

Open–Source and Shared Tools for Small Farms

2.4.2



Dear students, welcome to the second chapter! Small and medium-sized farms often face budget or capacity limitations when adopting new technologies. However, open-source tools and shared economy models offer practical ways to access digital solutions without high investment.

This section highlights real examples of accessible tools and collaborative approaches that support data-driven, connected farming – especially relevant for small-scale operations.



Study text

Open-Source Platforms and Free Data

FarmBot: A DIY open-source CNC farming robot for small garden plots, enabling automated seeding, watering, and weeding.

AgroSense: An open-source farm management system built for Eastern European conditions (field diaries, crop monitoring, inputs).

OpenWeatherMap: Free weather data APIs used in dashboards and alert systems for farmers.

Sentinel Hub / EO Browser: Provides access to NDVI and thermal satellite data for crop health monitoring.



Shared Platforms and Equipment-as-a-Service

The sharing economy is bringing a new dimension to agriculture – allowing small farmers to access machinery, technology and expertise without the need for ownership.



ONDO Smart Farming: Offers sensor kits and control panels for greenhouses and field crops; used by small farmers and cooperatives.

Agroop (Portugal): Plug-and-play sensors + cloud-based platform for irrigation and environmental data; available via service contracts.

Tun Yat (Myanmar): Platform for renting tractors, harvesters, and sprayers via mobile app – a concept adaptable for EU farmer groups.

TROTRO Tractor (Ghana): Mobile-based machinery-sharing platform – an inspiration for similar collaborative models in Europe.

Context and problem:

In many developing countries, such as Ghana, smallholder farmers cannot afford to own a tractor or other mechanization. The result is lower productivity, dependence on manual labor, and reduced competitiveness. A similar situation can occur in rural regions of Europe, where technology is lacking either due to cost or lack of shared structures.

Solution:

The TROTRO Tractor platform functions as a digital marketplace that connects farmers without their own equipment with tractor owners willing to rent equipment. It works similarly to the Uber service – the farmer places a request via a mobile app, the system operator assigns a machine with an operator, and the tractor arrives at the field at the specified time.

The farmer pays for the service based on the time and area used.

Data on the work performed is shared via the application, allowing you to monitor performance and plan next steps.

Results:

In Ghana, more than 35,000 farmers have gained access to machinery thanks to this service. There was an increase in harvests by up to 40%, a reduction in the time required for plowing, and higher efficiency in land use.

The position of women and young people in rural communities has also improved, as they can order the service without complicated negotiations or ownership of machinery.



 Proposed solution for Europe:

The “shared tractor” model for small organic farms:

- **An association of small farmers (e.g. a MAS or a cooperative) will create a common fleet of basic machinery (small tractor, mulcher, harvester).**
- **Equipment is reserved via a simple web platform – members pay according to usage.**
- **Operation and maintenance costs are budgeted based on annual usage.**

Possible benefits:

- **Reduction of equipment costs by up to 60% compared to purchasing your own equipment.**
- **Greater self-sufficiency in the community.**
- **Better work planning thanks to digitalization and data sharing (via GPS and IoT sensors).**

 **The main idea? You don't have to own everything to start a farming business. Collaboration and sharing are the way to sustainable and affordable farming.**

Software solutions and farm management: – A digital assistant in your pocket

 What can software do on the farm?

- **Crop rotation planning**

The applications allow you to record what, when and where was sown, what varieties were used and when to expect the harvest.

- **Monitoring plodding**

The user can record growth stages, observed pests or diseases, and add photos.

- **Animal feeding and treatment records**

In animal production, applications help track which animal received what, what treatment was performed, and when further intervention is needed.

- **Evaluation of revenues and costs**

The applications allow you to clearly track yields by field, crop, or season and compare them with the costs of seeds, fertilizers, labor, etc.

- **Notifications and calendars**

Applications will remind you of the date of fertilization, vaccination or irrigation.

→ **Examples of available applications (suitable for small farmers)**

Application name	Key features	Language / availability	Offline mode	Price for small farms
<u>CleverFarm</u>	Maps, sensors, records, weather	Czech	partly	free up to 3 fields [WEF, 202]
<u>FarmLog</u>	Yields, crop rotation, weather, mobile app	English	yes	free version [AgFunderNews, 2022]
<u>AgriApp</u>	Cultivation, weather, advice, market prices	English (India)	yes	free [ICRISAT, 2023]
<u>Cropwise Operations</u>	Satellite imagery, input planning	multiple languages	no	limited free version [Cropio, 2023]
<u>AgriWebb</u>	Records in animal production	English	partly	free trial [AgriWebb, 2024]

Summary:

- **Using IoT on a small farm does not mean expensive technology.**
- **The combination of sensors, mobile and open software can significantly increase efficiency.**
- **Thanks to open-source tools, farmers can create a tailor-made solution.**
- **The most important thing is to start simple – for example, with one sensor or mapping fields.**

Practical Tips for Small Farms

- **Start with one small tool – e.g. a moisture sensor and a basic app.**
- **Check local cooperatives, pilot projects, or Erasmus+ platforms offering shared digital tools.**
- **Use GitHub, open data portals, and open-source communities to find tools maintained by farmers and developers.**

Conclusion

Open technologies and cooperative models lower entry barriers. They enable even small farms to participate in the digital transition – without needing to own or maintain the entire infrastructure themselves.

In this final chapter, we explored how small farms can go beyond data collection and build simple, connected systems that save time, reduce input costs, and protect the environment.

You've seen that precision farming doesn't have to mean complex, expensive technologies. Even basic combinations of sensors, mobile apps, and automated systems – many of which are open-source or service-based – can bring real benefits to farms with limited resources.

Real-life case studies show that connected solutions are already in use on organic, fruit, greenhouse, and dairy farms. Many of these systems have one thing in common: they were designed to solve a specific problem – irrigation, greenhouse control, pest detection, or herd health monitoring – with a practical and affordable setup.

The examples also demonstrate that sharing tools, platforms, or data can help farms access innovation without owning everything themselves. This is particularly important for smaller or family-run farms, where every investment must be well thought out.

