2.2

Automated Documentation of Arable Crop Farming Processes

LOCATION

Germany

PARTNERS

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CHALLENGE

Today, agricultural processes are often documented with a considerable time lag after they are carried out, leading to inaccuracies. In addition, the cost of a job depends on various factors like the fuel consumption of a machine, labour time, and the efficiency of the job with regard to the weather conditions. Due to these influences, and others, occurring over a period of several months, farmers and contractors cannot assess the total cost of a job. Most farmers mainly rely on themselves and their resources for documentation, impairing the quality and quantity of the outcome.

AIM

This pilot will develop an automated job identification and documentation, and job cost calculation for fertilisation, tillage, seeding, and spraying applications. This will largely eliminate the need for manual documentation.

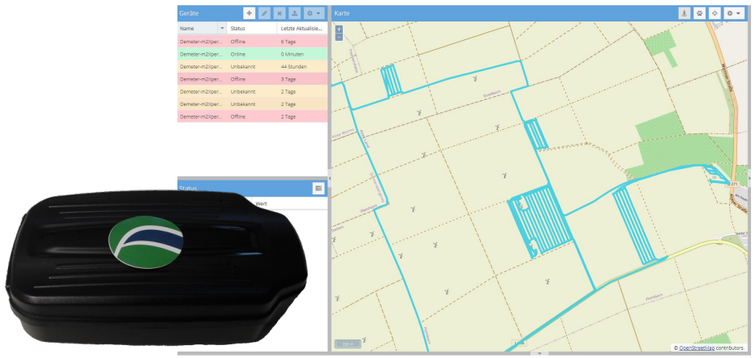
HOW

The focus of the job cost calculation element of the pilot will be on fertilisation and spraying applications for winter wheat. These jobs are done several times in the year and will therefore deliver more data than seeding or harvesting, which are only executed once per field.

For the development of an automated documentation tool, the detection of the difference between fertilisation spraying, tillage and seeding jobs will be the most challenging part of job identification. It is based on sensor data from machines and external sensors such as satellites (e.g. sentinel) and on data from weather stations.

Position and movement data are analysed for automatic process identification. Other external data like the seasonal date of measurement for estimating the relevant process season and weather data or satellite images for checking the plausibility of processes are added. This system is to make process forecasts for automated documentation.

Furthermore, this pilot will make use of data quality assessments to support the development, and to further increase the quality, of these data-driven services.



BENEFIT

Given the many factors influencing a profitable job application, the abovementioned approach delivers three major benefits. On one hand, job cost prediction has the potential to increase farmers' and contractors' productivity. In addition, the automated job documentation and collected weather information will improve decision support. Finally, automated documentation will help in terms of time efficiency and precision of the process.

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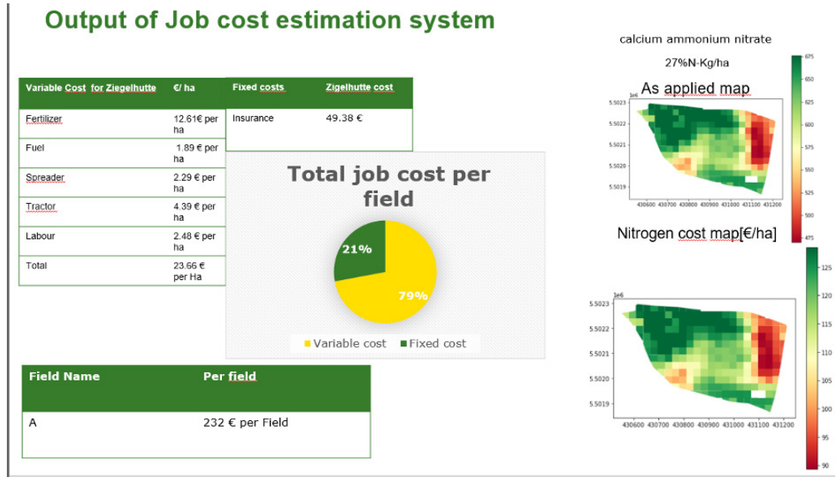
DEMETER Integration

The pilot tracks machinery movement data and tries to identify the process for an automated documentation which will replace manual documentation. By utilizing smart analysis of GPS positional data over time and circumstantial data of agricultural processes the system is trained to understand patterns of movement and agricultural processes. The system then translates these into ready-made decision templates by which the farmer can validate an already-documented process supplied by the engine saving substantial amounts of time. First, the pilot uses the 'Data Quality Assessment' (DQA) enabler for structured data for the data analysis pipeline to ensure adequate quality of gathered and monitored data.



Feedback From Farmers

Throughout the project, there was a regular exchange of feedback and interaction between agricultural experts and the pilot members. The feedback on the solution in development was consistently positive. Even if an automated system has a few bugs at the beginning, they will see great benefits of timely documentation. Most of the time, farmers only know approximately what they did at what time in the fields therefore measuring and documenting the approximate time. By using this solution, even if the system has only an 80% hit rate in process recognition, the date and duration of the process is 100% correct. In case of a misinterpretation, the error can easily be corrected by the farmer. Thus, one initially has a support function which was welcomed very positively by the end user. Test farmers see great potential in a future version, but it must be seamlessly integrated to fulfill its potential.

Outcomes

With further training of the algorithms and linking the results to external process data, the automation success will continue to increase. The solutions developed can improve efficiency and overall experience for the farmer. Job cost prediction has the potential to increase farmers and contractors' productivity. In addition, automated job documentation and collected weather information will improve decision making while automated documentation will enhance both efficiency and precision. Providing the output data in a DEMETER AIM compliant format could make it possible to visualize the results of the analysis using the DEMETER Adaptive Visualization Framework increasing interoperability for future applications. In summary, the data from the GPS-Logger and its visualisations and analysis provide a simple and intuitive overview of farming processes.