

EFFECT OF TILLAGE ON THE YIELD OF CROP PLANTS

János NAGY - Dénes SULYOK – László HUZSVAI

University of Debrecen, Center of Agricultural Sciences
Faculty of Agronomy, Department of Land Use and Rural Development

Introduction

The new social and economic conditions following the change of regime resulted in new difficulties for Hungarian farmers and land owners. Scattered property structure, old machinery, the loss of eastern export markets resulted in daily livelihood problems. The protection of soil, which is only renewable if specific conditions are fulfilled, became less important (Rajkainé *et al.* 2004). A basic requirement in land use is to fit the environment and ensure sustainability (Rátonyi *et al.* 2005).

A number of harmful processes began during the period of large scale agriculture, making rational soil use the primary objective (Birkás 2002). In many cases, other unfavourable effects also occurred in intensive tillage methods, for example during the cultivation of excessively wet or dry soils which was accompanied by increased energy consumption and resulted in physical and biological degeneration of the soil (Nagy 1997, Rátonyi *et al.* 2003, Kovacevic *et al.* 2004). Since stubble was not recycled and utilised, organic matter cycles were damaged making erosion and deflation processes more extensive (Nagy *et al.* 2003).

The spread of alternative tillage methods can be promoted through two factors:

- Suitable soil conditions for plants can be established through reduced tillage methods which also require less input and expenditures,
- Alternative tillage methods, compared to traditional methods, also inflict less harmful direct and indirect effects on the soil (Sulyok *et al.* 2005).

Methods

The aim of our examination was: evaluation the efficiency of different tillage systems.

Location of examination: Petőfi Agr. Cooperative, Csárdaszállás

Duration of examination: 2001-2004.

Investigated tillage treatments: winter tillage, disk ripper, shallow, spring tillage, direct sowing.

Maize prices were determined in accordance with EU intervention prices in all four years. We could filter the effect of seasonality this way, since a great degree of changeability occurred in the examined period (e.g. 2003: 29000 HUF/tonnes, 2004: 17000 HUF/tonnes):

We have carried out a full economic evaluation (expenditure-income). The reason for this is that the experiment was set up at the Petőfi Agricultural Cooperative at Csárdaszállás. The primary objective of the cooperative is to achieve the highest profit while fulfilling directives of sustainable land use. During the evaluation according to expenditure types (material-, labour, supplementary sector service, other and general expenditures) income conditions were also taken into account. Incomes were determined by considering both.

Results and conclusions

During the examination of the four tillage systems it can be found that from all the occurring costs the material cost, the special equipment costs and other direct costs, the distributed costs (insurance fees, membership fees), land lease fee all represent the same value. In the case of different technologies the cost of supplementary sector service changes. It is the lowest in the case of direct sowing while it is the highest in winter ploughing. The difference between the highest and the lowest value is 15% in 2001 and 2002, 14% in 2003 and 22% in 2004 per hectare. This value modifies the different cost structures and the cost of different tillage systems.

The incomes were considered 100% in the case of winter ploughing in all four examined years (Figure 1.). The income compared to winter ploughing treatment was 6% higher in 2003 and 2% higher in 2004 for disk ripper tillage system. In the other years we have received lower incomes compared to winter ploughing and rate loss was 2-13%. When examining expenditures, we have stated in the above mentioned section that the cost of production were 5-22% lower compared to the winter ploughing control.

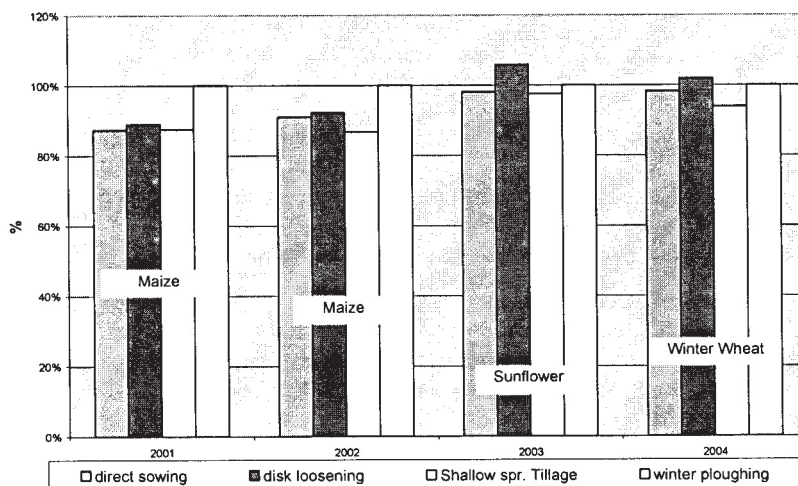


Figure 1. The amount of incomes in the Csárdaszállás plant experiment compared to winter ploughing (2001-2004)

In the four examined years and four tillage variations we have achieved the highest profit in direct sowing (19% higher than with winter ploughing) and disk ripper treatment (7% higher than with winter ploughing) considering winter ploughing as one hundred percent. In the case of direct sowing, we have also experienced significant increase in profit (28%) when cultivating maize as indicator plant in 2002 and 98% increase when cultivating winter wheat maize as indicator plant in 2004. The cultivation of winter wheat based on disk ripper also brought favourable results, since the profit exceeded that of winter ploughing system by 73%. Shallow spring tillage showed a favourable picture in the case of sunflower and winter wheat, since in both cases (2003 and 2004) 19-32% increase in income was experienced compared to winter ploughing.

In the four examined years, in direct sowing accompanied by 11% (2001) loss in profit but if we consider that in the other three examined years direct sowing resulted higher profit than winter ploughing then it could be considered as favourable.

In 2002, the technology based on disk ripper resulted a 36% loss compared to winter ploughing. If the technology based on disk ripper is treated collectively for the four examined years, then it is more profitable than winter ploughing.

Shallow spring tillage is recommended for application for sunflower and winter wheat on the basis of the four examined years. As for maize it resulted a 26% loss in 2001, and a 60% loss in 2002 compared to winter ploughing. By considering these data, we do not recommend the application shallow spring ploughing when cultivating maize.

Traditional (winter ploughing) tillage proved to be profitable with all indicator plants. The highest profit was achieved with maize in 2001. The profitability of sunflower was also significant in 2003. (Figure 2.).

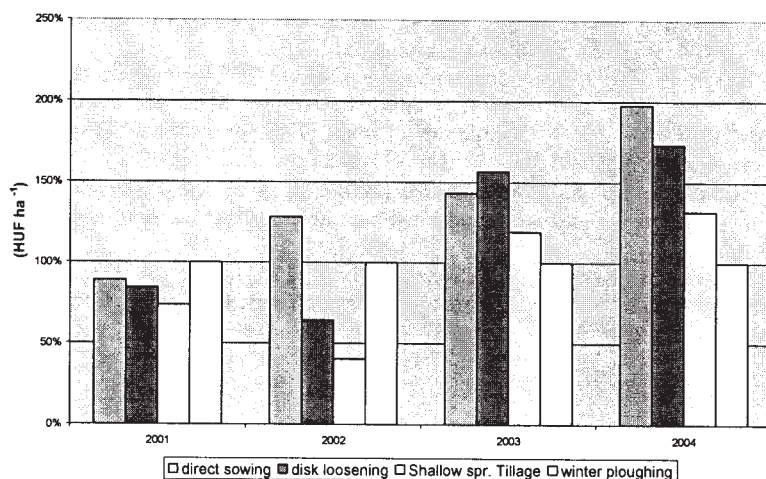


Figure 2. The profitability of the corn production using by different tillage treatment compared to winter ploughing in the Csárdaszállás plant experiment (2001-2004)

Acknowledgement

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