

## Comparison of precision and conventional crop farming in technical and organizational terms

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### Introduction

In the course of the production of goods, farmers aim at the reduction of their production costs (Nábrádi and Felföldi, 2008), as they are unable – or only slightly able – to influence sales prices. From amongst cost types, material costs and wage costs are of great importance. Thus, farmers should try to reduce them as much as possible; precision crop production might contribute to this effort, while reducing the utilization of input materials (Kemény et al., 2017). To achieve this, technical improvements are required, which contribute to the competitiveness of farms (Ványiné et al., 2012). The purpose of organization is to utilize available technical tools through human resources.

### Materials and methods

Our examinations were carried out at crop producing farms, in Hajdú-Bihar county, between 2016 and 2018. The conventional – in some aspects transitional – farm (F1 – Farm 1) operates on 240 hectares, while the precision farm (F2) on 800 hectares. Crops that are produced on both farms: maize, sweet corn and green pea. We primarily analysed the human and technical state of supply of field operations and plot sizes. Data collection was carried out via methodological observation and verbal interviews (Nagy et al., 2003).

### Results and discussion

As farm size fundamentally determines the demand for human resources and technical supply, these essential data are shown in Table 1.

*Table 1: Major data of the analysed farms*

Farms	Farm size (ha)	Number of machinery drivers	Plough-land / person (ha)
Conventional farm – F1	240	2	120
Precision farm – F2	800	4	200

The table shows that there is more than twice as large plough-land/driver at the F2 farm than at the conventional farm. The reasons behind this are mainly larger field plot sizes, the use of navigational equipment and the existence of higher performance power engines. The supply of power engines of the involved farms is as follows: There are 3 power engines operate at the F1 and 4 at the F2. The average age of the tractors is 7.5 years at F1 and 11 years at F2. Tractor output per 100 hectares is 138 kW at F1 and 68 kW at F2.

#### *Description of the major factors of technical supply*

There are 2 (remountable) row guides in the power engines of the F1 farm, which are used for certain field operations (fertilization, spraying and mowing). The on-path accuracy of it is 30 cm. Therefore, in terms of these processes, the activity of the farm can be described

as transitional level; this is strengthened by the fact that they use a crop production management software. The RTK signal correction applied for the automatic steering at the F2 farm allows 2-2.5 cm accuracy.

Besides ploughing, both farms use non-ploughing tillage as well (field cultivator and mid-deep subsoiler), and modern disks cultivator equipped with a closing cylinder. The main difference between the farms is that the F1 farm does not use the row guide for tillage operations, while there is RTK accuracy automatic steering at the F2 farm. This allows strip tillage, which has been used in maize and rapeseed production for years.

There is no GPS section control of implements at the F1 farm, although the driver can control spraying sections (24 m, 4 sections) and the fertilizer spreader (2 sides) electronically. At the F2 farm, planting (12 rows), spraying (30.5 m, 7 sections) and fertilization (2 sides and spread width control) are GPS controlled. There is no precision variable rate application (VRA) at the F1 farm; however, the applied amounts of spraying and fertilization can be controlled via electro-hydraulics. At the F2 farm, the fertilizer spreader, the planter and the self-propelled sprayer can differentiate the dosage of inputs based on digital map. The planter of F2 equipped with pneumatic row down force system.

## Conclusions

It is true for F1 farm that its specific efficiency is lower due to smaller plot sizes and farm size. At the same time, it applies modern soil tillage procedures, power and work equipment is up-to-date, but it has made only a small step towards precision farming for the time being. Specific efficiency of the F2 farm is higher and it applies almost the entire range of precision farming techniques.

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## References

- Kemény G., Lámfalusi I., Molnár A. (2017): A precíziós szántóföldi növénytermesztés összehasonlító vizsgálata. Agrárgazdasági Kutató Intézet. Budapest
- Nagy T., Dienesné Kovács E., Pakurár M. (2003): Mezőgazdasági munkaszervezés. Egyetemi jegyzet. DE ATC AVFI. Munkatudományi Tanszék
- Nábrádi A., Felföldi J. (2008): A jövedelem kategóriái. In: Üzemtan I. (Szerk.: Nábrádi A. - Pupos T. - Takácsné György K.) Szaktudás Kiadó Ház. Budapest
- Ványiné Széles, A., Bogdán, I., Sulyok, D., Nagy, J. (2012): The effect of fertilisation and irrigation on the yield of different genotype maize hybrids and the economic aspects of production. In: Halasi-Kun G. J. (Szerk.) Impact of Anthropogenic Activity and Climate Changes on the Environment of Central Europe and USA, Columbia University - University Seminars. 341-360.