

Sustainable Agriculture through ICT innovation

Quo vadis, Landwirtschaft? - Outlook on the support of Austrian farmers by modern IT-systemsGregor Neumeyer, M.Sc. ¹

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ABSTRACT

Agriculture in Austria is currently facing many challenges. Innovative products, the increase of efficiency and the careful use of resources are the critical prospective factors for further success. In order to meet these requirements it is more than necessary for Austrian farmers to intensify the usage of modern IT systems.

Taking this hypothesis as a basis, the present paper, supported by declarations of farmers, manufacturers of agricultural machines and IT-service providers, describes which systems are currently available on the market and how these modern IT systems can support Austrian farmers in the near future.

The conducted market analysis shows that nowadays there are already many IT systems which cover different realms of agriculture. In the future, IT in agriculture will be affected by topics like integration of operating data as well as traceability and sustainability of agricultural products, amongst other things. Based on these subject areas, two possible future scenarios are described which illustrate how IT can be best used in the agriculture of the future.

Keywords: Modern it-systems in agriculture, traceability and sustainability, erp-system, market analysis, future scenarios, outlook, austria

1. INTRODUCTION

Agriculture in the EU is suffering enormous pressure of price on the world markets. Especially for the Austrian agriculture, historically grown in small structures, it gets very hard to continue using the food production methods from the last decades. One consequence out of this is the continuous decrease of agricultural businesses in Austria. (Bundesministerium für Land- und Forstwirtschaft, Grüner Bericht, 2011)

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As the increase of the utilized agricultural area is not possible anymore, Austrian farmers need to find other ways into a successful future. Innovation, increase of efficiencies and the sustainable use of resources could be factors of success. (Bundesministerium für Land- und Forstwirtschaft, Grüner Bericht, 2011)

The Austrian agriculture, as an important economic factor, already realizes the importance of modern IT-Systems for improving the competitiveness, but the implementation is still ongoing and not finished at all. The innovative capacities that already exist in the IT industry need to be utilized. To use these potentials extensive know-how and especially the support of all involved stakeholders is needed. (e.g. Das iGreen Projekt, 2011),

This scientific work shows how Austrian agriculture can be supported by modern IT-systems in the near future. The farmers are placed in the focus of all these considerations. During their daily business they have many interfaces to a multitude of stakeholders, which cooperate and support them. It will be shown, from their point of view, which of these interfaces are already supported by modern IT-systems and how a future support could look like.

The analyses of the current state as well as the outlook on possible, future applications are innovative parts of this paper. Especially the active involvement of all stakeholders and the direct consideration of the farmers' opinions during all scientific stages are unique characteristics. There is no comparable, public work, with such a focus on Austrian agriculture, known by the author.

2. RESEARCH DESIGN & METHODS

The goal of this paper is to show, from the view point of Austrian farmers, how agricultural businesses can be supported by modern IT-systems. The first step of the research is the analysis of the systems which are already available for farmers and how they are working. Taking this as a basis, future possibilities and visions for an innovative agriculture are shown.

Based on that, the main research questions for the paper are:

- Which IT-systems are currently supporting Austrian farmers?
- How can Austrian agriculture be supported by modern IT-systems in the future?

To answer these questions the qualitative research approach has been chosen. The main research method is the problem-centered interview. The author decided for this approach because qualitative research gives the possibility to be more flexible at finding answers and possible future scenarios.

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Figure 1 shows the applied research process, which will be described in detail below.

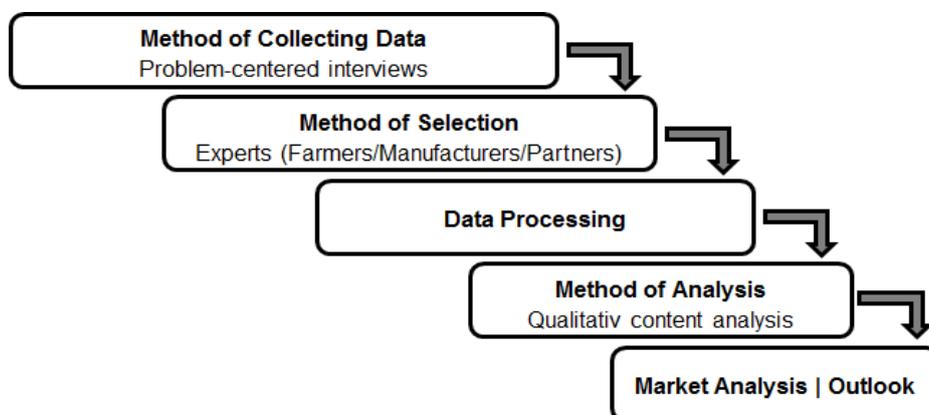


Figure 1. Applied research process

Problem-centered interviews with 14 experts are accomplished. Experts are farmers as well as software producers and other partners like legal institutions. (6 farmers and 8 partners) The interviews are recorded and transliterated. This data is then analyzed, structured and summarized with the method of qualitative content analysis to use it as an input for the market analysis and the outlook. The market analysis answers the first research question about the current situation, whereas the outlook answers the second research question about the future on IT in Austrian agriculture.

3. RESULTS

The results of the scientific research can be split in three parts.

- The market analysis shows the current structure of the market for agricultural-used IT-systems as well as examples for relevant IT-systems and vendors in Austria.
- The outlook demonstrates the future of Austrian agriculture in general and the future of IT in Austrian agriculture in detail.
- The future scenarios present two possibilities on how modern IT-systems could support Austrian famers in the future.

3.1 Market Analysis

On the Austrian market for agricultural-used IT, several IT-systems and vendors show up. Although the market is slightly growing, it needs to be developed as it is not very mature yet. The market can be split in four major groups.

- General standards define for example data exchange languages and hardware interfaces used in the whole branch. Two main standards should be mentioned here: ISOBUS – a standard for the data-exchange between

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agricultural machines (Rothmund & Wodok, 2009) and AgroXML – a data-definition for the data-collection and data-exchange between FMIS and pre- and post-agriculture businesses (Kuratorium für Technik und Bauwesen in der Landwirtschaft, 2010).

- Software producers are focused on the development of software and IT-systems for agricultural use. This group is relatively small but very flexible and innovative. Relevant vendors for Austrian farmers are: Active-IT, LBG-CD, Insyde KG, LAND-DATA, ProGIS.
- Federal institutions execute the laws given by the government or the European parliament meaning that they develop eGovernment systems for the whole country like Agrarmarkt Austria or LFRZ (Land-und forstwirtschaftliches Rechenzentrum)
- Agricultural Machinery Manufacturers are the big players on the market. Most of them have subsidiaries focused on innovative IT-solutions for agriculture as CLAAS Agrosystems or Fendt-AGCO.

3.2 Outlook

The results of the problem-centered interviews are the basis for this outlook, which means that all statements below are based on the views of the interviewed experts. The outlook can be split into two parts: future of Austrian agriculture in general and IT in agriculture in detail.

3.2.1 Austrian agriculture in General

This section gives an outlook on the Austrian agriculture in general and focuses on four major categories.

Structural changes

Due to the current cost pressure which exists in the food sector, there will be a structural change in the Austrian agriculture. Although there is the political will to protect the small-structured Austrian farms, the trend to more acreage per farm will be consistent in the future. This change gives, from business perspectives, the chance to produce more efficiently and therefore be more cost competitive on the market.

Specialization of small farms

Small and family-run structures will also have a chance to survive in the future. Their advantages are the possibility of specialization, flexibility and the production of high quality products. Also the increasing demand of organic farming presents a possible success factor for small agricultural businesses. (Willer & Klicher, 2009) If they focus on their strength, Austria will still have many small farms in the future.

Quality awareness of the consumer

One critical factor for the future of Austrian agriculture is the buying pattern of the consumer. If the quality awareness of the consumer will increase in the future, Austrian

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farmers have the chance to focus on one of their strengths: the production of high quality products. Rethinking about food quality will be also triggered by the latest food scandals.

Cost awareness of the farmer

To be more competitive on the market, Austrian farmers will increase their professionalism from a business point of view. One important topic here is the cost awareness of the farmer. Many especially small agricultural businesses are not aware of the importance of cost accounting, which leads to inefficient production processes.

3.2.2 Agriculture and IT

This section gives an outlook on the future of IT in Austrian agriculture and focuses on six major categories.

Integration of data

The digital collection (e.g. directly on the field/cattle) and integration of data on the farm to a central data/information platform is the main topic for most of the interviewed experts. The real-time availability of all relevant information is a critical factor for successful decision making. Although there are already many applications that cover nearly all relevant areas of an agricultural business – central data storage and integration is missing. This makes many current solutions not user-friendly. One requirement for an integration of data on the farm will be the increased usage of already existing standards like ISOBUS or AgroXML.

Traceability and sustainability of agricultural goods

Through the increase of quality awareness, traceability of agricultural goods along the food production chain and sustainable production will be claimed by the consumer. These two topics can only be realized (especially for larger farms) with the usage of IT-systems to track and document all related information. This is already important today, but will, in consequence of the ongoing structural changes, be more important in the future.

Precision Farming and automatization of agricultural production processes

Considering the increase of efficiency in agricultural production, precision farming is a logical consequence for Austrian farmers. Even though the interviewed experts are not sure if precision farming is only useful for large farms, it will be an important topic in the future. One barrier for the implementation of precision farming (like automatic steering) is the heterogeneity across current available solutions and machines.

Accounting and cost control

Due to the increased cost awareness of the farmers, account and cost control will be more important in the future. There are many software solutions already available on the market, but especially small agricultural businesses do not use them. This will change in the future, probably also due to new legal constraints.

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Mobile information access

Following the general trend on mobile information access also agriculture will intensive the usage of mobile solutions. Not only accessing information on mobile devices, but also the documentation of data is a possible use case. (Thinus, 2011) Also from the view point of a consumer of agricultural goods, mobility is an interesting scenario. (e.g. access information about product they want to buy directly at the store)

Usability of software

Usability (like mobility) is a general trend and will be more important for agricultural software as well. Especially because the user group of agricultural-used IT-systems is extremely heterogeneous.

3.3 Future Scenarios

Based on the results of the qualitative content analysis of the interviews and the outlook, two main topics about IT and agriculture are identified by the author: The integration of data on the farm and the retraceability along the food production chain. This leads to two future scenarios which will be described in the following sections.

3.3.1 Central “ERP-System” for farms with interfaces to external partners

The first scenario is mainly based on the challenge of data integration and describes an ERP-system for farmers.

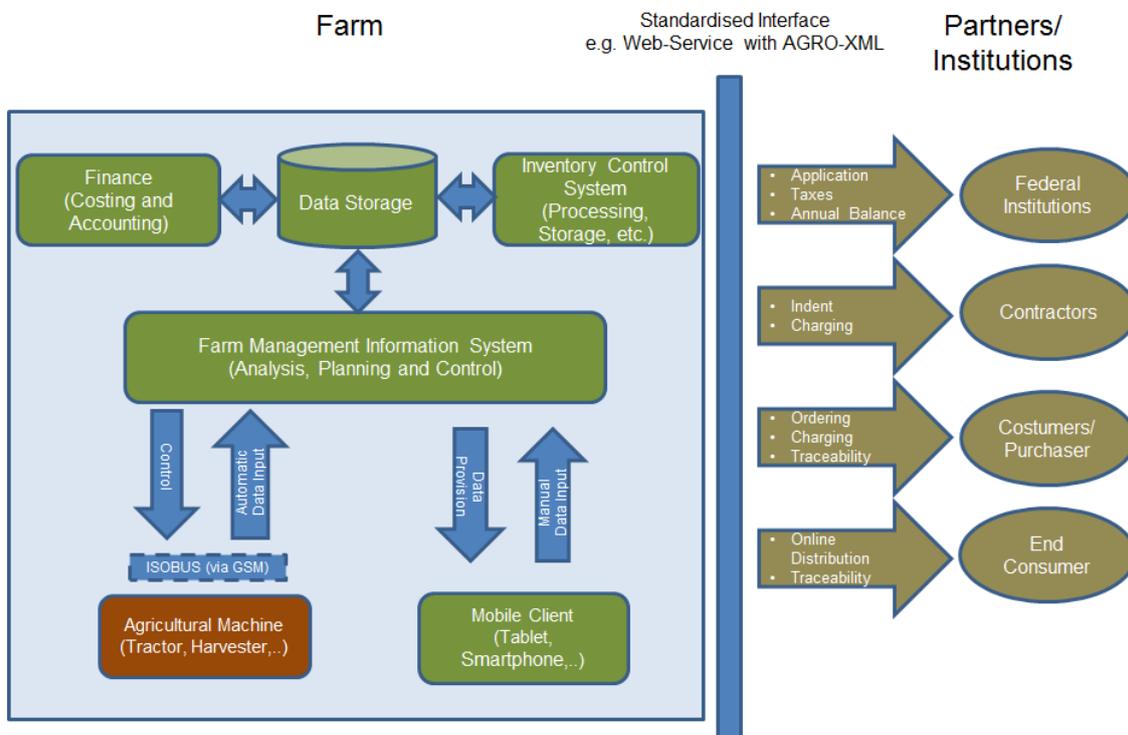


Figure 2. Central “ERP-system” for farms with interfaces to external partners

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The heart of the system is a central data storage and modules like Finance, Inventory and FMIS make it easy to analyze, plan and control all processes on the farm. The data is tracked automatically on the field and can be accessed through mobile end devices giving the farmers the possibility to access information directly where needed. Additional to the central data storage, standardized interfaces (e.g. with AGRO-XML) to external partners like legal institutions or contractors make automatic data exchange possible. Figure 2 demonstrates all details of the described system.

3.3.2 IT-platform for traceability and quality improvement of agricultural goods

The second scenario is mainly based on the challenge of traceability and sustainability along the food production chain.

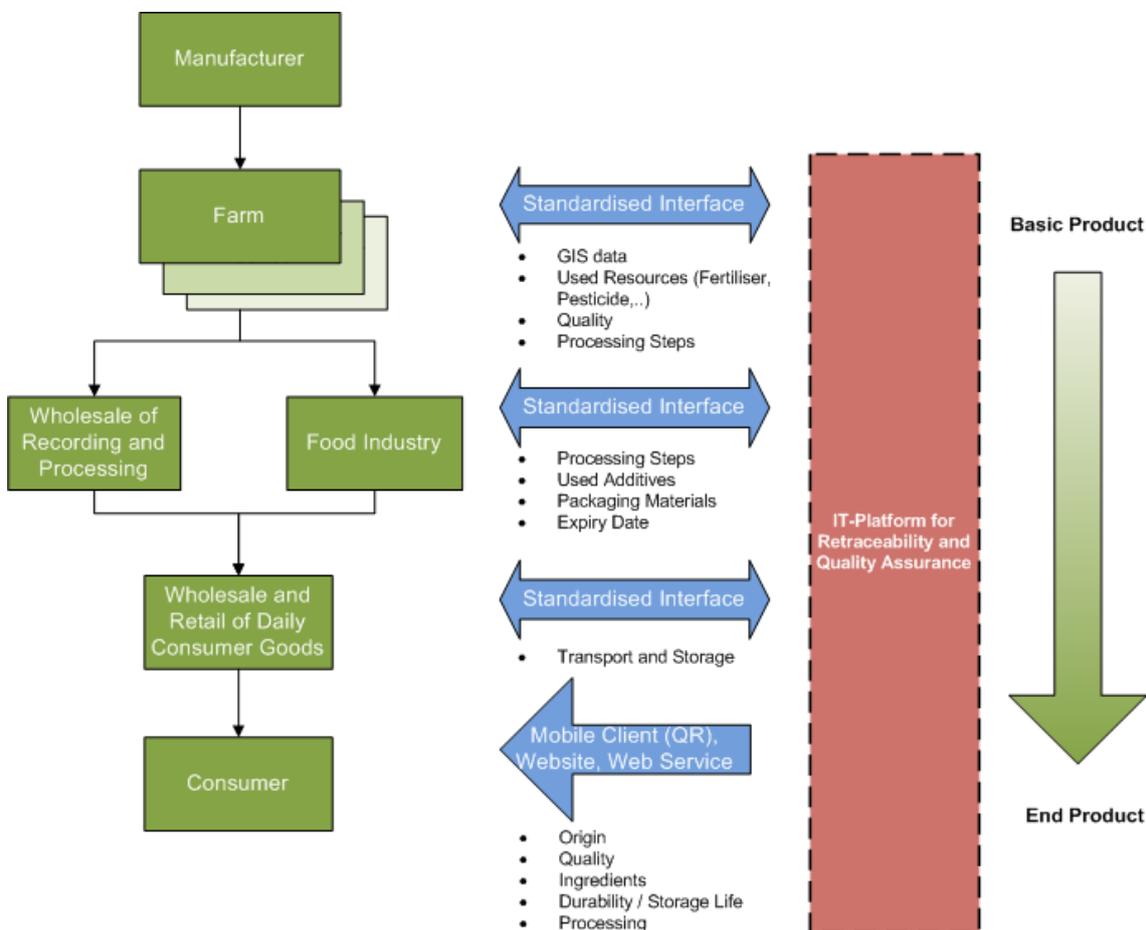


Figure 3. IT-Platform for traceability and quality improvement of agricultural goods

It describes a central IT-platform where all contributors of the food industry share information about their specific step in the food chain. Starting from the farm over the

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food processing companies to the retailers. The information shared with the platform can be for example: geographic data, quality, used resources (e.g. pesticides) and packaging material. At the end, the consumer can access the collected information of the product intended to buy, for example via mobile devices at the food store. This gives a full traceability of the food chain and will improve the sustainable producing of agricultural goods through improved quality awareness of the consumers. Figure 3 demonstrates all details of the described system.

4. CONCLUSION

To conclude, let me say that Austrian agriculture, embedded into a common European Agricultural Policy, is facing major challenges. It will be a balancing act between improvement of efficiency due to the increase of acreage per farm and the improvement of quality by innovation and specialization of small farms. Modern IT-Systems are essential to overcome these challenges. This was proven by the statements of the interviewed experts. The deployment of already existing IT-systems and the integration with independent standards needs to be pushed to come up with the requirements of future farm operators. To achieve this, the involvement of all stakeholders is required: the legislators, the system manufacturers, the consumers and of course the farmers itself.

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