

Press Release

A current study on ecological and economic importance of conservation tillage system

- **Erosion protection of farmland can be ensured by conservation tillage system**
- **Use of glyphosate in the crop rotation guarantees the best agricultural practice and low operation costs**

Executive summary of the publication (64 lines, 4400 characters) attached as an annex

Giessen, 25th November 2014

The current study of the Institute for Agribusiness reveals ecological and economic advantages of conservation tillage. German farmland is frequently endangered by wind and water erosion. According to the Cross Compliance Criteria, two million hectares of farmland are classified as area with very high risk of erosion. The conservation tillage with plough renunciation and catch crop cultivation before summer crops provides a covering of the soil surface with organic material and lead to an increased number of soil organisms. Both lead to the decline of erosion risk.

The business-management analysis for two different German farmland regions (North-East and Low Mountain region) with different crop rotations demonstrates some advantages, as against the ploughing, in operating costs with working time reduction of 8% to 30%. Prof. Dr. P. Michael Schmitz, the director of Institute for Agribusiness, emphasises: "These ecological and economic advantages without yield decrease could be exploited through the targeted use of glyphosate in the crop rotation in order to control the weed and to break the Green Bridge."

Study Nr. 32 „The Importance of Conservation Tillage as a Contribution to Sustainable Agriculture: A special Case of Soil Erosion“ in the series Agribusiness-Research (ISSN 1434-9787) can be ordered for 30,- Euro by: Institute for Agribusiness, Senckenbergstrasse. 3, 35390 Giessen, Germany or info@agribusiness.de.

The Importance of Conservation Tillage as a Contribution to Sustainable Agriculture: A special Case of Soil Erosion

Executive summary of the study:

SCHMITZ, P.M., P. MAL and J.W. HESSE (2014): The Importance of Conservation Tillage as a Contribution to Sustainable Agriculture: A Special Case of Soil Erosion. Ed. Institute for Agribusiness, Agribusiness-Research no. 32, Giessen (info@agribusiness.de)

Soil erosion caused by wind and water is a major problem in the world, which is set against sustainable agriculture due to fertile soil loss. Also in Germany, arable land is threatened by soil erosion. According to the Cross Compliance criteria, two million hectares (ha) (17.3% of total arable area) are classified as land with high soil erosion risks due to wind and water. 1.8 million ha of this area are attributable to the land with the highest risk of soil erosion by water. This land is endangered by the soil loss of about 15 tons/ha annually. The areas with cultivation cereals and average risk of soil erosion could lose about 2 tons/ha annually, which can be easily increased up to 10 times in row crops areas. German farmers face the challenges of soil erosion with best agricultural practice and implement it in various forms of conservation tillage. Tillage operations renunciation and cultivation of catch crops before summer crops provide a covering of the soil surface with organic material throughout the year and lead to an increased number of soil organisms, especially earthworms with their positive effects on topsoil stability and its capillary porosity. Reducing vulnerable soil surface against wind and water as well as increasing water absorption and water holding capacity of the soil belong to the positive effects and lower the risk of soil erosion

A simple scenario highlights the need of soil erosion reducing tillage systems: One ton soil loss corresponds to a topsoil reduction of about 0.8 mm/ha. Assumed average soil loss by erosion of about eight tones in a crop rotation with row crops corresponds to the topsoil reduction of 0.64 cm annually and to the organic layer reduction of 13 cm in 20 years. Depending on the topsoil, this loss could be decisive for further use of the land as farmland or as grassland.

Evaluated budgeting of crop rotations with involved direct and operating costs shows, (additionally to the valuable ecological effects) the positive economic effects of reduced tillage. For this purpose, there was selected the typical crop rotations with increased production intensity in North-East Germany and with low production intensity in the Low Mountain region. The experts' interview was organized in these respective regions with their related machinery and pesticides use. Production intensity was based on use of machines and pesticides. Adapted to the regional conditions crop rotations were compared under conventional and conservation tillage systems.

The broad-spectrum herbicide glyphosate is planned within the pesticide use program in the crop rotation for weed control under conservation tillage. In average, about 1148 gm/ha of active ingredient (glyphosate) is used annually in case of quadrinomial crop rotation in North-East Germany for winter rapeseed / winter wheat / catch crop mustard / maize / silage maize rotation. In Low Mountain region, about 1770 gm/ha of active ingredient (glyphosate) was applied before rapeseed and stubble wheat in winter rapeseed / winter wheat / winter wheat / winter barley crop rotation. For this crop rotation, that would mean about 880 gm of active ingredient (glyphosate) per hectare annually. The results from the experts' interviews confirmed that there is no significant difference in yields under different tillage strategies due to the weed control and regionally related machinery use.

The results of the business-management approach show that conservation tillage in North-East Germany has higher direct and operating costs (German: Arbeiterledigungskosten freie Leistung, DAKfL) of up to 14% in case of working time reduction of 8%. In Low Mountain region with assumed current ploughing for each crop and with average yields, conservation tillage could double the operating costs (DAKfL) and reduce the working time use up to 30%. In addition, reduced conservation tillage, in comparison to the conventional tillage, could lead to the significant savings in fuel consumption - up to 8 liters/ha in North-East Germany and up to 30 liters/ha in Low Mountains region. Fuel savings and carbon sequestration in cropland of 0.5 tons/ha lead to the reduction of CO₂ up to 580 kg/ha annually.

Based on results of the different crop rotations from two arable farming regions in Germany, the study shows the positive economic and environmental effects of conservation tillage. Due to the German Soil Protection Act, the farmers are obliged to follow the regionally adapted good practice; for its implementation, the conservation tillage is an appropriate instrument for the crop protection management in order to control the weed and to break the Green Bridge using the glyphosate. In addition, conservation tillage combines sustainable production and profit stability together with positive environmental excellence.