

**Tsinghua University Certificate Program**

**“Innovation & Entrepreneurship for Digital Economy”**

**PROJECT TITLE**

**THE BENEFITS OF SMART FARMING: WHAT PERSPECTIVES FOR DEVELOPING COUNTRIES?**



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# I. Context and Objectives of the Project

The global objective of this project was to investigate the benefits of smart farming techniques, and how they could boost agricultural yields so as to enable developing countries meet the demands of their growing population.

We focused on African countries due to the fact that the continent is barely beginning to get familiar with smart farming techniques, meanwhile according to analyses by the African Development Bank, one quarter of the world's population is expected to reside in Africa by 2025.

Specific objectives included:

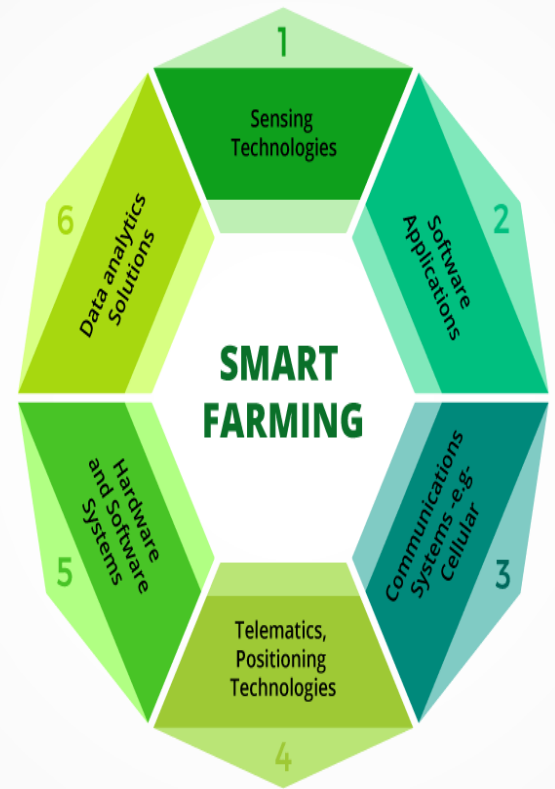
- Present agricultural trends in Africa as a whole, supported by country-specific data from Cameroon and Mali
- Propose some strategies for the effective use of smart farming techniques in African economies that are still lagging behind in terms of innovation in the agricultural sector.

## II. What is Smart Farming?

Smart farming is agriculture that integrates information and communication technology into machinery, equipment and sensors in agricultural production systems, and allows for the generation of a large volume of data and information with the gradual introduction of automation into the process.

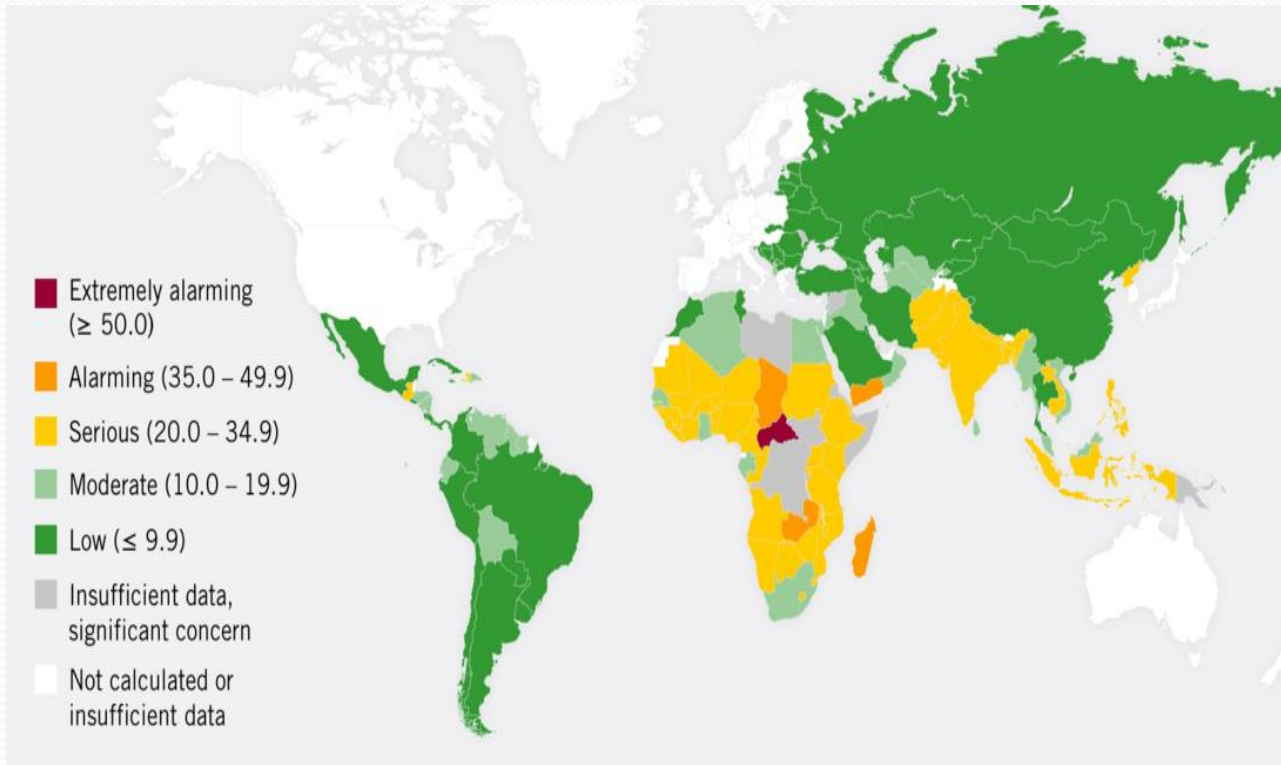
It is dependent on data transfer and data aggregation in remote storage systems that allow for the combination and analysis of different farm data for decision making.

New technologies such as the Internet of Things (IoT) and Cloud Computing are expected to positively influence this development and introduce more robots and artificial intelligence in farming.



# III. The African Context

More than half of working Africans have jobs in agriculture, but poor infrastructure, inadequate tools and a lack of investment have left the continent's mostly small-scale farms struggling to feed a growing population. This explains why in 2017, Africa spent US\$64.5bn on importing food, a number that has the potential to increase year after year as the population expands. Smart technology solutions could be at the heart of empowering Africa's agricultural sector, turning it into a major source of commercial advantage for the continent.



*The 2019 World Hunger Index of the WHO illustrated in the map here beside, situates Africa as the continent with the most alarming scores.*

*It incorporates four component indicators:*

- Undernourishment,*
- Child wasting,*
- Child stunting, and*
- Child mortality.*

# IV. Country-Specific Realities

## ❖ The Case of Cameroon

- Cameroon has been experiencing a complex humanitarian crisis since 2013 with the number of food insecure people doubling since 2015 from 1.1 million to 2.7 million.
- Currently 57% of rural people live in poverty. This is partly due to the Lake Chad crisis that has seen unsustainable water management and climate change reduce the lake's surface area by 90%.

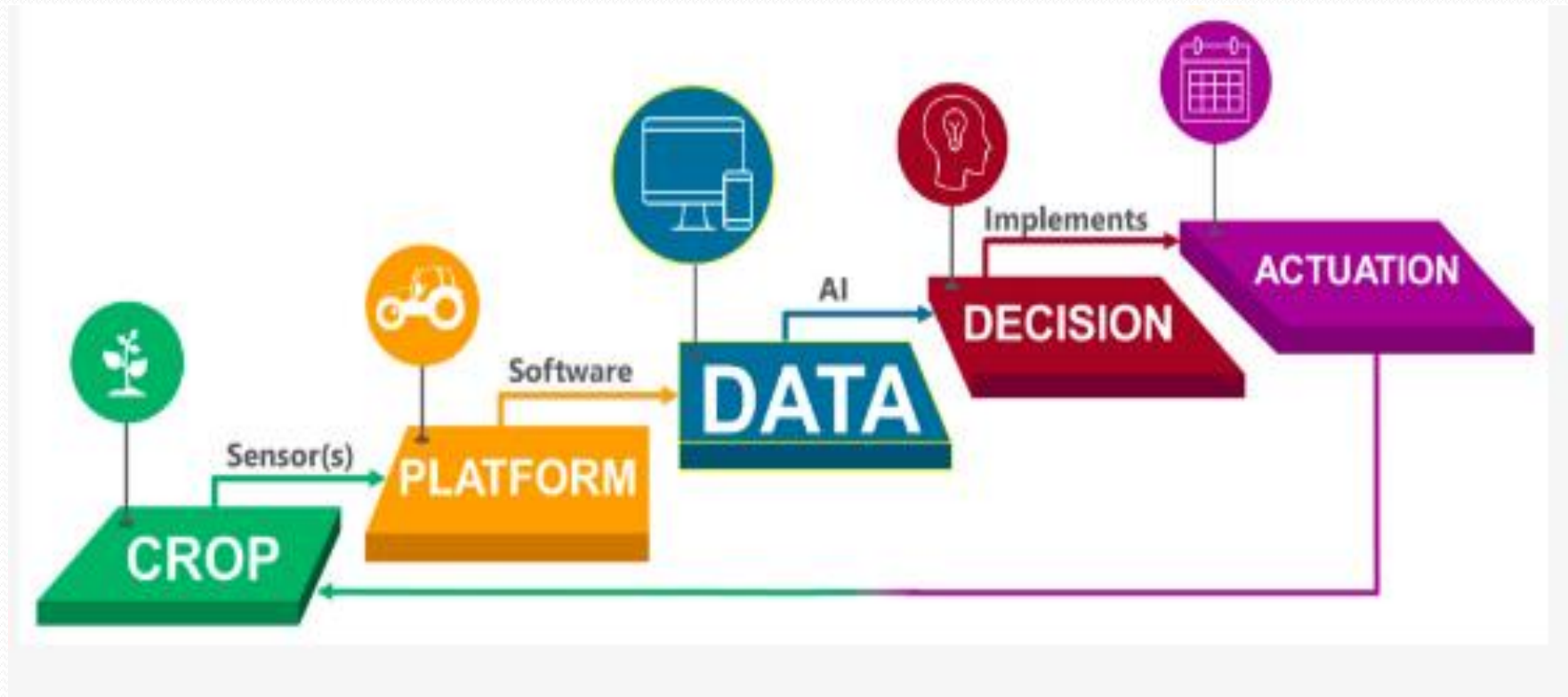


## ❖ The Case of Mali

- In Mali, three-quarters of the country's 15.3 million people rely on agriculture for their food and income.
- With 80% of its population engaged in agricultural activities, the sector is the cornerstone of Mali's economy and holds great potential for driving economic growth.
- Over 29% of the population is malnourished. Low productivity, post-harvest crop losses, under-developed markets, and vulnerability to climate change are some of the major challenges which need to be addressed for Mali to become food secure and benefit from more broad-based economic growth.
- Approximately 65% of Mali's land area is either desert or semi-desert, and less than 4% is used for farming to grow crops.
- Mali is located in the eastern Sahara in northeastern Africa is particularly noted for its world sunshine records. The area experiences some of the greatest mean annual duration of bright sunshine, as the sun shines bright during approximately as much as 4,300 hours a year, which is equal to 97% of the possible total. This region also has the highest mean annual values of solar radiation (over 220 kcal/cm<sup>2</sup>).

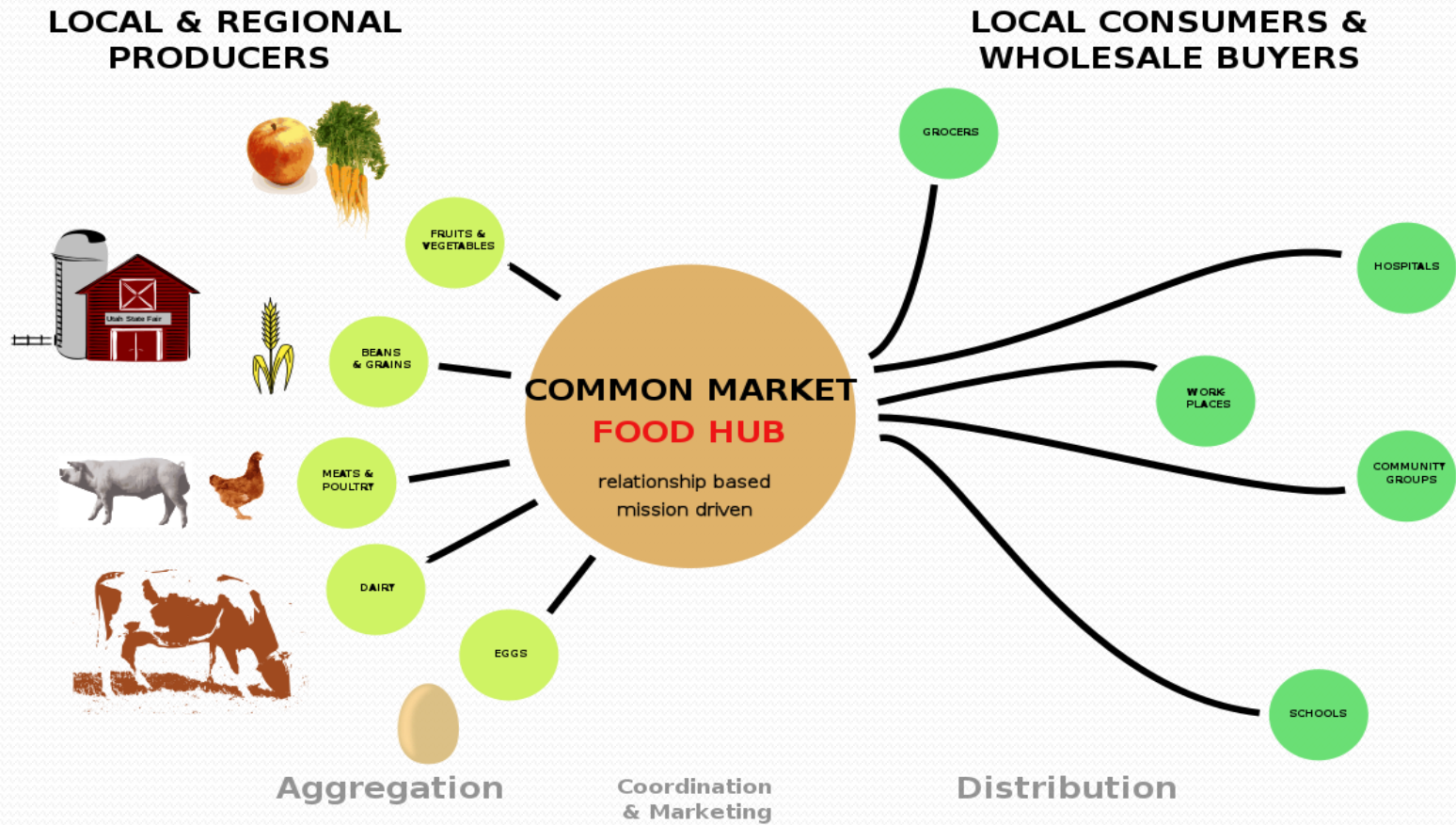
# V. How Digital Technologies can Help Africa's Smallholder Farmers

## ❖ Information-based Management Cycle for Advanced Agriculture

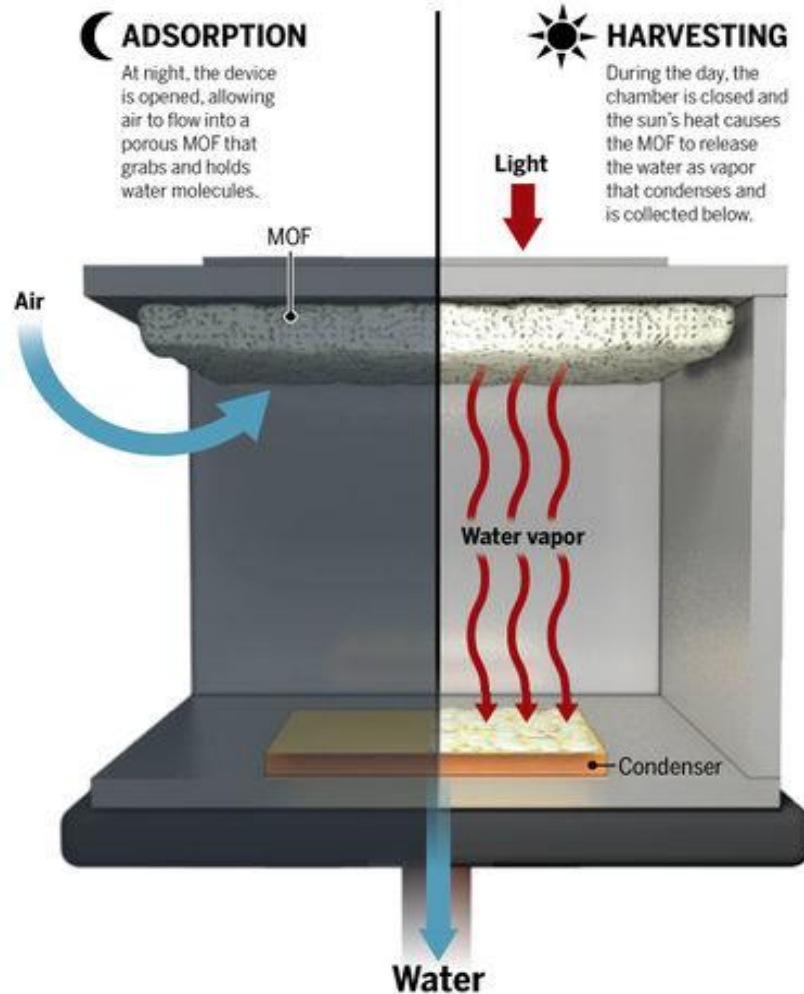




# ❖ Innovating the Agricultural Value Chain



## ❖ A Solar Water Maker



An innovative solar water maker powered by solar panels. This water maker functions in two stages:

### ▪ Absorption

At night, The device is opened , allowing air to flow into a porous MOF that grabs and holds water molecules.

### ▪ Harvesting

During the day, the chamber is closed and the sun's heat causes the MOF to release the water as vapor, which passes through the condenser and produces water.

# VI. Concluding Remarks

While it is still early to evaluate the impacts of this digitalization of farming systems in Africa, in terms of productivity and improvement of human welfare, there is already a promising trend: technology is making farming exciting for young people.

The Food and Agriculture Organization (FAO) has identified seven critical factors of success and challenges that have to be taken up in making ICTs available and accessible for farmers and rural communities namely:

- *Capacity development;*
- *Content;*
- *Gender and diversity;*
- *Access and participation;*
- *Partnerships;*
- *Technologies;*
- *Economic, social and environmental sustainability.*