

The influence of long-term nitrogen and phosphorus fertilization on winter wheat and maize productivity

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The mineral fertilization of crops proved to be necessary in order to increase crop productivity, yield quality and soil fertility. The scientific results are based on the long-term fertilization with nitrogen (N) and phosphorus (P) experiments which started in autumn of 1976. Plots were not irrigated in the 5 year crop rotation of peas- wheat-sunflower-maize-wheat. The soil was a cambic chernozem at the ARDS -Teleorman, placed in the south of Romania with an average temperature of 10.8 °C and mean precipitation of 539 mm.

N and P fertilization caused consistently an increase of yield during the past 38 years of experimentation. To winter wheat sown after maize, in years with 500-600 mm rainfall, 80-120 kg/ha N + 80 kg/ha P₂O₅ were applied. The yield was > 5.4 t/ha which equals a surplus of < 2.4 t/ha when compared to the control. The utilization coefficient for N was 70% and < 20% for P. In dry years, N and P rates of 40-80 kg/ha N+ 40 kg/ha P₂O₅, respectively proved to be sufficient for a maximum yield of 4.2 t/ha. The maximum yield was 1.7 t/ha higher than that of the control. The utilization coefficient for N was < 55% and that of P <20 %.

For winter wheat sown after peas, in the years with common rainfall 90 kg/ha N + 80 kg/ha P₂O₅ were applied. The yield was >5.8 t/ha with a surplus of >2 t/ha compared to the control. The utilization coefficient was 60% and that of P <15%. In the dry years, 30 kg/ha N and 40 kg/ha P₂O₅, proved to be sufficient to achieve the maximum yield. In all treatments the yield was reduced significantly compared to years with average precipitation.

In case of maize, for an average grain yield of 5.9-6.8 t/ha 100 kg/ha N + 80 kg/ha P₂O₅ were required. Yield was 1.5-1.7 t/ha higher than in the control plots in common years (May-August-over 300 mm rainfall). In dry years, the maximum yield was 2.2-2.4 t/ha and only 0.5-0.7 t/ha higher than in the control.

The N utilization coefficient varied between 42-47% in normal years and 15-17% in dry years. The utilization coefficient for P was 12-15% in normal years and 2-5% in dry years. The N and P removals from the soil were 120-140 kg/ha N and 49 kg/ha P₂O₅ in case of winter wheat in common years. In dry years the respective values were 95 kg/ha N and 35 kg/ha P₂O₅. Maize took off on average 50-230 kg/ha N and 32-97 kg/ha P₂O₅ with the harvest products.

The results of the field experiments showed that moderate N and P rates were sufficient to achieve the site-specific yield potential and that N and P rates should be adopted to rainfall events.