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PrAEctiCe

PRAECTICE

POTENTIALS OF AGROECOLOGICAL PRACTICES IN EAST AFRICA WITH A FOCUS ON CIRCULAR WATER-ENERGY-NUTRIENT SYSTEMS

D1.6 – Practice Abstracts - Batch 1

TIMELINE OF ACTIVITIES: M1-M42

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V1.3

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Abstract	After 18 months of implementation of the PrAEctiCe project, 10 Practice Abstracts have been generated. These Abstracts provide knowledge on agroecology stakeholders in East Africa, mechanisms for co-creating knowledge with stakeholders, agroecology practices including in integrated agriculture-aquaculture, development of an indicator framework for transition, design of a Decision Support Tool (DST) for farmers and their advisors, and living labs to experiment and develop agroecology practices in the circular water-energy-nutrient systems.
Keywords	Agroecology, Integrated Agriculture-Aquaculture Systems, Indicator Framework, Decision Support Tool, Living labs, East Africa

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NATURE OF THE DELIVERABLE	**R**	
Dissemination Level		
PU	Public, fully open, e.g. web (Deliverables flagged as public will be automatically published in CORDIS project's page)	X
SEN	Sensitive, limited under the conditions of the Grant Agreement	
Classified R-UE/ EU-R	EU RESTRICTED under the Commission Decision No2015/ 444	
Classified C-UE/ EU-C	EU CONFIDENTIAL under the Commission Decision No2015/ 444	
Classified S-UE/ EU-S	EU SECRET under the Commission Decision No2015/ 444	

*** R:** Document, report (excluding the periodic and final reports)
DEM: Demonstrator, pilot, prototype, plan designs
DEC: Websites, patents filing, press & media actions, videos, etc.
DATA: Data sets, microdata, etc.
DMP: Data management plan
ETHICS: Deliverables related to ethics issues
SECURITY: Deliverables related to security issues
OTHER: Software, technical diagram, algorithms, models, etc.

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Executive Summary

The PrAEctiCe project aims to develop a novel agroecology indicator framework focusing on circular water-energy-nutrient systems of integrated aqua-agriculture to facilitate a swift transition of smallholder farmers to agroecology. This will be achieved through seven critical activities; i) Mapping of agroecology stakeholders in East Africa; ii) Co-creation with stakeholders in the agroecology space in East Africa; Profiling of agroecology practices in East Africa; Development of an Agroecology Indicator Framework for East Africa; Development of a Decision Support Tool (DST) for farmers and agroecology advisors; Living Labs; and Training of farmers, agroecology advisors, and next generation of scientists.

After 18 months of implementation of PrAEctiCe, useful knowledge and data has been and is still being generated to bridge research and practice for farmers, private companies, researchers, and policy makers working in the field of agroecology in East Africa and globally. All this generated information has been packaged as Deliverable D1.6–Practice Abstracts-Batch 1 containing 10 Practice Abstracts in the European Innovation Partnership in Agriculture (EIP-AGRI) format.

Emerging as key practice knowledge points from the Abstracts are:

a) Traditional agriculture approaches practiced by smallholder farmers are compliant with several agroecology principles.
b) Context-specific strategies for mobilising more stakeholders beyond farmers to address the challenges are required.
c) Main challenges among stakeholders were limited access to agroecologically compliant inputs and knowledge, and limited access to better markets for agroecology products.
d) A simplified indicator framework relevant to the East African context and a user-friendly Decision Support Tool to facilitate smooth transition are required.
e) Guidance on how Integrated Agriculture-Aquaculture practices could operate more efficiently, helping local farmers diversify their food and income production will be developed and tested in the living labs.
f) The modular aquaponic system that efficiently balances the growth of plants and fish and efficiently enhance nutrient utilization to generate knowledge on the model that farmers can deploy will be tested in Kenya, Tanzania, and Uganda using low-tech installations, making them suitable for use in East African countries.

Other results from activities first four activities and results from activities five to seven will be presented in the second and third batches of Practice Abstracts to be submitted in the months M30 and M42 respectively.

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Abbreviations

Abbreviations	Meaning
ARDC	Aquaculture Research & Development Centre, Kajjansi, Uganda
D1.6	Deliverable 1.6
DST	Development of a Decision Support Tool
EIP-AGRI	European Innovation Partnership in Agriculture
EU	European Union
EU CAP	European Union Common Agriculture Policy
IAA	Integrated Aquaculture Agriculture
IDEA	Indicateurs de Durabilité d'une Exploitation Agricole (Farm Sustainability Indicators Method)
kW PV	Kilowatt Photovoltaic
kWh	kilowatt-hour
kWp	Kilowatt peak
MBR	Membrane Bioreactor
MESMIS	Manejo Ecológico y Sostenible de los Sistemas de Producción Agrícola/Ecological and Sustainable Management of Agricultural Production Systems
NARO	National Agricultural Research Organisation
NFT	Nutrient Film Technique
OASIS	Organisation of Agroecology and Sustainable Agriculture Systems

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PrAEctiCe	Potentials of Agroecological Practices in East Africa with a Focus on Circular Water-Energy-Nutrient Systems
R&I	Research and Innovation
SAFA	Sustainability Assessment of Food and Agriculture
SAFE	Sustainable Agroecosystem for Food and Energy
SIAF	Sustainable Intensification Assessment Framework
SOCLA	Sociedad Científica Latinoamericana de Agroecología/ Latin American Scientific Society of Agroecology Framework for the Study and Analysis of Food and Nutrition Security
TAPE	Tool for Agroecology Performance Evaluation

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1 Introduction

1.1. About the PrAEctiCe Project

The Potentials of Agroecological Practices in East Africa with a Focus on Circular Water-Energy-Nutrient Systems (PrAEctiCe) project was designed to help smallholder farmers in their transition to agroecology by testing and deploying locally relevant and profitable agroecological practices. The PrAEctiCe consortium aims to achieve this by developing a novel agroecology indicator framework focusing on circular water-energy-nutrient systems of integrated aqua-agriculture while keeping the needs of smallholder farmers at the center. Impacts of the various agroecological practices will be quantified in the local context, and the most promising approaches for integrated agriculture-aquaculture systems identified. Recommendations for maximum sustainable productivity in the circular water-energy-nutrient addressing climate change impacts in smallholder farming systems will be addressed.

These outcomes are designed to be achieved through 7 key activities.

a) **Mapping of agroecology stakeholders in East Africa:** This activity involves identifying the agroecology practitioners spanning the entire agrifood system in East Africa. Their roles and responsibilities, interactions among each other, challenges, capacity gaps and opportunities for accelerated transition to agroecology are to be profiled. The mapping would consider, the different agroecological zones in Kenya, Tanzania and Uganda, the different social and cultural settings as well as diversity of actors across the agri-food systems. The knowledge generated was designed to identify the most active and less active actors, assess the degree of interaction, identify capacity gaps, challenges, and opportunities, and design appropriate mechanisms to address them.

b) **Co-creation with stakeholders in the agroecology space in East Africa:** Important stakeholders in agroecology space will be engaged to jointly develop a sustainable path to accelerated transition to agroecology from the start of the project. They will be involved in the mapping of the practices, identification of the most relevant practices to the local context, development of the appropriate indicator framework, the capacities required and the necessary tools to facilitate accelerated transition. This activity responds to the co-creation of knowledge and participation principles of agroecology.

c) **Profiling of agroecology practices in East Africa:** Given the diversity of agro-ecological zones in East Africa and the many segments and actors in the agrifood systems, documentation of examples of best practices in agroecology are necessary. The examples provide an impetus to various actors who have not started the transition to initiate. In PrAEctiCe, there is a focus on agroecological practices in integrated aquaculture, which is relatively less widespread in East Africa, hence the need to provide examples to motivate more farmers and other actors in the agriculture and food systems to engage.

d) **Development of an Agroecology Indicator Framework for East Africa:** In recognition of the human & social values, culture, and solidarity economy elements, and the social values and diets, co-creation of knowledge, and land & natural resources governance

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principles of agroecology which all recognize the importance that context plays in accelerated transition, a locally relevant agroecology indicator framework will be developed.

e) **Development of a Decision Support Tool (DST) for farmers and agroecology advisors:** Given the complexity of agroecology practices, a tool to help farmers and advisors to monitor their farms and farmers respectively for accelerated transition to agroecology will be developed. The DST will be a digital tool co-designed with farmers and advisors and to monitor performance of various elements of the agroecology-based farms and provide real time advise on corrective actions to enable agroecology farms achieve maximum sustainable productivity.

f) **Living Labs:** Three living labs will be established in Kenya, Tanzania, and Uganda to test and co-create the most appropriate technologies in the circular water-energy-nutrient systems. The purpose of the living labs is to provide demonstration sites to unify scientific and local knowledge to test appropriate agroecology approaches, test the indicator framework, and validate the Decision Support Tool.

g) **Training of farmers, agroecology advisors, and next generation of scientists:** After the Indicator Framework, DST, and compendium of agroecology practices relevant to East Africa are developed, farmers, advisors and students will be trained on how to deploy or use the knowledge generated. For farmers and advisors, training of trainers approach will be deployed on courses such as integrated aqua-agriculture, and establishment of farms deploying circular water-energy-nutrient nexus. For researchers and students, exchange between African and European institutions across the disciplines under study in the project will be conducted.

1.2. About the Practice Abstracts

After 18 months of implementation of PrAEctiCe, useful knowledge has been and still being generated that will be helpful to bridge research and practice for farmers, private companies, researchers, and policy makers engaged in the space of agroecology in East Africa and globally. Deliverable D1.6 – Practice abstracts - Batch 1 summarizes the emerging knowledge generated and/or yet to be generated from the PrAEctiCe. It also provides a summary of knowledge that will be generated in the subsequent years and will be shared in Batch 2, and Batch 3 of the Abstracts. The purpose is to share results generated or yet to be generated from research and innovation (R&I) work, best practices and innovative solutions with farmers, advisors, rural communities, and innovative projects across the agroecology landscape. The ultimate outcomes are that the practical knowledge and research needs are eventually taken up by practitioners to accelerate their transition to agroecology in East Africa and across the globe where agro-ecological, social, and cultural conditions are similar.

The Abstracts are prepared according to the format of the European Innovation Partnership in Agriculture (EIP-AGRI). These formats provide for sharing main expected or results or outcomes of the activity. It also provides for main practical recommendation, the main added value, benefits, and opportunities to the end-user if the generated knowledge is implemented. The Abstract should also describe how the practitioners can make use of the results. The

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summary should be as interesting as possible for farmers/end-users, using a direct and easy understandable language and pointing out entrepreneurial elements which are particularly relevant for practitioners (e.g. related to cost, productivity etc). This format is defined by EIP-Agri and facilitates not only the exchange of knowledge, but also the contact between potential partners in innovation projects. It contributes to building up a unique repository of practical knowledge across the EU via the EIP-AGRI project database which supports the dissemination of results of all interactive innovation projects.

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2 The PrAEctiCe Practice Abstracts

Presented in the first batch of 10 Practice Abstracts are:

(i) the stakeholders engaged in agroecology in East Africa, the challenges they face and the most important solutions;

(ii) the important considerations when co-creating agroecology practices and mechanisms for accelerating transition to agroecology in East Africa;

(iii) the most common agroecology practices in East Africa;

(iv) the importance of integrated agriculture-aquaculture integration;

(v) agroecology indicator frameworks of relevance to the East African context;

(vi) the design elements and functions of the Decision Support Tool;

(vii) opportunities and challenges for sustainable aquaponic farming in East Africa; and

(viii) Living Labs on Renewable Energy Powered Circular Agriculture-Aquaculture Systems in Kenya, Tanzania and Uganda.

The first 3 Abstracts (i.e. i–iii) present the results of the activities that have been carried out. The last 5 Abstracts (i.e. iv–viii) present the foundations and expected results to be achieved from the activities to be completed. The results of the latter activities will be presented in subsequent batches of the Practice Abstracts.

The following Abstracts included in Sections 2.1 – 2.10 were submitted to the EU CAP Network through an email to AGRI-EIP-PRACTICE-ABSTRACTS@ec.europa.eu with a copy to innovation-knowledge@eucapnetwork.eu.

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2.1 Mapping of Stakeholders Engaged in Agroecology in East Africa

Practice "abstract" 1:	Mapping of Stakeholders Engaged in Agroecology in East Africa
Short summary for practitioners in English on the (final or expected) outcomes (800-1000 characters, word count - no spaces).	A mapping of stakeholders engaged in Agroecology in Kenya, Tanzania, and Uganda was conducted. Stakeholders and their interactions, constraints, and opportunities for accelerated transition were profiled. Producers and producer organizations, research and academia, consumer groups, development partners, and government agencies were the most common stakeholders. Producer groups were the most engaged given that traditional approaches to agricultural production already comply with several agroecology principles. Only extension and advisory services providers had a holistic understanding of agroecology while other stakeholders were aware of few elements. Main challenges among stakeholders were limited access to agroecologically compliant inputs and knowledge, and limited access to better markets for agroecology products. Accelerated transition to agroecology in East Africa requires development of a simplified framework relevant to local context, and creation of platforms for capacity development, access to inputs and knowledge, and awareness of the importance of and how to comply with agroecology principles.

2.2 Co-creation of Agroecology Knowledge with Stakeholders for Accelerated Transition to Agroecology in East Africa

Practice "abstract" 2:	Co-creation of Agroecology Knowledge with Stakeholders for Accelerated Transition to Agroecology in East Africa
Short summary for practitioners in English on the (final or expected) outcomes (800-1000 characters, word count - no spaces).	PrAEctiCe engaged stakeholders practicing agroecology to co-create mechanisms for accelerating transition to agroecology at scale in East Africa. Stakeholders expressed that agroecology is not a completely new concept. Its novelty is in the integration into one concept, all the sustainable agriculture elements from indigenous and scientific knowledge. It is thus important to build upon the knowledge and practices deployed by stakeholders as a starting point for transition at scale. Practical indicators, and extent to which a given stakeholder can be designated as practicing agroecology and not need to be defined. While developing new technologies, jointly defining the value proposition of the new technologies to different stakeholders, and engaging

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	them in the co-creation is important. Given the diversity of agro-ecological zones, social and governance settings in East Africa, technologies must be co-developed with the end-users to ensure that their context, capacities, and interests are taken into consideration. Technologies and innovations should be availed in a user-friendly format with options for continuous capacity building.

2.3 Mapping of Agroecological Practices in East Africa

Practice "abstract" 3:	Mapping of Agroecological Practices in East Africa
Short summary for practitioners in English on the (final or expected) outcomes (800-1000 characters, word count - no spaces).	A comprehensive analysis of agroecological practices in East Africa to facilitate accelerated transition was conducted. Mixed farming was the most practiced approach where multiple crop species and animal species/breeds are grown/reared concurrently to optimize land use and resources. Agroforestry, integrated pest management, soil and water conservation, integrated aquaculture-crop production etc. are being practiced. The documented practices are mostly traditional practices that are compliant with agroecology principles and elements. Advocacy for agroecology in East Africa has resulted into introduction of new practices such as permaculture, vermiculture. Major challenges include among others high labour intensity of existing practices, limited access to agroecology compliant inputs and knowledge, and limited access to markets that recognise the distinction between agroecology and conventionally produced farm products. Context-specific strategies for mobilising more stakeholders beyond farmers to address the challenges faced and enhance food security, farmer well-being, soil health and environmental conservation are necessary.

2.4 Integrated Agriculture-Aquaculture in East Africa

Practice "abstract" 4:	Integrated Agriculture-Aquaculture in East Africa
Short summary for practitioners in English on the (final or expected) outcomes (800-1000 characters, word count - no spaces).	Demand for animal protein in Africa is increasing. As agriculture is facing challenges of land scarcity and water shortage, it is important to support the agricultural sector with aquaculture. Aquaculture production in East Africa, has increased in recent years, responding to an increased demand for fish, however, the current production is still low

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	and struggles with several challenges. The concept of integrated aqua-agriculture (IAA) increases water efficiency and reduces the need for synthetic fertilizers. Through integration of aquatic and terrestrial components, incorporating fish, crops, and livestock, waste from one element serves as nourishment for another. IAA holds the potential for elevated sustainability, profitability, productivity, and resource efficiency, harnessing the full potential of water, land, and labour. The PrAEctiCe project will provide guidance on how these IAA could operate more efficiently, helping local farmers diversify their food and income production.

2.5 Screening and synthesis of existing Indicator Frameworks for Evaluating Sustainability of Agroecological Practices in East Africa

Practice "abstract" 5:	Screening and Synthesis of Existing Indicator Frameworks
Short summary for practitioners in English on the (final or expected) outcomes (800-1000 characters, word count - no spaces).	Agroecology holds great potential to address food system challenges and enhance food security in East Africa. However, the region's unique complexities require tailored indicator frameworks adoptable by smallholder farmers who are the main food producers in the region. The existing agroecological frameworks also fall short in addressing key aspects, such as aquaculture and the circular water-energy-food system, leading to a lack of evidence on integrated aqua-agriculture practices. The project evaluated various agroecological frameworks pertinent to East Africa, identifying nine promising candidates: SIAF, TAPE, Five-dimensional Presidia, IDEA, MESMIS, SOCLA, OASIS, SAFE, and SAFA. These frameworks underwent screening for applicability, practicality in data collection, socio-economic viability, and environmental sustainability, particularly in the East African context. These indicators will empower agroecology consultants and service providers to monitor the adoption of optimal agricultural methods, facilitating smallholder farmers in transitioning to agroecology.

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2.6 Development of a Decision Support Tool (DST) for Agroecology farmers and Advisors in East Africa

Practice "abstract" 6:	Development of a Decision Support Tool (DST) for Agroecology farmers and Advisors
Short summary for practitioners in English on the (final or expected) outcomes (800-1000 characters, word count - no spaces).	The PrAEctiCe Decision Support Tool is designed to help smallholder farmers in East Africa to effectively manage their farms and access advisory services through three end-user applications: indicator monitoring centre, advisory DST, and a mobile application. It will provide support to farmers and link them to advisors. A mobile application will provide farmers with monitoring and information gathering capacities. The application will capture farmers current practices, monitor the performance of the farms using predefined proxy indicators and satellite data for soil, water, and plants at farm level. In case of deviations from optimum measurements, the DST will provide warnings to the farmers with indications of the appropriate corrective actions and required budget. The agroecological advisors on the other hand will have a data-rich interface that allows them to monitor and manage multiple farms. An efficient alert system will keep them updated about potential issues detected by sensors, satellites, or farmers in each farm. The system will help farmers and advisors to address challenges as they emerge and smoothly and swiftly transition to agroecology.

2.7 Opportunities and Challenges for Sustainable Aquaponic Farming in East Africa

Practice "abstract" 7:	Opportunities and Challenges for Sustainable Aquaponic Farming in East Africa
Short summary for practitioners in English on the (final or expected) outcomes (800-1000 characters, word count - no spaces).	Agroecological farming approaches provide effective techniques to enhance food production while conserving the environment. In the context of increasing population and land size, producing food in soilless systems is a promising strategy for agricultural production since it utilizes less water than traditional agriculture. The limited expertise coupled with challenges related to changing customary practices undermine diffusion and adoption of this technology. Data and information about system design and environmental conditions to help local farmers to maximize production in their aquaponics operation is insufficient. In the PrAEctiCe, researchers are working on establishing modular aquaponic systems that efficiently balances the growth of plants and fish and efficiently enhance nutrient utilisation. To guide small-

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	scale farmers, three different modular aquaponic systems are being established that will deploy media-based culture, nutrient film technique, and deep-water culture. The developed modular systems use low-tech installations, making them suitable for use in East African countries.

2.8 Living on Renewable Energy Powered Circular Agriculture-Aquaculture System in Kisumu, Kenya

Practice "abstract" 8:	Living on Renewable Energy Powered Circular Agriculture-Aquaculture System in Kisumu, Kenya
Short summary for practitioners in English on the (final or expected) outcomes (800-1000 characters, word count - no spaces).	Living Lab 1 in Kisumu involves the construction and operation of two key systems: The construction of a membrane bioreactor (MBR) for domestic wastewater treatment and the design and installation of grow-out fishponds using the MBR permeate. For the construction of the MBR as much equipment as possible will be purchased locally. Local partners and students are involved in the whole process and will be trained. Various sensors will be installed to aid learning and feed the decision support tool. In addition, a photovoltaic (PV) system will semi-autonomously power the Integrated Aquaculture-Agriculture (IAA) facilities, addressing socio-economic needs and barriers in the East African region. The Living Lab also integrates organic fish feed production using Black Soldier Fly and vegetable intercropping with aquaculture, promoting land use efficiency and resilience to climate change. This holistic approach aims to overcome technological and socio-economic barriers, enhancing food security and economic growth while complying with regulatory frameworks.

2.9 Living Lab on Renewable Energy Powered Circular Agriculture-Aquaculture System in Kajjansi, Uganda

Practice "abstract" 9:	Living Lab on Renewable Energy Powered Circular Agriculture-Aquaculture System in Kajjansi, Uganda
Short summary for practitioners in English on the (final or expected) outcomes (800-1000 characters, word count - no spaces).	At Living Lab 2 in Kajjansi a PV system for semi-autonomous operation of Integrated Aquaculture-Agriculture (IAA) facilities will be developed, addressing socio-economic needs and barriers in East Africa. A circular water and nutrient management system will be installed for aquaponic systems using different techniques, such as a combination of deep-water culture and media bed as well as a NFT system. A low-cost sensor system will help to focus on optimal water quality

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	and nutrient balance. Validation of the PrAEctiCe Decision Support Tool (DST) will occur at the Aquaculture Research & Development Centre Kajjansi (ARDC, NARO), which will be adapted to Ugandan conditions and serve as a training centre. The living lab will experiment with various techniques, species, and materials to inform decision-making. By using fish tank effluent for vegetable growth and optimizing water-energy-nutrient resources, PrAEctiCe aims to address challenges in aquaponics adoption, including high water and energy bills. The installation of a 10 kW PV system with a 10 kWh battery and real-time water sensors will increase system resilience and efficiency of the system.

2.10 Living Lab on Renewable Energy Powered Circular Agriculture-Aquaculture System in Morogoro, Tanzania

Practice "abstract" 10:	Living Lab on Renewable Energy Powered Circular Agriculture-Aquaculture System in Morogoro, Tanzania
Short summary for practitioners in English on the (final or expected) outcomes (800-1000 characters, word count - no spaces).	In Living Lab 3, a 30kWp PV system will autonomously power Integrated Aquaculture-Agriculture (IAA) facilities, considering socio-economic needs and robustness. Two 10x20m fishponds will be constructed and floating PV panels in the ponds will increase electrical efficiency and reduce pond eutrophication. An integrated aquaculture-poultry system will use chicken manure as fish feed and irrigate the 1000m2 agricultural area of cash crops with nutrient-rich pond water. In addition, a biochar stove will produce biochar from agricultural waste, benefiting the environment and agriculture by reducing fertiliser use and improving soil fertility. Validation of PrAEctiCe DST will take place in Tanzania, integrating fish-poultry-vegetable production for food security and sustainability. Solar PV, satellite observation and sensor technology will improve agricultural efficiency and impact assessment, ensuring compliance with farm-to-fork principles and sustainable food systems.

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3 Conclusions

Presented in this first Batch of 10 Practice Abstracts are results from the 7 main activities of the PrAEctiCe project: i)Mapping of agroecology stakeholders in East Africa; ii) Co-creation with stakeholders in the agroecology space in East Africa; iii) Profiling of agroecology practices in East Africa; iv) Development of an Agroecology Indicator Framework for East Africa; v) Development of a Decision Support Tool (DST) for farmers and agroecology advisors; vi) Living Labs, and vii) Training of farmers, agroecology advisors, and next generation of scientists. The first 4 Abstracts present parts of the results from the first 3 activities – stakeholder mapping, co-creation workshops, and profiling of agroecology practices in East Africa.

Emerging as key practice knowledge from Abstract 1–4 are the following.

- Smallholder holder producers are the largest stakeholder category practicing agroecology since traditional forms of agriculture are compliant with several agroecology principles. Though not novel, agroecology principles are holistically understood by only extension and advisory services providers.
- Context-specific strategies for mobilising more stakeholders beyond farmers to address the challenges faced and enhance food security, farmer well-being, soil health and environmental conservation are necessary.
- Main challenges among stakeholders were limited access to agroecologically compliant inputs and knowledge, and limited access to better markets for agroecology products.
- A simplified framework relevant to the East African context, and creation of platforms for capacity development, access to inputs and knowledge, and awareness of the importance of and how to comply with agroecology principles are required.
- While developing new technologies, jointly defining the value proposition of the new technologies with the different stakeholders, and engaging them in the co-creation is important. The technologies and innovations should be availed in a user-friendly format with options for continuous capacity building.
- Mixed farming was the most practiced approach where multiple crop species and animal species/breeds are grown/reared concurrently to optimize land use and resources. The documented practices are mostly traditional practices that are compliant with agroecology principles and elements. Novel knowledge driven techniques that facilitate mass production to feed the growing population are required.

The subsequent 6 Abstracts present the expected results to be achieved from month M19–M42. Some the expected results include.

- Guidance on how Integrated Agriculture-Aquaculture practices could operate more efficiently, helping local farmers diversify their food and income production.
- How to deploy IAA to harness its potential for enhancing sustainability, profitability, productivity, and resource efficiency, harnessing the full potential of water, land, and labour.

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- Agroecology Indicator framework with clear indicators that will empower agroecology consultants and service providers to monitor the adoption of optimal agricultural methods, facilitating smallholder farmers in transitioning to agroecology.
- A Decision Support Tool (DST) designed to help smallholder farmers in East Africa to effectively manage their farms and access advisory services through 3 end-user applications: indicator monitoring centre, advisory DST, and a mobile application. The DST will provide warnings to the farmers with indications of the appropriate corrective actions and required budget based on predefined proxy indicators and satellite data for soil, water, and plants at farm level.
- The PrAEctiCe project is establishing a modular aquaponic system that efficiently balances the growth of plants and fish and efficiently enhance nutrient utilization to generate knowledge on the model that farmers can deploy. The system is being tested in three living laboratories in Kenya, Tanzania, and Uganda using low-tech installations, making them suitable for use in East African countries.
- In Kisumu, Kenya, the Living Lab will use a membrane bioreactor (MBR) for domestic wastewater treatment to be fed into fishponds. Various sensors will be installed to aid learning and feed the decision support tool. In addition, a PV system will semi-autonomously power the Integrated Aquaculture-Agriculture (IAA) facilities. The Living Lab also integrates organic fish feed production using Black Soldier Fly and vegetable intercropping with aquaculture.
- In Uganda, a PV system for semi-autonomous operation of Integrated Aquaculture-Agriculture (IAA) facilities is being developed. A circular water and nutrient management system will be installed for aquaponic systems. A low-cost sensor system will help to monitor water quality and nutrient balance. A 10 kW PV system with a 10-kWh battery and real-time water sensors will be used to power the system.
- In Tanzania, a 30kWp PV system will autonomously power Integrated Aquaculture-Agriculture (IAA) facilities. Two fishponds will be constructed and floating PV panels in the ponds will increase electrical efficiency and reduce pond eutrophication. An integrated aquaculture-poultry system will use chicken manure as fish feed and irrigate the 1000m^2 agricultural area of cash crops with nutrient-rich pond water.

Other results from activities i-iv, and results from activities v-vii will be presented in the second and third batches of Practice Abstracts to be submitted in months M30 and M42 respectively.

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