#7480 SMARTAFRIHUB FOR SMART AGRICULTURE CAPACITY BUILDING IN AFRICA

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ABSTRACT

Digital Innovation Hubs (DIH) are multi-actor ecosystems that support farming communities in their digital transformation by providing a broad variety of services from a one-stop shop. Besides providing access to digital technologies and infrastructure, DIH can be considered as a social space for a community of practices that helps in networking and connecting users and suppliers of digital innovations.

With the aim to bring together IT suppliers, the farming sector, technology experts, investors, science and technology, public bodies, and other relevant actors to understand and solve real life problems and challenges of the African farmers, SmartAfriHub[1] DIH was developed and launched at Nairobi[2] and Kampala[3] INSPIRE Hackathons to support the knowledge transfer and innovation between the ICT, farming communities and public bodies in Africa. These days, SmartAfriHub supports the development of African Agriculture Knowledge and Innovation System regionally and nationally.

This article presents a concept and strategy in which Digital Innovation Hub - SmartAfriHub, series of INSPIRE Hackathons and practice-oriented and research-driven Innovation Experiments build capacity and impact on the systemic change underlying the patterns, structures and mindset of African agriculture.

INTRODUCTION

Precision agriculture is an important component of the third wave of agricultural revolution and has enhanced hopes of battling food crises by increasing global food production with the help of new technological advancements [1].

SmartAfriHub started as a tool to provide farmers with the information to detect and prevent crop disease, weeds and insect damage based on weather forecasts gathered from aerial surveillance during the Nairobi INSPIRE Hackathon 2019 and Kampala INSPIRE hackathon 2020. The technology was then further developed by adding visual layers from satellites, planes and drones and leveraged with AI capabilities. Acknowledging that smart farming can create a massive impact on the agricultural economy in the near future and will be dependent on precision technologies gave room to integration of SmartAfriHub where new innovations were developed to tackle Africa agricultural problems.

Facing the African agricultural problems, capacity building is essential to foster the co-creation to find solutions that lead to emerging practices to advance agriculture and give farmers precise information. SmartAfriHub DIH has transformed through the INSPIRE hackathons into a capacity building tool that enables sharing the knowledge and ideas about

[1] https://www.smartafrihub.com/
[2] https://www.plan4all.eu/nairobi-inspire-hackathon-2019/
[3] https://www.plan4all.eu/kampala-inspire-hackathon-2020/

initiatives and technologies so that researchers and practitioners in developing countries can benefit.

At the end, the capacity building activities, embracement of emerging technologies, and advanced communication, dissemination and innovation in the long term boost a digital transformation and systemic change in agriculture- and food systems towards food security sustainability. The interventions are addressed on the intangible patterns, structures and people's mindset which have an impact on the way the farm in Africa.

MATERIALS AND METHODS

INSPIRE Hackathons - A Platform for Capacity Building and Innovations Prototyping

Starting in 2016, the INSPIRE Hackathon concept was born as a means to support sustainability and implementation of results of the European Commission Research Framework Program FP7 and H2020 and also to bring together different project communities to facilitate transfer of technology and knowledge between the projects, and eventually also to organizations and companies [2-3].

Capacity Building - To Pave the Path to the Systemic Change

In general, hackathon is a lab and platform for agriculture innovation experiments which aim to find solutions to real-life problems, leverage ambitiously scientific results to practice, and to apply open innovation practices that rely on co-design, co-creation and sharing (Figure 1). Capacity building is one of the core values and principles of INSPIRE Hackathon. It is integrated into all phases of the hackathon: challenges definition, solution ideation, solution piloting, team activities, webinars, communication and dissemination by using SmartAfriHub and social media.

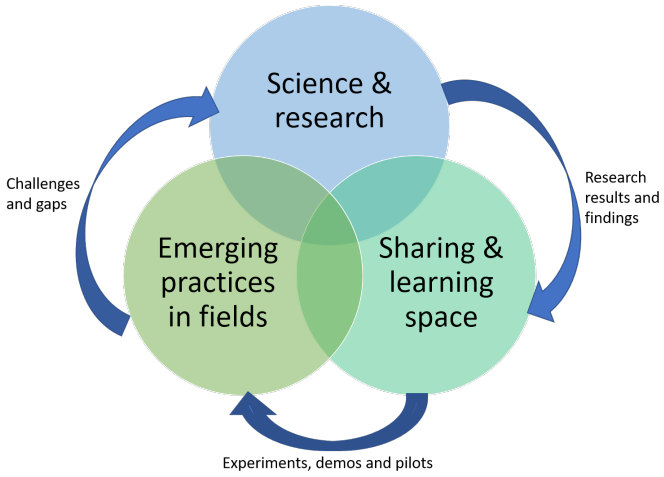

Figure 1. Practice-oriented learning and co-creation pattern

INSPIRE Hackathon Innovation Experiments to Support African Agriculture

INSPIRE Hackathons carry out Innovation Experiments to change agriculture practices, underlying patterns of behaviour, the structure of the system and mental models. Such Innovation Experiments form a unique intellectual knowledge hub and social space that leverages scientific results, non-formal learning and co-creation patterns to new knowledge and practices and concrete technical results.

Overall, 18 Innovation Experiments (IEs) were defined to tackle the African agricultural problems so far (in the Nairobi INSPIRE Hackathon 2019, Kampala INSPIRE Hackathon 2020 and COVID-19 INSPIRE Hackathon 2020).

Agricultural & Earth Observation IEs

- Food Security in Relation to Earth Observation (GEOSS and COPERNICUS Relevance)
- Agriculture Innovation Hub for Africa
- Citizen Science in Africa to Ground Truth & Exploit Earth Observation data
- SmartAfriHub
- Desert Locust [4]
- EO4 Food Security
- Digitalization of indigenous knowledge in African agriculture for fostering food security
- Developing a blockchain technology to enhance tracking and tracing of food items throughout the value chain to ensure food security in Africa

Climate data IEs

- Climatic Services for Africa
- Climate change trends for Africa

Open Data & Technologies IEs

- Open Land Use for Africa (OLU4Africa)
- IoT Technologies for Africa
- Open Data and Data Sharing in Agri-Food Chains in Africa
- Smart Points of Interest - Publication of Open Data in Africa as 5-star Linked Open Data
- Open Transport Map (OTM) Applications for Africa
- Text Mining & Metadata
- Ethical and legal aspects of open data affecting farmers
- Interchangeable map compositions in support of collaborative spatial intelligence

Systems Thinking - To Understand the Agriculture World

According to Waters Center [5] systems thinking is “a transformational approach to learning, problem-solving and understanding the world”. The approach monitors what is tangible, seeable and what has really happened, but above all systems thinking aim is to grasp what is under the water surface; what is unseen, what are the patterns of behaviour, how the system is structured, what factors are influencing into the patterns, and what assumptions, beliefs and values do people hold about the system.

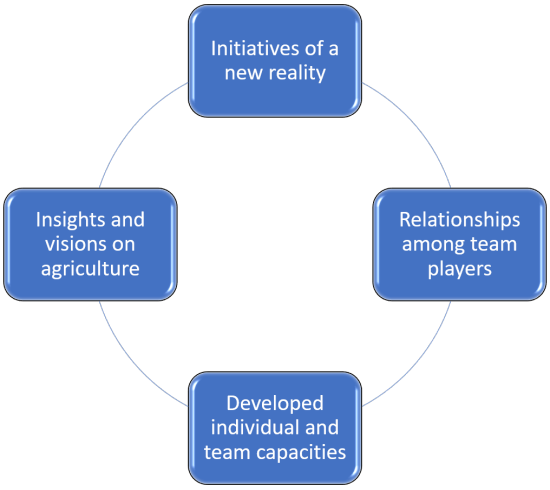

Figure 2. Hackathons' outcomes that advance systemic change

INSPIRE Hackathons generate intermediate outcomes that together help to achieve systemic change into the agricultural domain. The main outcomes are (Figure 2):

- Extends and deepens understanding into the current and potential state of the system
- Seeks solutions and answers to true everyday challenges of agricultural practitioners
- Strengthens liaison among the hackathon participants
- Develops individual and collective capacities

SmartAfriHub - A Platform for Knowledge Transfer

The accelerator for launching the SmartAfriHub DIH was the Nairobi INSPIRE Hackathon organized by Plan4all association in 2019. The intention was to develop an agriculture innovation hub for Africa, that becomes a social space for the African agriculture community to share knowledge and experience between farmers, industry, research community, advisory services and others involved. During this hackathon, an initial analysis was carried out, first technology solutions were drawn and the first release version of SmartAfriHub was launched.

A large community around the SmartAfriHub formed already during this hackathon and one year later, in the fully virtual Kampala INSPIRE Hackathon 2020, there was a huge interest of the hackathon participants and organisers in developing tactics on how Communities of Practices of agriculture and digital technologies could "seek, sense and share" needs, problems and knowledge at SmartAfriHub and deliver value to community members, farmers and society of African countries. Another goal was to explore and test the available SmartAfriHub applications with the help of a mentor. As the result of this hackathon was the increase of interest in SmartAfriHub DIH by Communities of Practices RUFORUM - Regional Universities Forum for Capacity Building in Agriculture[4], RCMRD - Regional Centre for Mapping of Resources for Development[5], GODAN - Global Open Data for Agriculture & Nutrition [6], P4CDA -Programme for Capacity Development in Africa[7] and Plan4all [8] that support the SmartAfriHub ambition.

[4] www.ruforum.org
[5] https://www.rcmrd.org/
[6] https://www.godan.info/
[7] https://p4cda.net/
[8] www.plan4all.eu

SmartAfriHub provides a variety of applications and tools, eg. HSlayers NG enables the creation and sharing of map compositions, JupyterHub for data cleaning, exploration, analysis and visualization, statistical modeling and simulations or Layman QGIS plugin that allows to create and edit layers and create map composition structures on local stations that are possible to upload to the server. The available tools that support the Digital Innovation Hub in being a community building are for example Blog, Wiki, Forum, Library and Science Shop. Nowadays, SmartAfriHub is a technical platform for Communication & Dissemination & Exploitation and Tools for Global Geospatial Information Management (GGIM).

RESULTS AND DISCUSSION

SmartAfriHub platform facilitates building a Community of Practice (CoP) on Precision Agriculture in Africa.

SmartAfriHub platform embraces systemic change by sharing insights, tools, methods, best practices and connections on how CoP of agriculture and digital technologies could explore needs and problems, share knowledge at SmartAfriHub and deliver value to community members, farmers and society.

SmartAfriHub embraces open innovation, open data, open sources and open dialogue CoP of Africa agriculture. The platform and the community are the key components for development of African Agriculture Knowledge and Information System.

The social spaces which are realized both in SmartAfriHub and in INSPIRE Hackathons enhance capacity development and particularly informal life-long learning.

The virtual and 3 months lasting hackathon journeys in which the communication took place over several digital channels was tested also in the COVID-19 lockdown period. This test proved that remote- and distance learning methods and tools are becoming mainstream.

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