

DOI: 10.17626/DBEM.ICoM.P00.2015.p082

## THE PRECISION FARMING TECHNOLOGY LIKE A MODERN TOOL OF AGRICULTURAL INNOVATION

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**Summary:** One frame of technological development is the precision farming technology in agriculture. The national and international researches handle a lot with the effects of precision farming technology like a possible method of innovation. At the same time the diffusion of this technology is very slow from the practical appear in 1990. The obstructive factor of adjudge the spread of precision farming technology is that the definition of the farm which apply this is hard. Because of the application of the different technology elements are dependent on plant, soil, weed-coverage and management. The adaptation of the site specific technology like a new innovation in the process demands an extra investment in one hand and in the other hand necessitates precise work from everybody which goes together with change of approach. The aims of this study to examine that in which condition will be viable the adaptation of the precision farming technology and what kind of factors make faster the spread of the technology. The other question is that which element of the technology called innovation and what are the effects of these on the profitability.

**Keywords:** innovation, site-specific treatment, profitability, cost-efficiency

### 1. Introduction

The meanings of innovations are different for the scientists, for the users, for the politics and for the usual people. Many times the innovation is only expounded like a novelty technology. In fact the innovation is more than a new technology or methods. The innovation should not be totally scientific newest things or an earlier does not know things. The widest used definition of innovation is the following: “implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations.” (Oslo Manual, 2006)

The task of technical development is to pass the rewarding results of the R+D activities. In the area of agricultural innovation is very high-pressure problems are the technical or process developments. (Husti, 2008) The agricultural-technical developments never are self-interest. These developments should always be lead with production aims. The prime aim for agricultural-technical development is to the results of research put into practice. The agricultural innovations eventuate the higher profitability and economic growth. (Kapronczai, 2011) In the practice the research of agricultural technical development materialize in the production technology. One of the well examined parts of the agricultural technical development is the precision farming technology.

The aim of this paper to show the precision farming technology in the different aspects of innovation, like process-, organizational-, environmental-, product- and marketing-innovations.

## **2. Precision farming technology as realization of agricultural innovation**

Beyond the traditional technology innovation a new business-model, a new organizational form, a new design or marketing-strategy are also mean innovation for companies. The most wide spread innovation type are the product and technical innovation. The practice can also speak about environmental innovation, marketing innovation, organizational innovation. (Schumpeter, 1939; Magyar Innovációs Szövetség, 2010).

Under innovation the inputs and the yield of the agricultural enterprises are change. The precision farming technology is a kind of production and management methods which able to handle the homogeneity of production condition and thanks to this it fit to the expectation of the agricultural innovation.

### ***2.1. Technological innovation and precision farming technology***

According to Oslo Manual (2006) a process/technology innovation is the implementation of a new or significantly improved production or delivery method. This includes significant changes in techniques, equipment and/or software. Process innovations can be intended to decrease unit costs of production or delivery, to increase quality, or to produce or deliver new or significantly improved products.

The agricultural technology innovation based on four pillars. These pillars are the biological, chemical, technical and human factors. (Dimény, 1975) The agro-technical development can not be self-interest, it should be fit with economical and ecological criteria. (Dimény, 1992) In this aspect the precision farming technology is the base of the sustainable agriculture. There are numerous researchers examined the correlation between the sustainability and precision farming technology. The latitude of this paper not allows to spread about in detail. [Weiss, 1996; Lambert – Lowenberg-DeBoer, 2002; Székely et al., 2000, Lencsés, 2008; Takács-György, 2008; Takács, 2008; Schmuk et al., 2009]

The appearance of global positioning system in the agricultural make possibilities for taking out the field-average treatment and handle the heterogeneity of the production factors (field, nutrients, etc.). In precision farming technology the treatments are based on maps or on-line sensors. The treatment unit called management-zone and usually not bigger than 3 hectares. The two technical methods of precision farming technology are the on-line and the off-line way. In on-line way the inputs optimized according the sensors (for example N-sensor or infra-red camera) information in real-time. In the off-line way first the treating maps should be generated before the treating. The advantages of both methods to optimized inputs according to field-heterogeneity, and thanks to this increase the profitability of the process with decrease the environmental harm of the agriculture.

In summary the precision farming technology squarely fit the meaning of technological innovation because it is a new way of plant production. Change the field-average treatment for the management-zone based treatment (in the process of planning, treating and monitoring).

### ***2.2. Organizational innovation and precision farming technology***

According to Oslo Manual (2006) an organizational innovation is the implementation of a new organizational method in the firm's business practices, workplace organization or external relations. Organizational innovations can be intended to increase a firm's performance by reducing administrative costs or transaction costs, improving workplace satisfaction (and thus labor productivity), gaining access to non-tradable assets (such as non-codified external knowledge) or reducing costs of supplies.

The precision farming technology is not only a new plant production method. An aim of precision farming technology (beyond the variable rate treatment in zone-by-zone) is to simplify the decision process thanks to the precise information base and the higher reaction for heterogenic production factors. In short the precision farming technology is information and remote sensing based farm management system. This system able to identify, examine the varying field parameters and lead the treatment in field.

The precision farming technology is an electronically observer system which monitoring the site-specific treatment of inputs, the timing of treatment, the process and the staff. (Lowenberg-DeBoer – Boehlje, 1997)

The switch to precision farming technology demand changes of the conventional thinking about farming. Come to the front the intention of exactitude of treatment. There are not permissible the margin from the plan or the overlaps in the field-twist.

In the aspect of organizational innovation very important to speak about the knowledge and acceptance of the philosophy of precision farming technology both on the management-level and on the staff-level. The staff should be understand and use the new and mostly informatics based system. The information-based precision farming technology is decrease the time-input for example vocational training, teaching, monitoring.

In summary the precision farming technology is an organizational innovation because the adaptation of the technology is require the changes in the working process. The tasks and time-input change with making of maps, input registration, etc.

### ***2.3. Environmental innovation and precision farming technology***

The precision farming technology is an information-intensive technology which is a part of the agricultural technical development. The precision farming technology is a complex, contiguous process and purposeful innovation activities which gives rise to changes in quality and quantity of agricultural production. These changes define in resources, for example soil parameters, human resource, equipment, information-system, etc.). Finally the plant production is happen in the higher efficiency way.

The precision farming technology is a kind of environmental innovation because the prime aim of the technology is to reduce the environmental impacts of plant production. According to Wolf and Buttel (1996) precision farming technology is increase the efficiency of production, decrease the environmental pollution. The input (seeds, nutrition, herbicide, pesticides, etc.) optimization happened zone-by-zone. Thanks to this the redundant of inputs in the soil are reduce.

### ***2.4. Marketing innovation and precision farming technology***

According to Oslo Manual (2006) a marketing innovation is the implementation of a new marketing method involving significant changes in product design or packaging, product placement, product promotion or pricing. Marketing innovations are aimed at better addressing customer needs, opening up new markets, or newly positioning a firm's product on the market, with the objective of increasing the firm's sales

In the marketing innovation the prime aim is the demand of consumer. Nowadays there are no differences between the consumer demand with the conventional and precision farming technology. The consumers do not knows which technology used for their product. The precision farming technology use the same quantify inputs like the conventional farming.

There are unproven the quality increase of yield with the precision farming technology. Otherwise in social-level the demand for the fork-to-fork monitoring of plant production is increasing. With precision farming technology it should be realize lot of information about the

production process. The society require the decreasing of environmental damage, ecological sustainability. Both demand make true with precision farming technology.

In summary the precision farming technology does not mean marketing innovation for producer or user because the preparation or use of equipments not goes to the changes in the market issue.

### ***2.5. Product innovation of precision farming technology***

According to Oslo Manual (2006 ) a product innovation is the introduction of a good or service that is new or significantly improved with respect to its characteristics or intended uses. This includes significant improvements in technical specifications, components and materials, incorporated software, user friendliness or other functional characteristics. Product innovations can utilize new knowledge or technologies, or can be based on new uses or combinations of existing knowledge or technologies.

The equipment for the site-specific production for the producer is a product innovation. Because the producers of equipment which able to implement the site-specific treatment in the practice. For this is necessary to make changes in the products, for example put GPS, board-computer on the tractor or put component which helps to variable rate treatment in for example the fertilizer.

### **3. Conclusions**

The condition of the successful innovation is the efficient information systems which react fast for the changes of micro and macro environment with quantity in the middle. The precision farming technology fit to these requirements. Thanks to the big amount of qualified information the system able to monitoring the production zone-by-zone.

The precision farming technology improve the productivity of labor, productivity of inputs, quantity and quality of yield with attentive the aspects the sustainability. These parameters are the bone of agricultural innovation too so the precision farming technology is a tool of innovation.

Thanks to the precision farming technology increase the inputs (and costs) and decrease the yield (in quality and in quantity). The precision farming technology squarely fit the meaning of technological innovation because it is a new way of plant production. Change the field-average treatment for the management-zone based treatment (in the process of planning, treating and monitoring). The precision farming technology is an organizational innovation because the adaptation of the technology is require the changes in the working process. The tasks and time-input change with making of maps, input registration, etc. The precision farming technology does not mean marketing innovation for producer or user because the preparation or use of equipment not goes to the changes in the market issue. The switch to precision farming technology demand changes of the conventional thinking about farming. Come to the front the intention of exactitude of treatment. There are not permissible the margin from the plan or the overlaps in the field-twist. (Table 1.)

**Table 1: Precision farming technology like agricultural innovation**

<b>Type of innovation</b>	<b>How precision farming technology measure up to expectation of innovation</b>
Technology innovation	New way of plant production which optimize the inputs zone-by-zone take into consideration the micro-facility of field and site-specific monitoring the treatment too
Organization innovation	Changes in the planning, working process. Need training for staff to understand the philosophy of precision farming technology.
Environmental innovation	Increase the environmental damage of precision farming technology.
Marketing innovation	No changes in the marketing strategy with precision farming technology
Product innovation	New product for the producers.

Source: own construction

Thanks to the precision farming technology the enterprises able to make products with less inputs or reach the higher yield with the same amount of inputs. The agricultural enterprises would be cost-efficiency and environmental friendly thanks to the site-specific treatment. In the agricultural practice the precision farming technology is require the new way of thinking about plant production.

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