Additionally, UPSCALE was expected to catalyze the design and widespread implementation of climate-smart and environmentally friendly food production in East Africa and beyond. She also gave information on the funding partners for *icipe* research projects.

8.3 Mrs. Katrin Hagemann, Deputy Head of EU Delegation

Mrs. Hagemann gave her salutation to the other guest speakers and the UPSCALE project team. She expressed her happiness to be at the Kick-off Conference. She had willingness to visit Kisumu for the Project Kick-off Conference but the COVID-19 pandemic situation had proven to be a hindrance on her schedule to travel.

She noted that for the past 10 years, the EU had actively partnered with *icipe* in furthering push-pull technology (PPT). Notably, between 2011 and 2015 the EU through *icipe* funded a €4 million project known as the 'Adaptation and Dissemination of the 'Push-Pull' Technology (ADOPT)'. The focus of the project was enhancing smallholder maize production in Kenya, Tanzania and Ethiopia. The success of ADOPT led to funding of another project in the region known as 'Integrated Biological Control Applied Research Programme (IBCARP)' to a tune of € 2 million. The IBCARP's goal was to contribute to increasing production, productivity, incomes and nutrition among poor smallholder agro-pastoral households in the eastern Africa Region. The project also encompassed the PPT as one of the pillars of interventions. She further noted that at the time of the conference *icipe* was rolling out a € 5.8 million EU funded project focused on mitigating the invasive fall armyworm. The project was intended to run up to 2022 and Push-Pull was one of the pivotal technologies that was being used in the programme to fight the fall armyworm.

She affirmed that there was tangible evidence that PPPT had proven to be an effective Integrated Pest Management (IPM) mitigation strategy and expressed gratitude to National Research Institutes, specifically, Kenya Agriculture and Livestock Research Organization (KALRO), Ethiopia Institute of Agricultural Research (EIAR) and Lake Zone Agricultural Research and Development Institute of Tanzania. She finalized her speech by noting that what remained was to ensure that the technology was embraced by as many farmers possible. The launching of UPSCALE project was expected to significantly contribute to upscaling the benefits of push-pull and this was much welcome in this time of COVID -19 which might likely aggravate the food insecurity.

8.4 Prof. Julius O. Nyabundi, Vice Chancellor Maseno University

Prof. Nyabundi thanked and welcomed everyone to Maseno University and Kisumu Hotel, which is also part of the University. He noted that Maseno University was honoured to be the host of the virtual UPSCALE kick-off Conference, and that it was unfortunate that due to COVID-19 situation physical attendance could not be possible. He noted that the spirit was what mattered in the virtual meeting. He further expressed his gratitude to EU for funding the UPSCALE project.

He explained that he was an agriculturalist by profession, and specifically an agronomist, and observed that UPSCALE project was an important research and development project. In reference to Kisumu County where the University is located, the push-pull technology was of relevance due to existential problems of food insecurity. He noted that food security problems were escalating due to decline productivity of staple foods such as maize and sorghum.

He also observed that the main triggers of food insecurity in the region was striga weed coupled with poor soils. He noted that although the poor soils could be corrected with chemical fertilizers, ravages caused by striga weed were getting more aggravated. With the UPSCALE project gearing to reduce the striga menace and the plant pests, he noted optimism that this would enhance food production in the region. He added that the use of chemical pesticides and herbicides had adverse environmental outcomes, which could be mitigated through the natural production methods such as the push-pull technology. He reiterated that push-pull was one approach that was environmentally sustainable and if more of such technologies could be developed they would richly enhance food production in the region.

He thanked the Maseno University team for being part of the project which would be running for five years. He finalized that the result should be able to improve food production, food productivity and environmentally sustainable practices.

8.5 Mrs. Marta Iglesias, UPSCALE Policy Officer, EU AGRI

Mrs. Iglesias thanked members of the UPSCALE team for giving her an opportunity to be in the conference and congratulated the research project partners on finalizing the agreement on the UPSCALE project. She affirmed that UPSCALE was a project within the Sustainable Intensification in Africa programme of the EU. She also noted that EU had had a strict selection process and the best proposals were funded.

She reported that Food and Nutrition Security and Sustainable Agriculture (FNSSA) partnership envisaged joint effort to tackle common EU-AU challenges. The challenges included global hunger, nutritional imbalances, climate change mitigation and adaptation, reduce environmental impact of farming and need for sustainable food production systems to respond to the rising global population. FNSSA aimed to avoid fragmentation of efforts and sharing knowledge (new and traditional) and boosting innovation processes.

She further reported that FNSSA had a 10-year roadmap which had four priority themes for joint research agreement for EU-Africa Research and Innovation Partnership. The areas of research interest were; sustainable intensification, agriculture and food systems for nutrition, expansion and improvement of agricultural trade and markets and a group of cross-cutting topics. UPSCALE was one of the pillar 1 projects, within the Sustainable Intensification Programme.

She further reported that in the short to medium terms expected outcomes and impacts of UPSCALE included i) boosting the impact of Africa-EU joint research at the local level. The research was to address the entire value chain, strengthening capacity building and emphasized on demonstration project and pilot actions to bring research and innovation to the users; ii) Providing simple tools and solutions for preserving and increasing national resources of specific agro-system; iii) developing methods and tools for improving soil condition for water retention, nutrient and organic matter; and iv) providing solutions and tools for increasing farm income with sustainability of long term farming. In the long term the project was expected to improve agricultural production potential and incomes of farmers.

She further urged the UPSCALE project partners to work with other projects which had been financed under the EU Sustainable Intensification Programme. This would deter duplication of similar actions around the project outputs and complement one another. EU DG- AGRI would be following results and experiences of the project outcomes in Africa.

9 The UPSCALE Project

The Project Coordinator, Emily. P. Martin, presented the UPSCALE project overview. She requested members to use SLIDO app for commenting on the proceedings of the conference.

UPSCALE facts and figures were presented. The project proposal was written under the call SFS-35-2019-2020 Scope A: Sustainable Intensification in Africa. It has 18 partners with 4 from the European

and 6 from African Countries. There are 7 universities (LUH, UWUE, JKUAT, MU, UKN, ULUND, SLU and UZH), 1 SME (INOSENS) and 10 Associations, Federations and Research Institutes (*icipe*, BayFOR, EAFF, KALRO, FH, RAB, TARI, NARO and ISD). The project coordinator is Leibniz University of Hannover. The project duration is 60 months running from 11/2020 to 10/2025 with a European Union funding of € 7.66 million.

The project is titled 'Upscaling the benefits of push-pull technology for sustainable agricultural intensification in East Africa'. It has two key objectives:

- (i) Address food security, livelihoods and climate change resilience in East Africa while reducing the environmental impact of agricultural practices.
- (ii) Foster the design, adaptation and adoption of strategies for integrated agro-ecological management based on push-pull technology for wide-spread and climate resilient sustainable intensification in East Africa.

She further broke down the key objectives into five key axes:

Axis 1: Expand push-pull adoption to as many farmers as possible (WPs 1 and 8)

Axis 2: Expand push-pull effectively using optimal conditions for success (WPs 2, 5, 7)

Axis 3: Further improve existing technology, increase flexibility and added value (WPs 6 and 7)

Axis 4: Address the integration of push-pull in long term sustainability and climate resilience strategies (WPs 1-7)

Axis 5: Mainstream women and youth in technology dissemination and adoption (WPs 7 and 8).

Under the five axes the sub- objectives of the project are as shown in diagram 1. below.

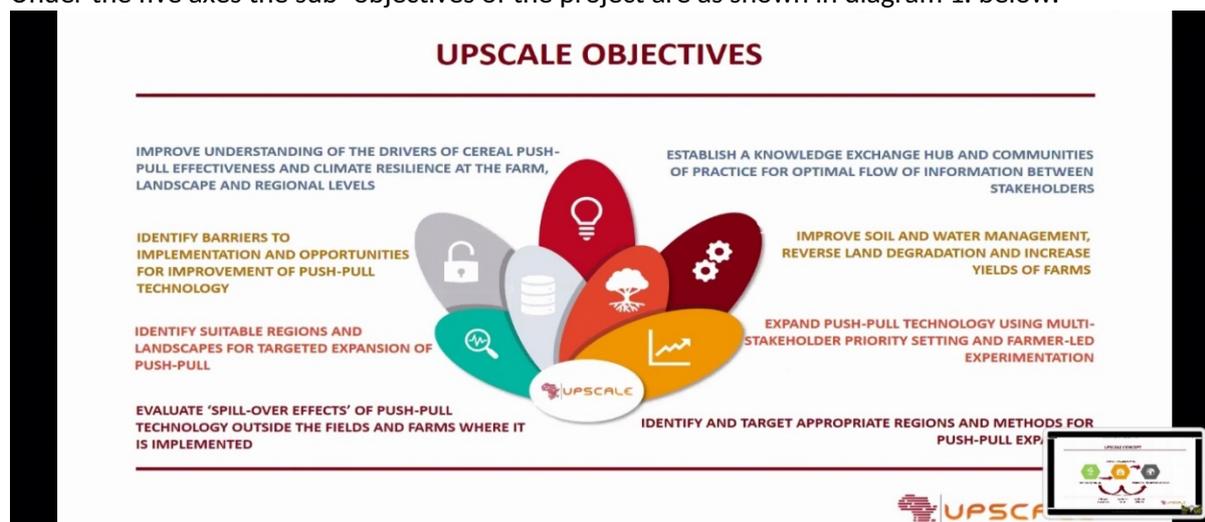


Diagram 1: UPSCALE Objectives. Source: Conference Proceedings

Prof. Martin also reported that the upscale concept put emphasis on mainstreaming of push-pull technology adoption from plants to fields, farm to landscapes and regional to international. The project envisaged that there would be an increase in farm productivity for plants and fields. For farms to landscape the project perceives beneficial biodiversity and ecosystem improvement. At the regional and international levels, the focus is on governance's impacts, larger socioeconomic and value chain aspects. The project working across scales will explore the spillover effects, feedback loops and climate scenarios from the use of push-pull. The Upscale concept is shown in the diagram below.

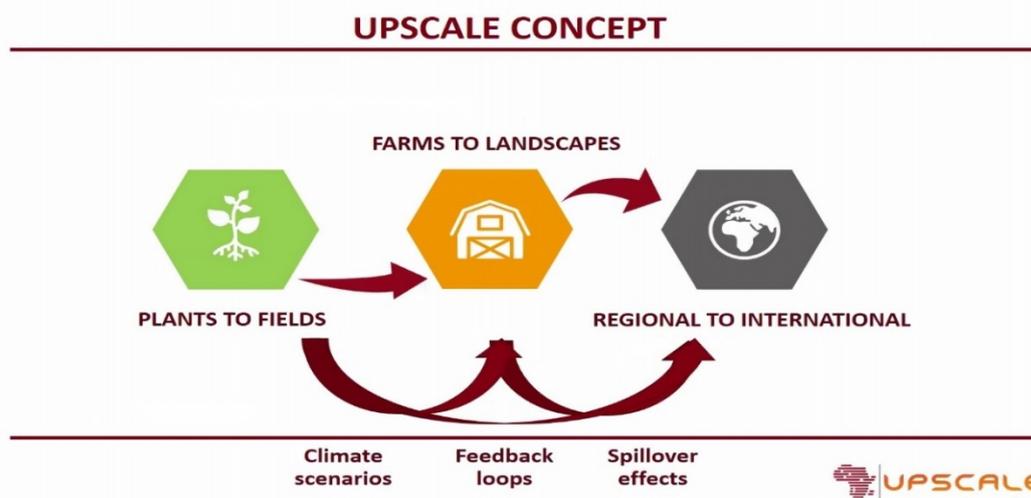


Diagram 2: UPSCALE Concept. Source: Conference Proceedings

On the UPSCALE innovation potential, she noted the following issues on diagram 3. The innovations emanating from UPSCALE would include training of MACs and communication among scientists and stakeholders; and capturing and mobilizing the innovation potential among farmers to enable long-lasting engagement and further development of sustainable intensification technologies. The innovation would also introduce novel application of ecological methods, modelling tools and socio-ecological approaches; unlock the potential of push-pull technology for other regions and cultivation systems; and development and adaptation of innovative dissemination toolboxes. The toolboxes included knowledge hub, mobile app, and interactive integrative maps for spatial targeting of dissemination efforts.

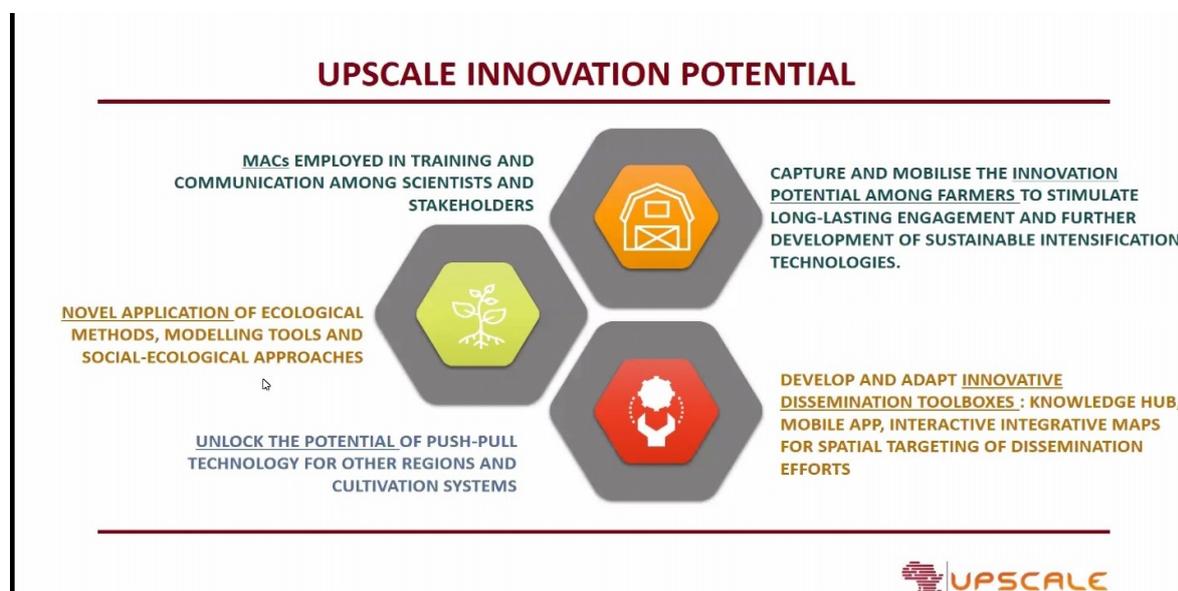


Diagram 3: UPSCALE Innovation Potential. Source: Conference Proceedings

She also reported that the UPSCALE had two important pillars. The first pillar was the Multi-actor communities of practice (MACs). In this pillar the project would unlock the potential for wider engagement, collaboration and adoption of push-pull technology, multi-stakeholder collaborative events, public-private partnerships, linkage to (e-) agro-services, and support of participative and transdisciplinary approaches. The project was envisaged to bring together existing and new networks and stakeholder clusters around push-pull technology and sustainable intensification of agriculture. The key to a successful upscaling of sustainable intensification (SI) were the MACs that would provide transdisciplinary facilitation platforms.

The second pillar of the project was Knowledge Exchange Hub (KEH) and e-granary. This would enable creation of a platform for knowledge and best practices exchange, during and beyond the project's lifetime. This could be done through practical and accessible tool to enable communication, dissemination of ideas and knowledge around sustainable intensification including push-pull; information collection through MACs would be fed into the KEH as a repository and interactive platform for use by farmers, extension, NGOs, communities; allow continuous networking and information exchange for researchers, stakeholders and the broader public.

She further reported that UPSCALE project methodology has common study design in 5 regions. Diagram 4 shows details on UPSCALE methods. The study area was designed in five regions namely: Kenya, Uganda, Tanzania, Rwanda and Ethiopia with a geographical span of 50 Km² in each country. The research leaders in the 5 regions are the national coordinators and contact points from *icipe*, Kenya; NARO, Uganda; ISD, Ethiopia; FH, Rwanda and TARI, Tanzania. The UPSCALE national coordinators would be key implementers of the field research, conveners for farmers and other stakeholders to join transdisciplinary research efforts and form communities of practice in each region with EAFF, RAB and others. This approach would involve Multi-Actor Communities that are to include local stakeholders and farmers (women included) as co-designers and creators of push-pull technology outcomes. The national coordinators would also provide support network, training and dissemination around the push-pull technology. Stakeholder participation in the projects would enhance knowledge transfer and follow-up on exploiting the push-pull technology benefits. Novel methods of analysis of chemical and optical make-up of farms and landscapes surrounding fields would be applied.

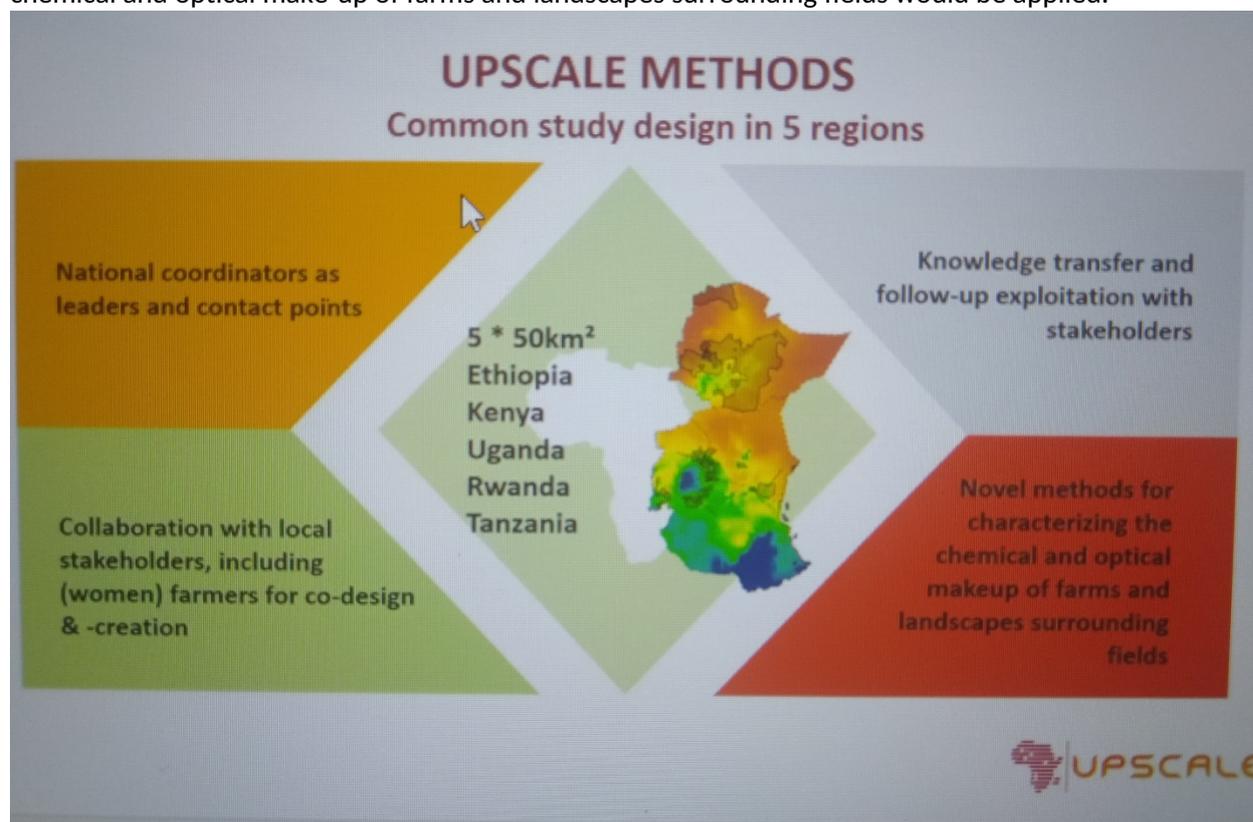


Diagram 4: UPSCALE Methods

Additionally, she reiterated that UPSCALE methods also involved 9 work packages. The essence of the 9 work pages is summarized in diagram 5. The core objects and research mandate for each of work packages are presented in the subsequent reports of the principal investigators. She noted that the first work package, 'Multi-actor transdisciplinary coordination' focused on building existing multi-actor communities through clustering and coordination to enable optimal flow of information between stakeholders, and to provide a platform for self-reflection and co-learning on the transdisciplinary efforts. In the second work package, 'determinants of push-pull success', the project

would conduct a baseline adoption study of push-pull farming, investigate the landscape, soil and climate drivers of push-pull effectiveness and evaluate resilience of food-webs and pest control. The third work package, 'functional mapping for mechanistic prediction', would focus on chemical remote sensing of crops and pest host plants and creation of functional maps for dynamic prediction of insect distribution.

She added that in work package four, 'social-ecological impacts of enhancing push-pull across scales', the project would estimate the impact of upscaling push-pull on surrounding crops and ecological networks; socio-economic and governance impacts of upscaling push pull, and modelling of socio-ecological feedback loops caused by upscaling push-pull. In work-package five, 'knowledge synthesis for targeted upscaling under changing climate', the project would build interactive, predictive maps of push-pull effectiveness and expansion under land use and climate scenario; model resilience of push-pull under climate change; and assess impacts of climate change on sustainable intensification potential through participative modelling. For work package six, 'co-constructing transdisciplinary push-pull expansion pathways', the project would co-design pathways for push-pull improvement and expansion; improve existing push-pull systems; expand to other crops, systems and value chains; explore synergies with other sustainable intensification practices; and assess socio-economic impact of push-pull innovations.

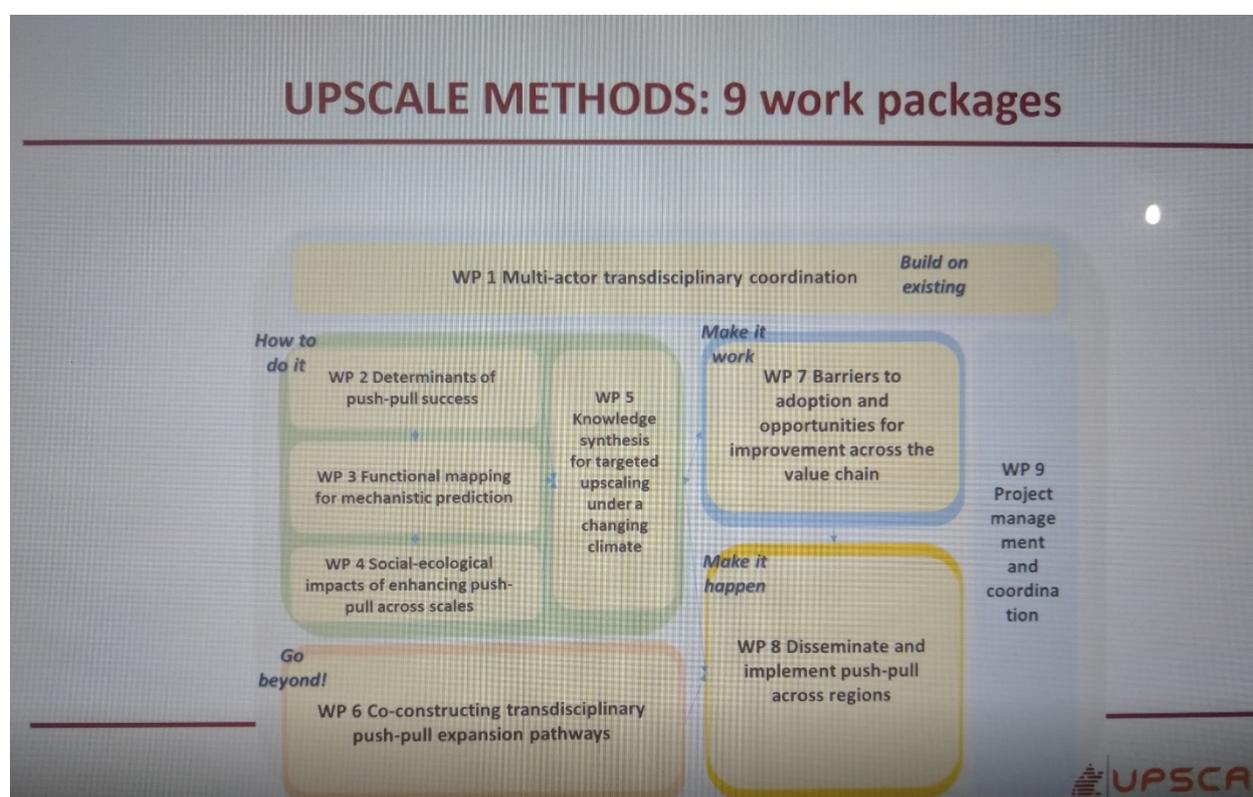


Diagram 5: Basis of the Work Packages

Prof. Martin further reported that work package seven, 'barriers to adoption and opportunities for improvement across the value chain', would focus on co-identifying barriers to adoption and strategies to address them; increasing value chain integration through transdisciplinary exchange; and co-developing policy guidelines in collaboration with MACs. Work package eight, 'disseminate and implement push-pull across regions', would communicate the project for long-lasting visibility across audiences; expand e-granary and implement the knowledge exchange hub; conduct UPSCALE roadshow events; and intellectual property rights and exploitation of project results. Work-package nine was on project management and coordination.

10 Work Package 1: Multi-Actor Transdisciplinary Coordination

This was presented by Dr. Benjamin Ombok, Maseno University (MU). He noted that UPSCALE was a complex project encompassing several sciences and diverse stakeholders including farmers, policy-makers and researchers. It sought to improve our understanding of push-pull and drivers of its success (and impacts), and to predict and optimize its sustainability, expand application to other crops, and deploy targeted dissemination. In this diversity, WP1 was the 'glue' or 'bloodline' putting it all together. Its effective implementation would thus ensure seamless integration of the various components for greater success.

10.1 WP 1: Multi-actor transdisciplinary coordination

The rationale of a 'multi-actor' approach is based on the logic that practicable solutions to the most challenging development problems are 'not within the means of one actor alone'. MAC approaches therefore exhibit;

1. Transdisciplinarity; include different disciplines, transcending boundaries between them to create new knowledge.
2. Inclusivity; involve all relevant actors, including end-users.
3. Co-design/co-creation; facilitate 'co-design' and 'co-creation' processes thus positioning end-users as co-designers and co-creators of solutions to their needs, ensuring the processes and outputs are relevant to their needs and practices.

10.2 WP 1 Objectives

1. Coordinate and create synergies with projects and platforms on sustainable intensification of agriculture (SIA)
2. Create/establish MACs for effective transdisciplinary collaboration and participatory research and technology implementation
3. Build networks that support advocacy for enabling policy environment for institutionalised dissemination and adoption of push-pull
4. Strengthen functional linkages between UPSCALE research and innovation activities and farmers and other stakeholders
5. Identify 'best practices' for transformative transdisciplinary research on SIA

10.3 WP 1 Tasks

Tasks under WP1 cover three key themes:

1. Creation of MACs, based on existing and new networks
2. Operationalization of MACs, including management and implementation
3. Synthesis of 'best' practices in service of further work on push-pull and sustainable intensification more broadly.

These are organized within four task areas

10.4 Task 1.1: Develop and implement multi-actor communities of practice on sustainable intensification

This would form multi-actor communities of practice (MACs). These would

1. include project partners and other stakeholders
2. be based on existing and new networks and platforms
3. be 6 in number (5 national and one regional/year), each with functional management and coordination structure

Tentative planning and timing of regional MAC meetings

	Country	National Coordinator	Regional	National
			Year 1 to 5	
1	Kenya	icipi	2020/21	2020/2021
			Nov	Feb/March 2021
			23 rd . -26 th	
			Kisumu	
2	Ethiopia	ISD	?????	
3	Rwanda	FH Association	2022/23	2020/2021
			Feb???	Feb 2021
			6 th -10 th	8 th -12 th
			Kigali	Kigali
4	Tanzania	TARI	?????	2020/2021
				Dec 2020
5	Uganda	NARO	?????	2020/2021
				March 2021

10.5 MAC formation framework/TORs

MACs composition would require engagement with and involvement of researchers/ higher education, farmers and farmer organizations, UPSCALE partners, research and extension, policymakers, co-operatives /associations, financial institutions/intermediaries, government agencies (MDAs), local and federal governments, insurance providers, agro-dealers/agro-vets, processors, distributors/market chains, consumers, and NGOs. This might vary according to country specific characteristics.

10.6 MAC Management

Being a foundation for co-creation/co-construction of information, and as framework for knowledge sharing and dissemination, MACs management would require representation and synergy creation among the multiple players: farming environment determinant agents, farmers direct interest representation, research agencies, government agencies (representatives), funding model institution, risk management agents (e.g. relevant insurance packages), advocacy channels, processors representation, and farming systems advisory. These would be derived from the membership of the MACs.

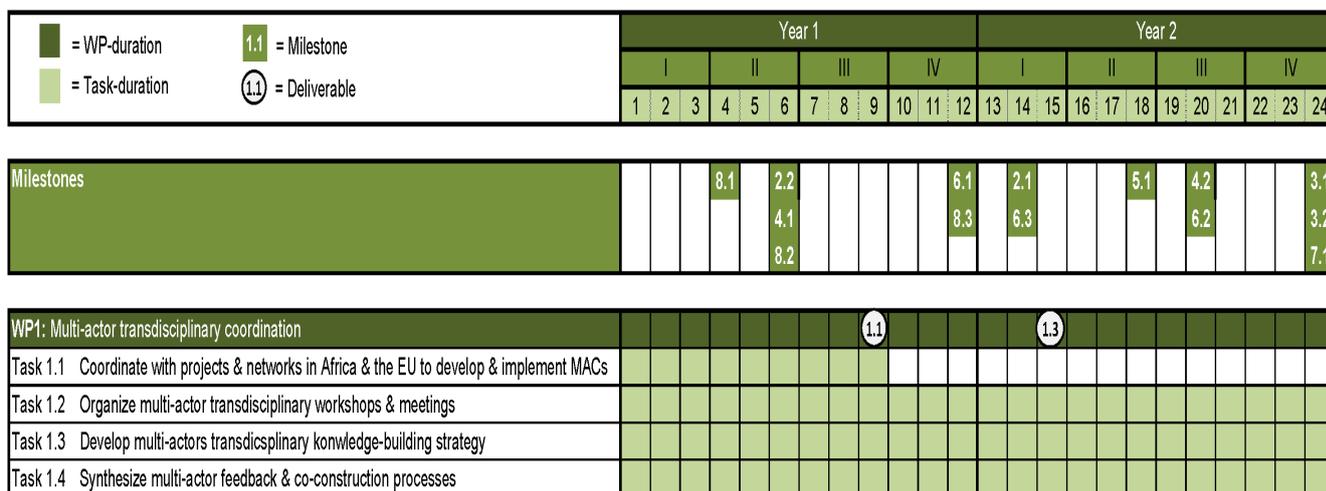
10.7 Task 1.2: Organize multi-actor transdisciplinary workshops and meetings

“This is where the action is,” he noted, ensuring a needs-based technology process! There would be one national MAC workshop/per country/year, and one regional workshop. The purpose of these workshops is to act as open discussion forums on objectives, scale of implementation, approaches, etc. and propose any necessary changes; raise awareness and facilitate **transdisciplinarity** of UPSCALE, and support advocacy for an enabling policy environment as well as ground for policy brief drafting.

10.8 Task 1.3: Develop a multi-actor transdisciplinary knowledge-building strategy

Main activity here was **development of a strategy** for internal and external information sharing; optimize continuous flow of research results to MACs; establishment of repositories and advocacy knowledge resource- success stories, and regular updates on progress to stakeholders; information sharing and capacity-building materials and media outreach for different stakeholder audiences; and provide input into the Knowledge Exchange Hub (WP8) for MAC stakeholders and the broader public.

10.9 MAC Formation and Knowledge building strategies' timelines



10.10 Task 1.4: Synthesize multi-actor feedback and co-construction processes for transformative transdisciplinary research approaches

Key lessons would be learnt from stakeholder meetings, and from the multi-actor information sharing and capacity-building channels. These would include policy, agro-ecological and socioeconomic challenges and solutions for adaptation of sustainable intensification research and dissemination strategies. The task would derive a synthesis of 'best practices' for future research and innovation efforts able to accomplish the highest level of transformative impact on agricultural practices, policy and overall stakeholder perspectives.

11 Work Package 2: Farm, landscape and regional-scale determinants of push-pull success

11.1 Task 2.1: Establish the socioeconomic baseline of the target communities in study region and establish indicators for monitoring project effectiveness and impact.

The deliverable targeted is a gender-based report on socioeconomic and policy barriers to push-pull adoption and possible strategies of addressing them (M48). Activities envisaged are development of the tools, baseline survey and data analysis.

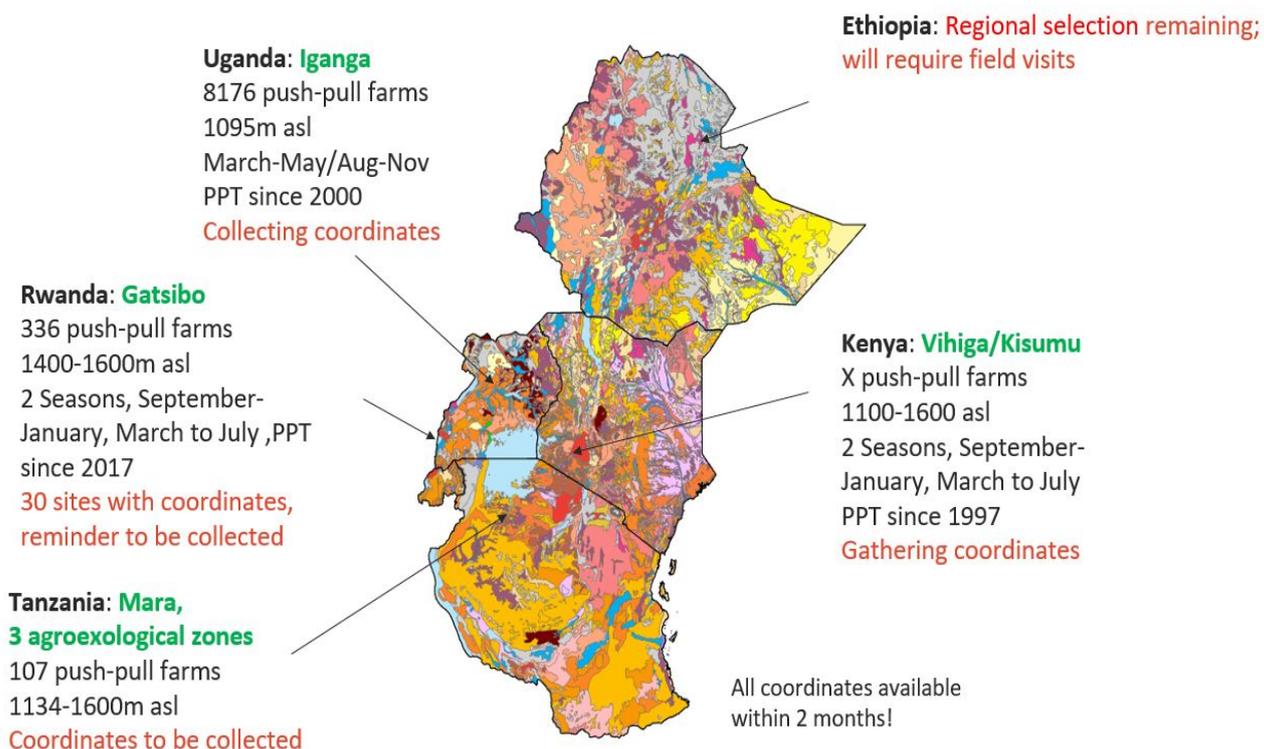
Guided by the following objectives, and on the basis of participation of the 10 partners, WP2 would be put to function by: establish the socioeconomic baseline of the target communities in the study regions and indicators for monitoring project effectiveness and impact (task 1); develop maps and select field sites for experimental tasks in WP2-4 (task 2); empirically assess how soil fertility, landscape context and climatic region determine the level of pest control and other ecosystem functions in push pull and monocrop cereal (task 3); and map food webs of push-pull and monocrop cereal crops to identify key predators to native and invasive pests, and to assess indicators of resilience against environmental change (task 4). In the implementation of the WP objectives the Lead Partners would also engage PhD students, whose recruitment process was on-going by the date of this kick-off meeting.

In each country selected region... 15 pairs of push-pull and monocrop farms in each region selected representing high and low soil fertility, and gradient of grassland cover in the landscape. March-June 2021 a workshop will be organised to train all field teams, ideally at *icip*e. Possibly this could be followed by field visits to different countries together with members of SLU team.

11.2 Ecological field work

Together with field teams from each national coordinator, conduct the actual sampling for WP2 during cropping seasons 2 and 3 (i.e., start ~September 2021); 2 (or 3) sampling rounds are planned. These will focus on assessment of pests, natural enemies, predation rates, weed cover, soil fertility and crop yield at each site.

Selected regions



11.3 Socioeconomic baseline survey

In each region select about 150 respondents (75 with push-pull, 75 without push-pull). Collect data on yields, perceptions, income, livelihood indicators. KALRO would lead but it is expected that field teams from national coordinators participate.

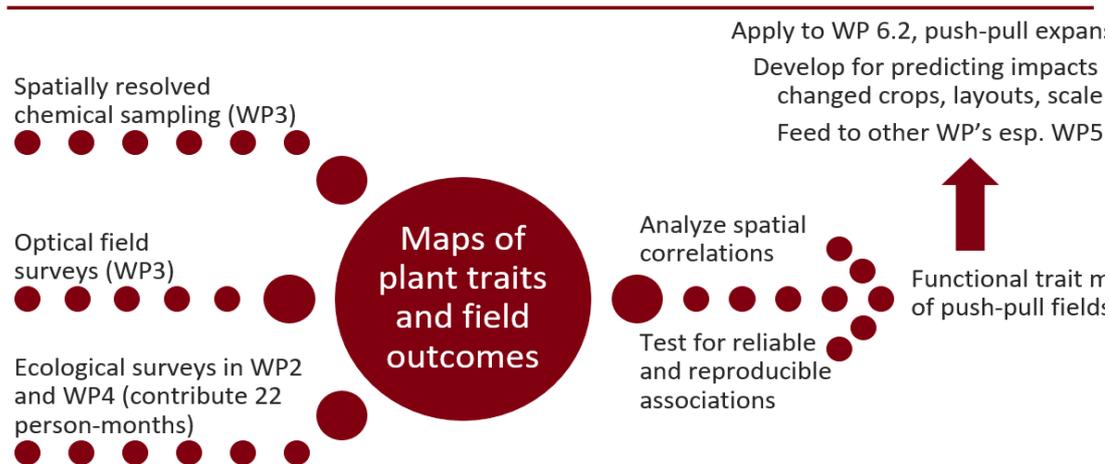
11.4 Links to other WPs

WPs 3 and 4 – maps and field selection; WP5 – would use both socioeconomic baseline and ecological data for modelling; WP6 and 7 – would use socioeconomic baseline when evaluating socioeconomic and market impact assessment of proposed innovations (WP6) and when co-identifying socioeconomic and policy barriers to push-pull adoption (WP7).

12 Work package 3: Functional mapping for mechanistic prediction

This was presented by Merry (Meredith) C. Schuman, University of Zurich (UZH). The main aim of the work package is to map plant properties in push-pull vs. conventional fields and their associations with agro-ecological outcomes

WP3: Functional mapping for mechanistic prediction



12.1 Task description

Task 3.1: Remote sensing of plant-derived cues within and surrounding push-pull and monocrop fields

Task 3.2: Generate functional maps to predict insect distribution and yield dynamics from the distribution of plant traits and push-pull factors

The work package has the following objectives

1. Describe spatial distribution of optical, structural and chemical plant traits in push-pull vs. paired conventional fields using remote sensing and spatially resolved high-throughput sampling
2. Overlay trait distributions measured in Task 3.1 with ecological distributions measured in WPs 2 and 4 and describe relationships
3. Test hypothesized push-pull relationships in experiments
4. Derive maps to predict ecological distributions from distributions of push-pull traits

Activity	Time plan
Establishment of study sites <ul style="list-style-type: none"> - observational fields, task 3.1 - experimental fields, task 3.2 	From M1 (participation in WP2, coordination with WP4)
Observational studies (task 3.1) <ul style="list-style-type: none"> - In-field observation - Spatial data analysis 	Coordinate with WP2 and WP4, and participation WP6 M3-M24
Map development (task 3.2) <ul style="list-style-type: none"> - Correlation analyses and hypothesis generation - Field trials manipulating plant traits 	Coordinate with WP2 and WP4, and participation WP6 M12-M48
Finalization and write-ups (final reports, publications)	From M36

12.2 Next steps

1. Participate in field selection (WP2)
2. Approach project coordinators, regional coordinators and other partners regarding permissions and conditions for planned sampling and observation, including possibility of flying drones
3. Coordinate with WP2 for field training
4. Work with WP6 to set up for Task 6.2

5. Engage in communication with coordinators and all WPs for information flow and project coordination

13 Work Package 4: Social-ecological impacts of enhancing push-pull intensification across scales

This was presented by Prof. Emily P. Martin; the UPSCALE Coordinator. The presentation was based on a fundamental question; **what happens when the amount of push-pull increases across scales?** The aims of the work package are

1. to evaluate 'spill-over effects' of push-pull technology outside the fields and farms where it is implemented
2. Anticipate short and long-term, small and large-scale social- ecological impacts of upscaling push-pull intensification
3. Identify feedback loops, trade-offs, synergies and thresholds associated with enhancing push-pull at field to regional scales, with a view to
4. Gaining predictive knowledge on the long-term safest approaches to reap the benefits of push-pull technology across scales

13.1 WP4 Tasks

Task 4.1: Impacts of upscaling push-pull on agricultural effectiveness in push-pull and monocrop fields (Lead: LUH)

Task 4.2: Ecological spill-over impacts of push-pull outside crops (Lead: UWUE)

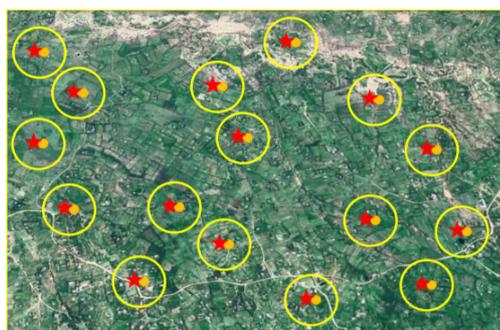
Task 4.3: Socioeconomic and governance impacts of upscaling push-pull, from individual livelihoods to regional value chains and policy (Lead: icipe)

Task 4.4: Social-ecological feedback loops of upscaling push-pull (Lead: LUH)

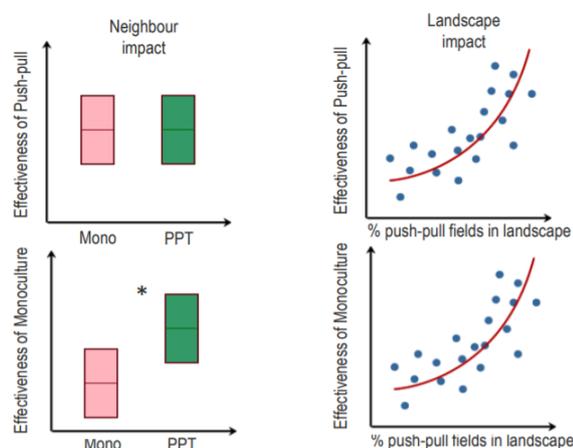
Task 4.1: Impacts of upscaling push-pull on agricultural effectiveness in push-pull and monocrop fields (Lead: LUH)

In each country selected region...

15-20 field pairs
5 ppt / mono
5 ppt / ppt
5 mono / ppt
5 mono / mono



% push-pull fields
In 1-2km around each field



WP4 Tasks

Task 4.3: Socioeconomic and governance impacts of upscaling push-pull, from individual livelihoods to regional value chains and policy (Lead: icipe)



- Household surveys (gender disaggregated) along gradients of Task 4.1 (75 field pairs in 5 regions)

% push-pull fields



- Agro-economic, social, health and food security impacts of the farmers' conversion to push-pull, accounting for time since implementation, for men, women and youth
- Computer-Assisted Personal Interviews of farmers: indicators e.g income, diet, social integration, linkage to markets & value chains
- National Panel Survey data, interviews of stakeholders at community & regional levels, e-Granary output

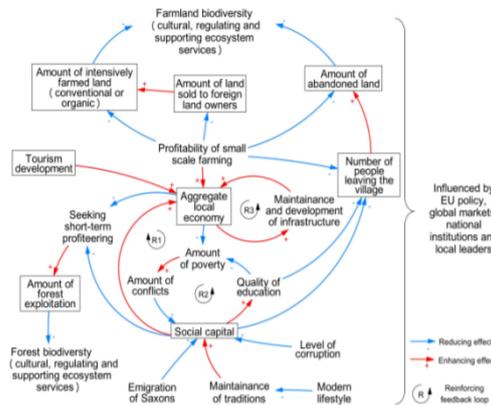
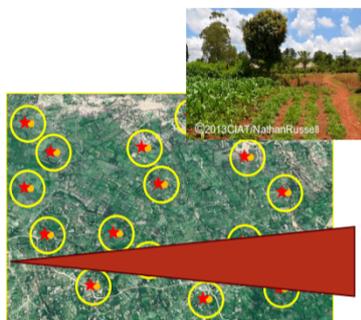
Impacts at community level incl. changes in governance mechanisms, value chain integration, impacts on stakeholders outside farmers, on policy uptake, on training and dissemination efforts outside the project



WP4 Tasks

Task 4.4: Social-ecological feedback loops of upscaling push-pull (Lead: LUH)

Synthesis modelling of the effects of upscaling push-pull on social-ecological systems



Input from Tasks 4.1, 4.2, 4.3 & WP2&3 for parameterization

Feedback loops & thresholds of increasing push-pull across scales

Participative learning, qualitative and quantitative modelling

Hanspach et al. 2014 Ecology & Society

Environmental, agronomic, farmer livelihood, gender and value chain impacts of an (even) wider spread of push-pull; trade-offs and synergies affecting a) further upscaling, b) agroecological and environmental effectiveness of PPT, c) community & regional-level socioeconomic and governance processes

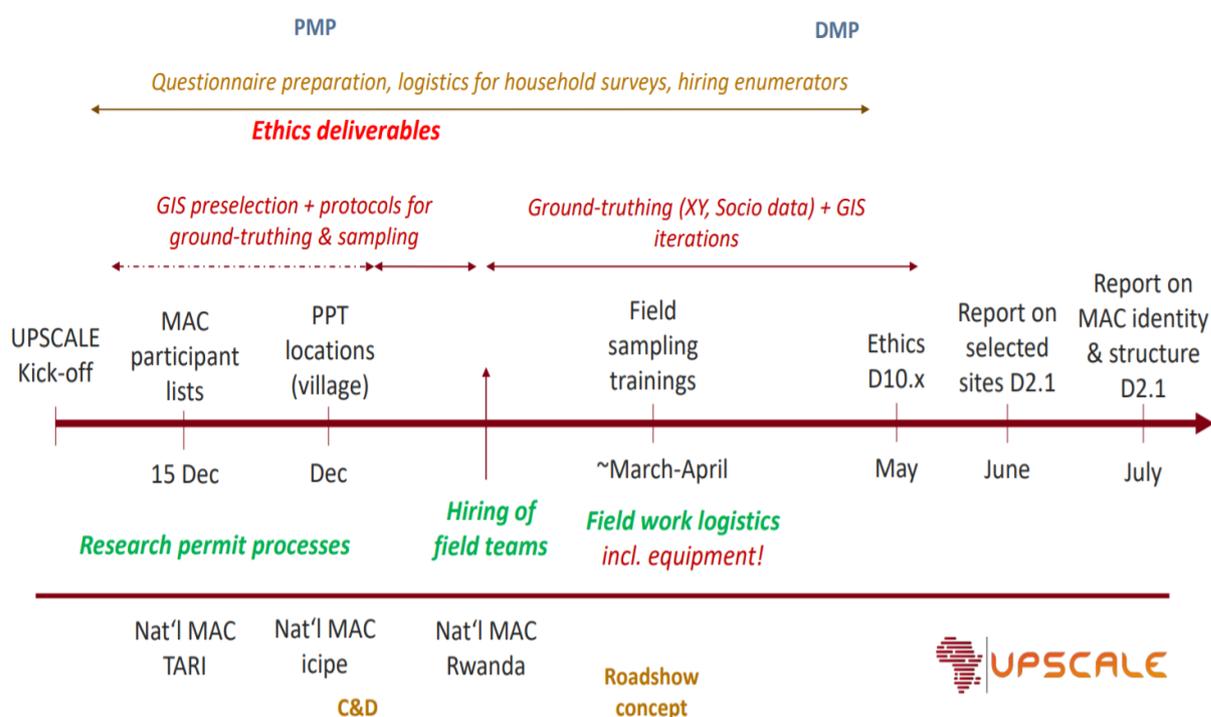


Based on the following objectives

1. Geo-visualising empirical and modelling results together with biophysical and climatic conditions, social and farming systems as an online information resource for upscaling
 2. Identify target regions for upscaling in which the focal crops and smallholder systems are likely to be viable and the push-pull system is effective in increasing yields well into the future, considering different climate projections
 3. Anticipate the joint effects and interactions of climate change and sustainable intensification strategies on the wider socio-ecological systems, including climate resilience at multiple scales
- **Where are the actions taking place? (Site Selection criteria, Coordinates)**
 - Consider the study site needs of each Work Package, co-location possibilities.
 - **What do we need in place at each specific location?**
 - Field personnel numbers and skills sets, materials type + quantity, and processes that are needed for each task. Consider Work Package / research-process synergies and material procurement timeliness and possible scale economies.
 - **When? (Start date, duration, end date) do we need human/material resource there?**
 - Synchronized timing of when personnel and materials are needed for each task. Synchronize with timing of crop seasons
 - **How do we get the people and materials there?**
 - National Compliance issues: Consider ethical imperatives (material transfer rules and agreements, phytosanitary regulations, human subjects, if any), Work/research permits for scientists
 - Institutional hosting/embedding of students and external research teams.
 - Skilled field technicians – hiring practices, duration
 - Field transport logistics – Motor vehicle purchase? Hire? Recharge?
 - Cost sharing (and funds transfers) for common resources e.g. Field technicians, lab space, shared field transport, etc
 - Events scheduling (field training events, road shows, workshops, conferences)
 - Field accommodation logistics

5. In terms of hiring of field teams it was resolved that it would be best to hire local people, but a blend with international Postdoc and PhD students to support the work would be ideal.
6. Other field logistical issues briefly discussed included accommodation, transport, hosting, funds, and permits

Partner timelines approximately 6 months



14.3 Follow-up (bilateral) meetings and to-dos

- National Coordinators
- MAC formation meeting MU, EAFF and National Coordinators
- 2 meetings - Team Socio-economics KALRO/icipe/LUH: field work organizational questions; harmonize survey tools & questionnaires across WP [coordinate a discussion about this]; baseline follow-up study
- Focal region selection follow-up Ethiopia: ISD/SLU/(LUH)
- Site selection follow-up using PPT location information + soils databases: SLU/UWUE/LUH/Sileshi
- Trainings financial & project management BayFOR: timesheets, pm calculation, financial reporting
- Ethics deliverables, harmonized guidelines e.g. for informed consent, and research permits (centralize information according to who needs to work where)
- Feedback on FNSSA meeting 18 Nov
- Continuous reporting: update project risks; enter events
- WP6: specific planning & timing of activities
 - Bundling of communication events before upload in the continuous reporting: INOSENS do quality check of this: update every 6 months within our internal reporting BayFOR+INOSENS; PM meeting before Christmas!

15 Work Package 6: Co-constructing transdisciplinary push-pull expansion pathways

	Tasks	Objectives	Outputs
6.1	Synthesis, review and multi-actor assessment of options for push-pull expansion and synergistic integration with other systems and practices	To provide a state-of-the art synthesis of the options for integration of push-pull and a complete mapping of actors	Proof of concept for expansion of push-pull and integration with other practices
6.2	Co-designing and testing push-pull expansion in other crops. Starting with the highest priority focal crop (task 6.1.3), use observational and manipulative field studies to fill major gaps in characterizing the chemical ecology of the system towards implementing push-pull.	Characterize pest and beneficial species, and candidate attractive (pull) and repellent (push) cues Measure push-pull effects and impacts in experimental field (factorial design) Test possible planting regimes with farmer participation	Proof of principle for new push-pull crop systems including key traits and suggested planting regimes
6.3	Co-develop innovation in existing push-pull through multi-actor exchange	Intensify existing cereal push-pull cropping systems through integration of compatible high value and farmer-preferred vegetables and food legumes.	
6.4	Identification of synergies to integrate push-pull in the framework of other sustainable intensification practices and farming systems	Determine the effectiveness of push-pull under different sustainable intensification pathways Merge the benefits of push-pull technology with those of other sustainable intensification practices and with other farming systems	Proof of principle for new push-pull crop systems including socioeconomic and market impact assessment

15.1 Task 6.1: Synthetic review and meta-analysis:

Several studies had been conducted, but limited synthesis existed. This synthesis would therefore through this task provide a synthesis to aid formulation of evidence-based practice and policy and subsequently provide a detailed review of existing knowledge as a basis for further exploration, testing and co-development of priority innovations. The research partners therefore intend to accomplish these through the following activity bases.

15.1.1 Task 6.1.1: Analysis of trade-offs and synergies

Here the technical focus of push-pull technology is on integrated, participatory and sustainable farming system that leads to increasing production, alongside delivery of other ecosystem services. This activity will employ multi-criteria decision analysis and Bayesian network models for trade-off analysis in finding the optimal model.

15.1.2 Task 6.1.2: Partner mapping and multi-actor needs assessment

A mixed methodology including surveys, key-informant interviews and focus group discussions will be applied

- Surveys to identify actors involved in R&D and farmers' needs
- In-depth discussions with key informants and experts
- Participatory rural appraisal to determine the kind of crops farmers want
- Community and multi-stakeholder meetings with actors across the value chain
- Through convergence-facilitation approaches, non-controversial criteria would be identified for ranking crops.

Timing of activities

	Activity	Time
6.1	Literature search	November 2020-March 2021
	Development of survey instruments	December 2020-March 2021
	Surveys to identify actors	January-March 2021
	In-depth discussions with key informants	Depends on site selection by partners
	Participatory rural appraisal to determine crops	Depends on site selection by partners
	Community and multi-stakeholder meetings with actors across	Depends on site selection by partners
	Data analysis and write-up	May 2021-2024
6.2	Establishment of experimental field	Synergize with Task 6.3 (<i>icipe</i>)
	Experimental field studies to test for - Push and pull effects - Soil and water impacts (with 6.4) - Spill-over (using approaches in WP3 and WP4)	Synergize with Task 6.3 (<i>icipe</i>) and WP4; plan M18-36
	Test integration via participatory plot experimentation - Work with farmer testers established in 6.1, 6.3 - Test possible planting regimes based on farmer input and experimental field study outcomes	Synergize with Task 6.3 (<i>icipe</i>) and WP3; plan M30-48
	Finalization and write-up	M42-54
6.4	Identification of target sites	site selection by partners
	Participatory rural appraisal - Identify SI pathways or alternative crops that farmers prefer - Identify their impacts (ecosystem services/ disservices)	Synergize with Task 6.1, 6.5; plan M3-60
	Establishment of experimental fields - Select 60 farms along major climate and elevation gradients - Establish experimental fields comprising push-pull planted within a SI practice of	Synergize with Task 6.5

	choice; push-pull with maize rotated with another crop	
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Timing of activities

Activity	Time
Establishment of experimental field	Synergize with Task 6.3 (<i>icipe</i>)
Experimental field studies to test for <ul style="list-style-type: none"> - Push and pull effects - Soil and water impacts (with 6.4) - Spill over (using approaches in WP3 and WP4) 	Synergize with Task 6.3 (<i>icipe</i>) and WP4; plan M18-36
Test integration via participatory plot experimentation <ul style="list-style-type: none"> - Work with farmer testers established in 6.1, 6.3 - Test possible planting regimes based on farmer input and experimental field study outcomes 	Synergize with Task 6.3 (<i>icipe</i>) and WP3; plan M30-48
Monitoring and management of crop production <ul style="list-style-type: none"> - Measurement of growth, biomass and crop yield - Monitoring population of weeds, insect pests and natural enemies 	Plan M3-60
Monitoring of biophysical parameters <ul style="list-style-type: none"> - Measuring changes in soil water content - Measuring carbon sequestration - Monitoring nutrient balances 	plan M3-60
<ul style="list-style-type: none"> - Data analysis and write-up 	plan M3-60

15.1.3 Task 6.3 Co-develop innovation in existing push-pull through multi-actor exchange

(Lead: *icipe*; Participants: MU, EAFF, JKUAT, UKN, NARO, and ISD)

Expected outputs: Deliverables 6.3, 6.5 (Duration: Months 3-60)

icipe's role:

1. Intensify existing cereal push-pull cropping systems through integration of compatible high value and farmer-preferred vegetables and food legumes.
2. On-station evaluation (*icipe*, NARO, TARI) of integrated push-pull models would involve replicated plot trials (push-pull-vegetable/legume combinations) evaluating a range of aspects including the agronomic design of the integration, planting arrangements, incidence of pests and diseases of the new crops, yields of the crops, impact of the integration on the constraints of cereals managed by push-pull and maize grain yields.

Task 6.4: Co-develop synergies with existing sustainable intensification practices and with other cropping systems and value chains, led by JKUAT.

This task will explore opportunities of integrating push-pull with other intensification practices including agroforestry. It will be participatory involving key stakeholders including farmers, and the approach will aim to integrate systems that provide additional services such as fodder for livestock integration

16 WP 7: Barriers to push-pull adoption and opportunities for improvement

The work package is established around three objectives

1. Identify socioeconomic and policy barriers to push-pull adoption and mitigation strategies among men, women and youth farmers
2. Enhance value chain integration through transdisciplinary multi-actor involvement in knowledge exchange, infrastructure, and policy.
3. Develop policy guidelines for enhanced push-pull innovation adoption and value chain integration.

16.1 Work package description

- Evaluate critical factors that hinder adoption and expansion
 - Socio-economic
 - Environmental
 - Gender
 - Biotic and abiotic
 - Institutional factors such as credit, input and output markets.
- **Data sources**
 - Surveys (baseline, midline, end line)
 - MAC discussions
 - Experiments described in WP2-5 will provide information biotic and abiotic conditions and landscape-level constraints.
 - Results will be used in WP5 and 8 to identify target regions for push-pull upscaling and dissemination

16.2 Task 7.1: Co-identify socioeconomic and policy barriers to push-pull adoption, including gender-based barriers, and strategies to address them

Deliverable: Gender-based report on socioeconomic and policy barriers to push-pull adoption and possible strategies of addressing them (M36). Activities here will include:

- Carry out adoption studies at baseline, midline and end line of the project
- Development and programming of research tools
- Recruit, train and supervise enumerators
- Data collection, exploration, analysis and publication

16.3 Task 7.2: Increase value chain integration through trans-disciplinary multi-actor involvement in knowledge exchange, infrastructure and policy

Deliverables: Report on push-pull integration in the value chain through trans-disciplinary multi-actor involvement (M48). Activities here will include:

- Linking farmers to main value chain players in the market,
- Carry out a value chain analysis for the different push-pull products
- The value chain analysis formulated in close collaboration with MACs

Initial stakeholder inception workshops (WP1.2) will be used to perform participative value chain mapping with all stakeholders.

16.4 Task 7.3: Co-develop policy guidelines through Multi-Actor Communities of practice

Deliverable: Policy guidelines on strategies to enhance adoption of push-pull technologies across the value chain (M57). This task will follow the results of tasks 7.1 and 7.2 as well as use outputs from WP4.4 and 5.3. MACs formed in WP1 will highlight the issues that need policy attention. The activities will include:

- Assessment and documentation of various policies
- Assess formal and informal institutions that influence, directly or indirectly, the adoption and use of push-pull in order to ensure an evidence-based policy process.

- Interact with policy makers for the promotion of policy dialogue around key issues identified during implementation

16.5 Discussion and clarification of emerging issues

Issues discussed included:

- Contribution of partners (professional/technical and financial)
- Role of partners in different tasks
- Logistics in carrying out surveys across the countries (baseline, mid-line and end line) including
 - Enumerator recruitment, training, transport during the survey, etc.
 - Household sampling – how many PPT and how many non-PPT?
 - Harmonize sample size (Task 2.1 say 150 per country and tasks 7.1 say 300 per country)
 - Budget for CAPI programming and data hosting (payment of enumerators, field logistics, farmers token etc.)

16.6 Household questionnaire design

- What questions to be captured in the baseline questionnaire survey as it cuts through several Tasks (i.e. 2.1, 6.5, and 7.1)? Same to mid and end- line surveys.
- Who will contribute to the questionnaire design?
- Market survey
 - Activities of Task 7.2: Do they include value chain analysis?
 - Who will design and conduct the market survey
- MAC tools for discussion on barriers

16.7 Student's involvement (PhDs, Masters) activities 2.1, 7.1

- Proposal (2 PhDs, 3 Masters)
- One for each country
- Can advertise these positions during Kick-off/ or request partners to assist identify from respective universities
- **Student recruitments**
 - Discuss the objectives/scope of the PhD and MSc. studies
 - To be competitively recruited

17 WP8 - Exploit, disseminate and communicate push-pull innovation in East Africa and beyond

Leaders: *icipe* and InoSens

17.1 Task 8.1 Communication and dissemination activities (Lead: INOSENS)

- Participate in developing a strategic plan for communication and dissemination of project activities and results (M3);
- Participate in monitoring and assessment of the strategic communication plan;
- Participate in final conference to communicate and disseminate the project's results.

17.2 Task 8.2 Online Knowledge Exchange Hub (Lead: INOSENS)

- Help evaluate the needs of Knowledge Exchange Hub users, seek feedback, and refine its dissemination and communication approach

17.3 Task 8.3 UPSCALE Promotion Events and Stakeholder Engagement (Lead: *icipe*)

- Generate ideas for co-learning and co-creation of policy guidelines on push-pull innovations.

17.4 Task 8.4 Adapting the e-Granary platform for UPSCALE (Lead: EAFF)

- Participate in mobilization and registration of farmers into the e-Granary system.

17.5 Task 8.5 Exploitation and IPR management of the project's results (Lead: *icipe*; All participants)

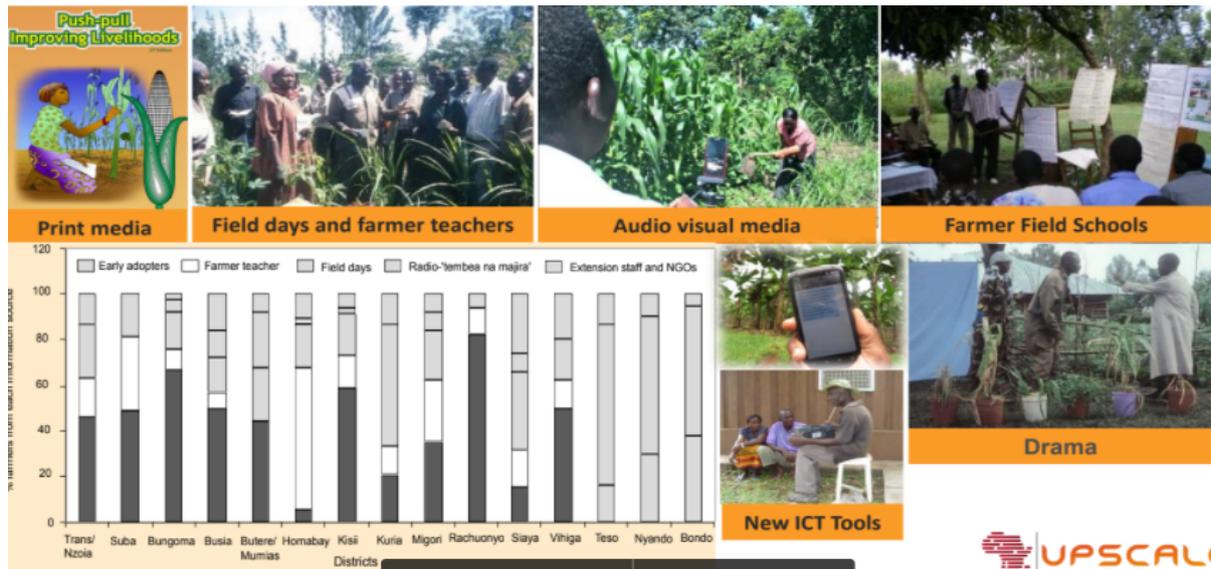
- *icipe* Deliverables D8.9, D8.10, D8.11, D8.12, D8.13 (see Deliverables table)
- Milestone MS 12 - UPSCALE roadshow concept implemented by Month 6.

17.6 Targets

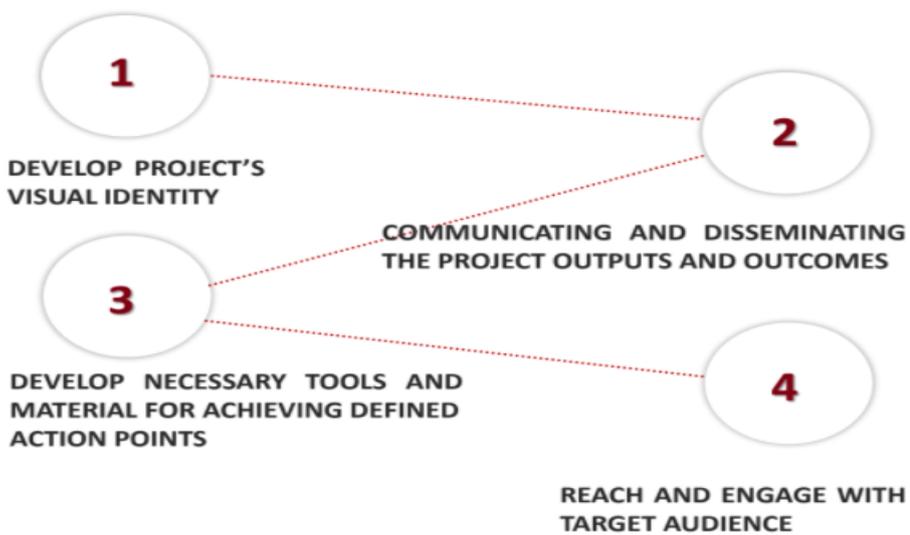
5 strategic technology learning sites in the 5 UPSCALE areas and new sites,

- 2 farmer field days each cropping season in the target areas,
- 2 "train the trainer" workshops in each target area,
- 40 farmer teacher training events (one training event per site per season, 5 sites for 8 seasons),
- 160 farmer group training events on push-pull (estimated at 4 training events per site per season, 5 sites for 8 seasons),
- 80 farmers' field days (estimated at two field days per site per season, 5 sites for 8 seasons),
- 40 review and planning workshops on technology implementation (estimated at one workshop per site per season, 5 sites for 8 seasons)
- Target at least 1 million stakeholders including farmers reached by the push-pull information by M60, among which 25,000 new adopters (at least 50% women).

Understand push-pull technology adoption processes and their impacts to design targeted and cost-effective impact pathways



Communication and dissemination



Dissemination and Communication KPIs

ONLINE



- Number of visits to the UPSCALE Knowledge Exchange Hub (KEH)
- Number of farmers registered on push-pull adapted e-Granary cell (smart) phone app through the KEH
- Number of value chain actors registering as push-pull supporters on the KEP



INTERACTIVE



- Workshops and meetings with relevant stakeholders
- Number of non-project events where UPSCALE is presented
- Number of visited schools
- Number of visits (men, women, youth) to demonstration farms and extension centers

OFFLINE

- Publications in peer reviewed journals
- Practice Abstracts and Policy Briefs
- Number of distributed printed materials
- Articles related to the UPSCALE project in printed media
- Project events
- Radio and TV coverage

photo credits: icipe



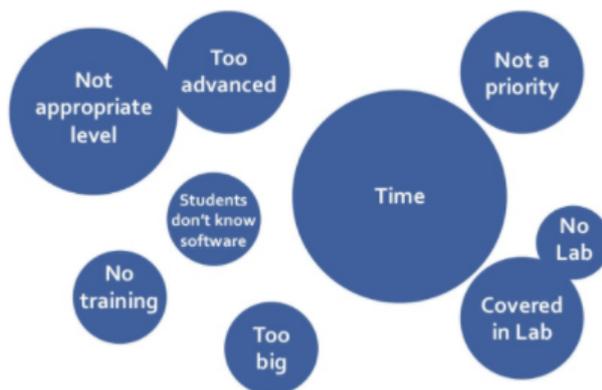
18 Work Package 9 Data management

University of Würzburg

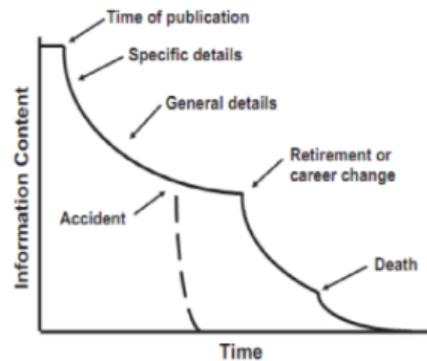
Upscale research is data intensive

- Manipulate, analyse, visualize data to discover patterns: Data management -> facilitate, innovate science
- Frequently reuse data for meta-analysis: Data management -> long term data availability
- Replication is troublingly rare: Data management -> unique evidence of land use & climate change impact

Data loss due to lack of management



(Strasser&Hampton 2012, Ecosphere)

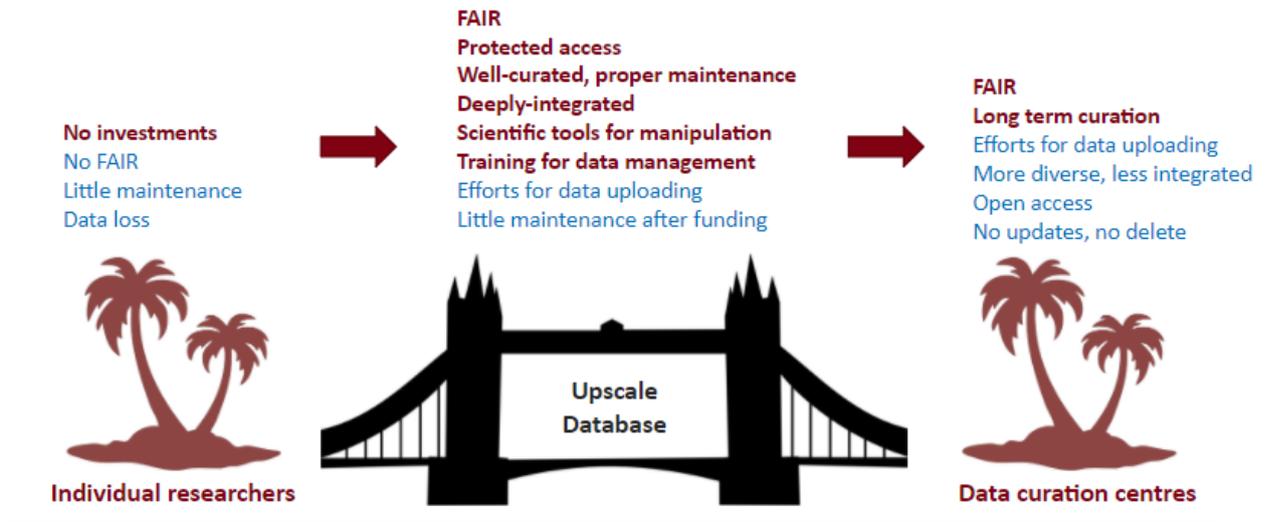


(Michener 2006, Ecol. Inf.)

Ugly truth: most data does not last long...



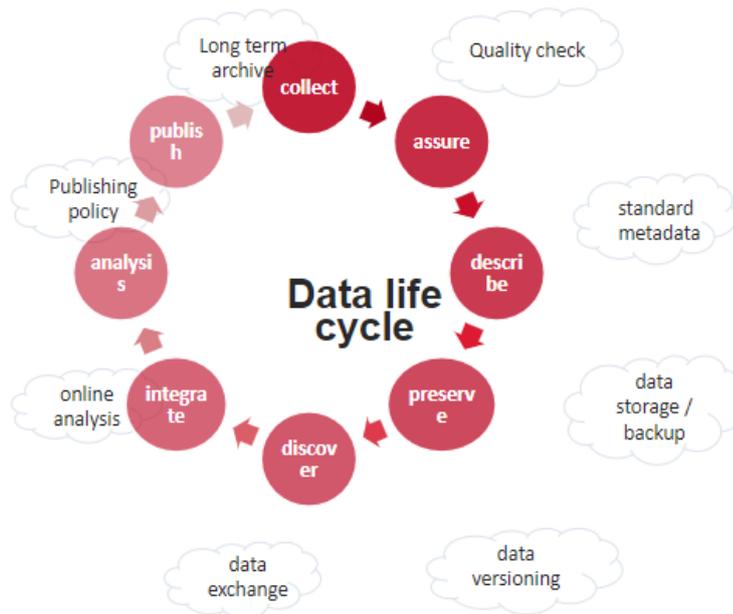
Make our data sustainable



FAIR principles: Findable, Accessible, Interoperable, Reusable



Management throughout data life cycle



DAY 4**19 Nov 26th 2020; Day 4, (~ 54 participants), Rapporteur: Vladimir Mrkajic**

There was a recap of events and issues of day 3 including contest of the 'field visit' videos that had been played on day 3. In brief.

Video 1: A women farmer reflected on her progress with PPT (production of maize increased, soil fertility improved, labour hired). Prof. Khan indicated problems of PPT as insufficient supply of desmodium seed in East Africa and climate change – longer drought and erratic rainfall.

Video 2: A research scientist informed the meeting of the many points on benefits from using PPT: desmodium suppresses the growth of *striga* weed and repels the stem borer pests, dairy producers' cooperatives established by the farmers, etc.

Video 3: A small holder farmer informed the meeting about his experiences with PPT: he uses PPT to control *striga* weed and stem borer pests, and to protect his maize crop from being damaged by fall armyworm. He also uses either Napier grass or Brachiaria grass as pull plants.

Video 4: Two small holder farmers informed the meeting about the importance of PPT for vegetable production. They focus on tomato and cabbage; during drought the vegetable field retains moist; soil fertility is enhanced; increased income by sale of dairy products; and food diversity is increased.

19.1 Way Forward: Coordination modalities and logistics

At the beginning of this session we took group photo of the meeting. The key coordination support issues discussed:

(i) Research support planning and execution: It is highlighted that there was a need for institutional collaboration in acquisition, access and management of laboratory space and materials, field sites and material inputs for coordination of trainings, local engagement of MACs as well as coordination and facilitation of MAC meetings (a major issue discussed – payment of travel and accommodation cost for MACs meeting and external stakeholders).

(ii) Day to day project operational support by national partners: Questions raised included the role of national coordinators, relationship with other partners – common list was to be clarified), and timing and nature of mid-term and end-term conferences.

(iii) Technical and Financial reporting: Prof. Emily Martin overviewed scheduling and responsibilities. The two very important reports highlighted were:

1. Report on identity and structure of MACs
2. Report on selected field sites for WP2-4

(iv) Partner timelines (ca. next 6 months)

1. 15 Dec – MAC participants' lists
2. Dec – PPT locations (village)
3. Dec 2020- March 2021 – Hiring of field teams
4. March-April 2021 – Field sampling trainings
5. May 2021 – Ethics Deliverables (D10.x)
6. June 2021 – Report on selected sited (D2.1)
7. July 2021 – Report on MAC identity and structure (D2.1)

20 Closing Ceremony

Dr. Mel Oluoch, Sasakawa Africa Association, gave the final remark, highlighting the project ambitious goals and strength of the consortium as well as necessity for good coordination and communication among the partners. During this session, the evaluation of the kick-off event was assessed via online survey. According to collected votes, the meeting scored 4.6 out of 5 (where 5 is the maximum value and 1 minimum value).

END