SMART AGRICULTURE

ECSEL JU Symposium

New horizons for the ECSEL JU Programme

Christoph Schmittner
RISING WORLD POPULATION

World population is increasing faster than arable land
RISING WORLD POPULATION

Population growth

- Developed
- Other Developing
- Least Developed
- World

Arable land

- World
- Developing countries
- Developed countries

High Level Expert Forum - How to Feed the World in 2050
DIETARY CHANGES

What’s on the world’s menu

Daily calories per person by type of food

- Cereals, roots and pulses
- Sugar
- Vegetable oils
- Meat
- Dairy
- Other

Year

1970
1990
2010
2030
2050

Source: FAO

18/06/2018
LABOR FORCE

Labor Force in 1990

Labor Force in 2017
LABOR FORCE

Number of people employed in agriculture since 1800
The total number of individuals in agricultural employment across select countries from the year 1800.

Source: Our World In Data based on Herrendorf et al. (2014)

CLIMATE AND AGRICULTURE

IMPACTS OF CLIMATE CHANGE

By 2030, nine out of 10 of the major crops will experience reduced or stagnant growth rates, while average prices will increase dramatically as a result, at least in part, due to climate change.

https://farmingfirst.org/sdg-toolkit#section_1

Global Greenhouse Gas Emissions by Economic Sector

- Electricity and Heat Production: 25%
- Industry: 21%
- Agriculture, Forestry, and Other Land Use: 24%
- Buildings: 6%
- Transportation: 14%
- Other Energy: 10%
- Other: 10%

CHALLENGE

• Produce more food with
  • Less arable land
  • Less economical impact
  • Less worker
SMART AGRICULTURE

IoT

Safety & Security

Sensor Technologies

Execution

Data acquisition

Low Power

Big data

Planning

Data analysis

Autonomous systems

Decision support

Artificial Intelligence

Interoperability

Human-Machine Interaction

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Farming as a Service

Collaboration

Sensor

Livestock & Crop

Farming Framework

Safety & Security

Automated systems
AFARCLOUD - AGGREGATE FARMING IN THE CLOUD

- Ease and aggregate solutions for the agriculture environment characterization
- Facilitate the creation of hierarchical mission plans involving elements working in an autonomous manner
- Efficient use of the available farming vehicles by means of a “sensing-on-the-move” approach
- Improvement of traditional business models and development of new ones
- Demonstration of efficient and feasible solutions in real application scenarios
IOT AND SENSOR TECHNOLOGIES

- Energy Efficiency
- Secure Communication
- Reliability
- Resistant against environmental factors

Smart Sensors
AUTOMATED SYSTEMS OF SYSTEMS

- Automated and collaborative
- Safe and secure
- Dynamic environment

U.S. agricultural robots market by product, 2014 - 2025 (USD Million)
By Grandviewresearch
INTEGRATED CONTROL-DECISION LOOP

Soil structure, fertility

Crop growth, fertilization, Soil preparation

Weeds, Insects, Irrigation, Diseases

Storm, Hail

Long cycles

Yearly cycles

Short cycles

24h cycles

Control

Decision Support

Actor

Sensor

Weather

GNSS

On-Field Sensors

On-Animal Sensors

Climate

Earth Observation

AfarCloud Platform

Actor

UAV

Farming Robots

Irrigation

Fertilizer

Forage

Illumination

Agriculture

Livestock

Crop

“Lot size one”
AFARCLOUD PLATFORM
Afarcloud:
Project Coordinator:
José-Fernán Martínez, Jf.Martinez@upm.es
Austrian Cluster:
Christoph Schmittner, Christoph.Schmittner@ait.ac.at
Start (planned): 01.09.2018
Duration: 36 months