Investigations for controlled nitrogen application on grassland by Nitrogen-Sensor technology

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Introduction

Yields of permanent grassland are dependent not only on the management but of the nitrogen supply of stocks. While in agriculture the use of nitrogen-sensors for selective supply of cereal stocks are increasingly finding its way, provides permanent grassland due to the heterogeneity of the stock a particular challenge to the use of such technologies. In particular, the legal requirements for N-efficiency, and reduce the N-losses through leaching or emissions, the use of technology to differentiate the nutrient gifts make a significant advance in the crop stocks. The use of this technology based on different technical solutions has already been introduced in crop production as a standardized method. For use in the grassland area are few experiences and foundations available.

Material and Methods

For the experiment, an approximately 10 ha pasture area was selected over 2 years. On the surface are mainly arable and meadow grasses, as well as clover and wild herbs. The use takes place exclusively via cutting; a grazing does not take place. The nutrient is carried out by means of a transfer of manure in the spring. Mineral fertilizer is applied with an autumn and a spring gift. After the first cut is usually a repeat dose of nitrogen. The aim of the experimental design was to be recognized precisely at this point of the management. During the fall and spring fertilizer application and the application of manure should continue to be carried out by means of a constant delivery, the aim was to optimize the replenishment after the first or second cut use by means of a previously generated withdrawal card. For this, the surface was scanned before each cutting with a N-sensor of the company YARA and recorded in this way, the biomass present on the surface. The amount of biomass can be used as a measure for the withdrawal of soil nutrients. As a result of nutrient removal, based on the geo-referenced areas should be specifically compensated.

The experimental area was divided into 10 working strip. These were scanned at regular intervals and immediately prior to harvest. The data obtained were converted into an application card for the nitrogen fertilization and entered into the computer of the fertilizer spreader. When nutrient delivery then two adjacent processing strips (lane) have been supplied with a constant or regulated amount of fertilizer (figure 1). After the spreading of the fertilizer the surface was scanned again using the N-sensor and the regrowth observed. Besides the question of what effects bring the targeted nutrient grassland, was also questioned whether a yield estimate can be made possible by this method to so offer the practitioner a simplification in planning for the silage capacity.
Results

Basically, it is clear that a system such as the N-Sensor, the biomass can also be detected in the grassland. Differences in the nursery, in the degree of concentration and also in the expected earnings are plausible mapped with this system. Hence algorithms for nutrient removal and the necessary replenishment of plant nutrients can be derived. Initial results suggest that even in the grassland by means of a precision farming targeted, site-specific nutrient supply is implemented.

The results have revealed but also open points. Thus, the manufacturer of such sensors do not offer related to grassland basic data. While particularly cereals, validated data are available for market crops, and here, there is no evidence base for the grassland. In the measurements therefore for cereals (wheat, EC31) had to be made to data. Secondly, the grassland is by its very inhomogeneous plant community more dependent on weather influences such as Cereal. Especially the water supply plays an essential role. So an attractive biomass value was given sufficient water supply on more profitable poorer plots in the experimental area generated and thus determined a high supply of nutrients claim which would not be given under worse weather courses. From this it can be deduced that in addition to biomass scans the ground conditions with feed into the application card should (figure 2).
Another result of the experiment was the overestimation of potential savings in nitrogen. Here it has been shown that a comparison with the crop production is not possible. While the crops 4% can be saved up to 10% of the annual fertilizer
application rate by the use of a sensor, it was in the first year of the trial on the experimental area just 1 kg of nitrogen per hectare. However, this value is to be verified by the continuation of the trial in 2015. Last, the system can also be used to estimate yield well. However, there is so far no data base in the offered software that delivers stating the dry matter content and biomass scan a reliable income number.

Conclusions

By means of a system for site-specific nutrient supply of farmland is also the management of grassland conceivable. Initial results suggest that a similar saving way of fertilizers as in crop production cannot currently be predicted. But probably can be carried out more targeted, aimed at the withdrawal of replenishment areas and thus contribute positively to the nutrient balance of the farms can be achieved with the system.