Challenges for Introducing Precision Agriculture in Albania

Endrit Kullaj
AUT
OBJECTIVES

• NEXUS implementation as a cross sectorial interlinkage with Precision Agriculture Practices in Albania

• Build a road map on how should Albania adapt the implementation of the different PA practices

• Adjust a pre-feasibility study on the application of PA technologies in pilot locations in Albania.
Actions

• Mapping the related national and local *strategies, plans* and *support schemes*
• Engage National *Stakeholders* in the Project Development and Implementation of PA
• Describe and Propose technical solutions for 3-4 different *pilot sites* depending on crop, irrigation and other farming inputs
• Propose *funding and budget* alternatives
Actual Situation

- Agriculture production dominant by smallholders
- Extremely small and fragmented fields (average size of 1.2 ha)
- Labour deficiency due to low mechanization
- Poor Irrigation and Drainage infrastructures – Maintenance Problems
- Land Ownership Problems and Migration of young farmers
- Lack of Market opportunities
- Regional Divisions by Crops: (ATTC & AREB)
  - Shkodra – Medicinal and Aromatic Plants & Maize
  - Lushnja – Vegetables & Wheat
  - Vlora – Olive orchards, grapevine and fruit trees
  - Korca – Apples and cherries
Current Policy, Strategies and Action Plans

- SARDF is aligned with CAP and Green Deal
- SARDF states “precision agriculture and digitalisation in agriculture are still rarely applied”
- Implementation of Irrigation and Drainage Strategy 2019-2031 increasing resource-efficient irrigated land
- **MARD** Action Plan for 2022 – 2024: providing advice for farmers and the rural development/demonstration farms
- IPARD III (Strategy 2021-2027) : PA investments for fruits and vegetable farmers, related to precision agriculture
Processes and analyzes temporal, spatial and individual data and combines it with other information to support management decisions.
Precision Agriculture Technologies – Satellite Imagery

- Free resources from Copernicus (Sentinel 2)
- Ready available outputs – Vegetation Index NDVI
- 1 image per week (average)

Applications:
- Crop growth monitoring
- Harvest date decision
- Variable rate application of inputs
- Larger scale analysis for crops and drought
Crop growth monitoring - Grapevines

Limitations:
- Row crop – high % of soil cover is between rows and the proportion of vines/cover crop changes along the year
- Sentinel 2 imagery has a minimal pixel of 10 m

Benefits:
Possible to identify differences of cover-crop development at early stages and early canopy senescence
Variable rate application of inputs – Colza
Total area of 15 ha
Map represent variable doses of nitrogen for application
Precision Agriculture Technologies – Satellite Imagery
Precision Agriculture Technologies – Drone Imagery

Advantages over Satellite:
- Much higher resolution (cm level)
- Fly when want and “under clouds”
- Commercial available options

Disadvantages:
- Investment cost
- Operation constraints (know-how, risk evaluation)
Precision Agriculture Technologies – Irrigation Management

Soil monitoring sensors:
- Soil water content monitoring;
- Define when and how much to irrigate
- Manage the irrigation system according to crop water requirements

Plant monitoring sensors:
- Adding an extra layer of information
- Manage crop stress in real time
Project Progress...

1. Key National Actors and Stakeholders:
   - Government, public agencies and institutions
   - Academic and research institutions
   - NGOs, organizations and farmer associations
   - Private service providers involved in digitalization of agriculture

2. Online Survey
   https://docs.google.com/forms/d/e/1FAIpQLScsHiu1v5XeKpBLc0PGBWaYQC0r9vgpK5LbnqXiKjRmYo-CbQ/viewform
According to the Survey and the Stakeholders Consultation:

i. Just a very small percentage of the farmers are aware and use/adopt PA. These are mainly bigger producers in vegetable and/or apple farms.
ii. Which kind of PA was more encouraged through information/training/advisory activities?

- Global Navigation Satellite System (GNSS) - all navigation satellite systems
- Controlled Traffic Farming (fixed tracks on your field to avoid compaction)
- Yield monitor
- Parcel boundary mapping with GNSS or with Integrated Administration & Cont. System
- Airborne imagery made with drones
- Variable rate technology – fertilization
- Variable rate technology - crop protection
- Variable sowing / planting
- Precision mechanical weeding (e.g. with the help of camera support)
- Crop sensors
- Weather station in the field
- Irrigation at the field level
- Precision irrigation in management zones
- Soil moisture sensors
- Soil scanners
- Satellite imagery
iii. What factors influence farmers' adoption of PA in your territory?

- Environment – climate reasons (e.g. less water pollution, improved soil quality): 4 (28.6%)
- Efficiency gains (e.g. less production costs, less time spent on field work): 9 (64.3%)
- Improvement of labour conditions (e.g. better working conditions for employees): 7 (50%)
- Support to farming decisions through better data and information: 5 (35.7%)
- Introduction of innovative practices: 7 (50%)
- I do not know: 0 (0%)
iv. How would you assess the potential effects of PA on labour at farm level?
According to the Survey and the Stakeholders Consultation:

v. Are farm Management Information Systems used by farmers in your territory?

- Input (fertilisers, plant protection products etc.) record keeping
- Nutrient management plan (including both mineral fertilisers and manure)
- Soil management plan (e.g. direct to improve soil conditions and fertility)
- Carbon management plan (e.g. carbon management through holistic farming practices)
- Other types of sustainability management plan
- Harvesting – Marketing tools or information
According to the Survey and the Stakeholders Consultation:

vi. Are there any systems providing information to improve decision making for farmers?
Key findings

- Less than 25% of the farmers are aware of the precision agriculture existence.
- Pioneer examples already exist and show benefits in terms of production, safe water and labour force.
- PA shows to be adequate tools in improving labour condition and making agriculture attractive for new generations.
- Both public and private sector show a lack in capacity building, in expertise and agronomist specialized in PA adaptation techniques, capable to transfer and share these tools to the farmers.
- There is a policy support to introduce digitalization in agriculture, smart farming and PA technologies. These technologies will be eligible for support under the national scheme and IPARD funding.
- There are already private service providers offering PA related services to agricultural enterprises but the costs are still high.
Next Step...

3. Workshop with stakeholders to discuss on proposed pilots from Project team
   - Academic and research institutions
   - NGOs, organizations and farmer associations
   - Private service providers involved in digitalization of agriculture
Some ideas for smart farming research and demonstration activities planned to take place at DEF/AUT
It offers best conditions to be a pilot for several facets of precision agriculture, i.e. fertiliser application, seeding, crop protection, irrigation and soil cultivation

- Normalized Difference Vegetation Index (NDVI),
- Vegetation Conditions Index (VCI)
- Temperature Conditions Index (TCI)
- Vegetation Health Index (VHI)
In cooperation with ASIG GEOPORTAL, this ATTC could make available various SUITABILITY MAPS for agricultural purposes.

- hyperspectral remote sensing data for the classification of soil types and the measurement of soil total nitrogen (TN) content
- diagnosis, climate change effects and agricultural shocks, soil degradation, soil erosion, soil carbon, crop insurance and environmental hazards (i.e. floods)
Considering the special focus on water in agriculture and irrigation, for fruit trees the Pilot will establish correlations between the different vegetation indices obtained by multispectral satellite imagery and the agronomic parameters at the orchard level:

- continuous stem potential measurements (Florapulse water potential sensors);
- dendrometric measurements;
- water content measurements (capacitive probes).
Multispectral drone imagery can also be used for the estimate of biophysical and geometrical parameters of olive trees under different irrigation regimes. This can help identify regions of unequal development of trees and further investigate the causes but also for early warning of sanitary issues and changes in plant development. Assist in planning of:

- replanting, pruning, thinning;
- pesticide applications
- determining harvesting date
Other uses of high-definition drone imagery can include fruit counting and estimation of production yield by plant/row with the assistance of deep learning image classification algorithms.
Other uses of high-definition drone imagery can include fruit counting and estimation of production yield by plant/row with the assistance of deep learning image classification algorithms.

3D view of point cloud of apple orchard; top right – apple fruit identification; bottom left – fruit count by tree; bottom right – fruit count by row.
Precision Agriculture AL

Thank you for your attention!