Low-cost and environment-friendly system of fertilizing and sowing of maize

- *Preliminary effects of AZOMAIS project Nr PBS1/B8/4/2012 supported by*
- *The National Center for Research and Development - Poland*

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Introduction

Maize is widely cultivated throughout the world and a greater weight of maize is produced each year than any other grain. It provides supplies for growing demand for food, forage and energy. As the current reliance on petro-based fuels and chemicals is not sustainable, starch from maize can be made into plastics, fabrics, adhesives, and many other chemical products. Maize products is being increasingly used for generating heat and maize cobs are also used as a biomass fuel source. Despite such a variety of use, production of maize, due to plenty of necessary agronomic measures (tillage, repeated fertilization, pests treatment), is still highly capital-intensive, consumes much time, energy and generates substantial amounts of CO_2.

Aim and objectives

The aim of the AZOMAIS project is to develop innovative, environmentally safe, low-cost maize production technology dedicated both to reduce time and resources and to create sustainable agriculture with lower CO_2 footprint. At the same time "maize package" will be capable to produce high quality and quantity of yields. Main objectives of the project are: to devise special (NPS+micronutrients) fertilizer, to elaborate instruction for its application, to select the most effective and efficient method of application and finally to construct innovative equipment for simultaneous sowing of maize seeds and application of specialized fertilizer in one single tractor ride.

Results

1) As a critical milestone new fertilizer's formula was developed and its chemical, and biological properties were evaluated. Specialized fertilizer is based on urea super phosphate enriched with micronutrients. Technology for producing fertilizer in the form of small granules (3-5 mm) and super-granules (>8 mm) was developed. Feasibility study of new fertilizer production was performed on installation constructed by industrial entity (fig.1).

2) In model experiments conducted in "rhizoboxes" optimal depth of application of small granules and supergranules was established. It was respectively 5 mm and 25 mm under the seeds (fig. 2).

3) Computer-aided modelling (Cad-3D virtual prototyping) and simulation studies on idealized models were employed to design functional multi-sectional tillage-seeding aggregate. Parameters as uniformity of fertilization and seeding were evaluated in empirical tests before commencing agricultural research (fig. 3).

4) The model of equipment was built and employed for fertilizer application and sowing of maize in the field-scale experiments (fig. 4).

5) By using AZOMAIS's technology numbers of cultivation treatments were performed in one single tractor ride (fig. 5).

6) Production, environmental and economic effects of new technology are under evaluation in field experiments (fig. 6). In 2014 the yields obtained in reduced and conventional technology did not differ significantly.

Fig.1. Two sizes of specialized fertilizer

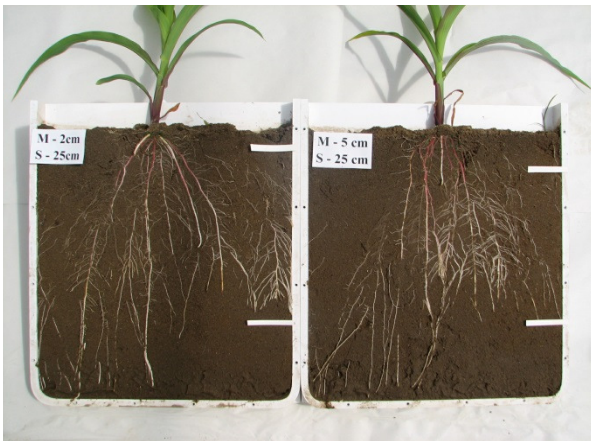

Fig. 2. Experiments in “rhizoboxes”

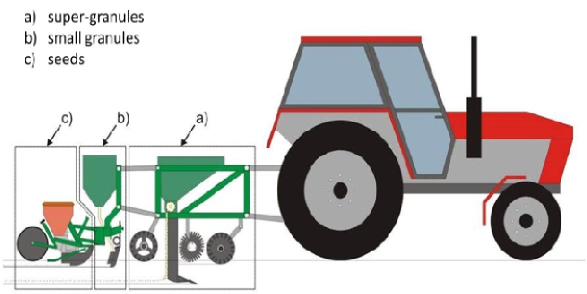

Fig. 3. The scheme of tillage-seeding unit

Fig.4. The model of tillage-seeding unit

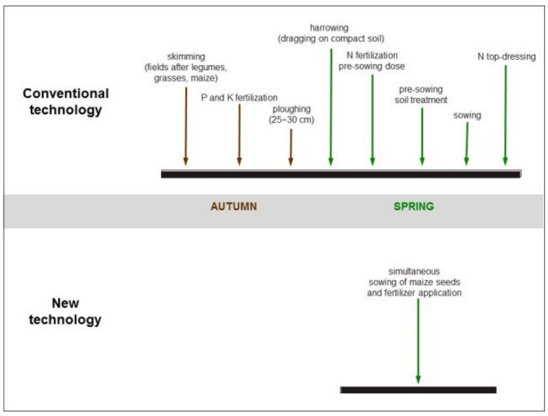

Fig. 5. The scheme of reduction of agri. treatments

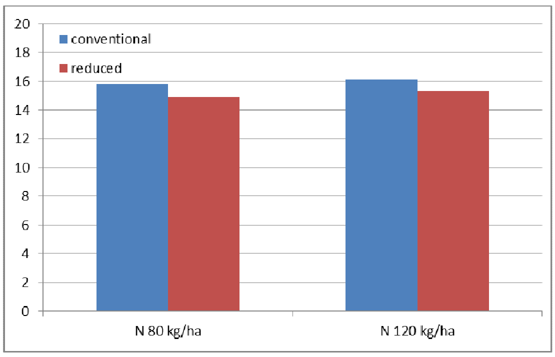

Fig.6. The yield of dry matter of the corn silage