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Monograph. Sustainable nutrients management in CEE countries, editors Fotyma M.,Dobers E.I.

Pro Memory **Dr Duncan Greenwood CBE, FRS 1932-2010** – member of the Advisory Board

Loch,J. 12 years of CEEC (MOEL) consultative meetings in retrospection

Zusammenfassung

Das Konsultativtreffen der mittelosteuropäischen Länder (MOEL) wurde von Prof. Dr. Gerhard Breitschuh, Präsident des VDLUFA im Jahre 1998 hervorgerufen. Am ersten Treffen in Nitra nahmen Vertreter aus Deutschland, Österreich, Polen, Slowakei, Tschechei und Ungarn teil.

Als Ziel der Zusammenarbeit wurde vor dem EU Beitritt die Förderung der Integration der mittelosteuropäischen (MOE) Länder in die EU deklariert. Diesem Ziel dienten die Gegenseitige Informationen über

- die Lage der landwirtschaftlichen Produktion und deren Entwicklungstendenzen,
- Organisation des Landwirtschaftlichen Versuchs- und Untersuchungswesens,
- Grundlagen der Düngeberatung, Methoden der Bodenuntersuchung

Das Frühjahrsreffen wurde jährlich in einem anderen Land organisiert, außerdem trafen sich die Ländervertreter regelmäßig im Herbst am VDLUFA Kongress in Deutschland (Tabelle 1). Nach dem EU Beitritt haben sich Slowenien, Estland, Lettland und Litauen der Zusammenarbeit angeschlossen.

Tabelle 1. Tagungsorte der Konsultativtreffen

Jahr	Frühjahrstagung	Herbsttreffen
1998	Nitra, Slowakei	Gießen, VDLUFA Kongress
1999	Pulawy, Polen	Halle, VDLUFA Kongress
2000	Velence, Ungarn	Warschau, Internationaler Kongress
2001	Brno, Tschechei	Berlin, VDLUFA Kongress
2002	Wien, Österreich	Leipzig, VDLUFA Kongress
2003	Jena, Guthmannshausen, Deutschland	Saarbrücken, VDLUFA Kongress
2004	Nitra, Slowakei	Rostock, VDLUFA Kongress
2005	Pulawy, Polen	Bonn, VDLUFA Kongress
2006	Piran, Slowenien	Freiburg, VDLUFA Kongress
2007	Visegrád, Ungarn	Göttingen, VDLUFA Kongreß
2008	Brno, Tschechei	Jena, VDLUFA Kongreß
2009	Lambrecht, Deutschland	Karlsruhe, VDLUFA Kongreß
2010	Pulawy, Polen	

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Spiegel,H., Robier,J., Springer,J.,Ubleis,T.,Dersch,G. Application of the N_{min} soil test in fertilizer recommendations and environment protection in Austria

Abstract

Nmin soil tests are included in the fertilizer recommendations in Austria to adjust N fertilizer amounts. Based thereon field experiments are carried out in different Austrian provinces (e.g. Styria, Upper and Lower Austria) to take into account regional differences. N fertilization that considers the actual mineral N status in spring is proved to provide optimal N supply to the crops without a decrease of yields. Nmin analyses after the harvest may evaluate if N fertilization measures have been conducted properly. Additionally, in late autumn Nmin analyses indicate the risk for N losses to surface and ground waters. This can also be demonstrated in field experiments that investigate the effects of different agricultural management (tillage, organic and mineral N fertilization) on the Nmin status at different times. Especially in catchment areas sensitive to nitrate leaching Nmin monitoring areas have been established in some Austrian provinces

Čermák,P., Kubík,L. Monitoring of nitrogen content in the soil and water

Abstract

The paper presents the results of mineral nitrogen monitoring in the soil and water in the Czech Republic. The main aim of this monitoring is to study volume of soil mineral nitrogen together with nitrogen in the water. Nitrogen in the soil was observed and valuated in the selected basal soil monitoring plots (arable soil 145 plots and grassland 29 plots). Nitrogen in water is monitored in the irregular net of monitoring profiles. Both monitoring nets (for soil and water) were compared and for common valuation were selected about 20 parallel monitoring points in the years 2002 – 2005 and 16 to 18 monitoring points in 2006 – 2009. For the transfer of nitrogen from the soil to water data of nitrate nitrogen in topsoil and subsoil from basal soil monitoring and data from water monitoring were compared.

Key words: mineral nitrogen, N_{min}, soil monitoring, water monitoring, nitrogen content,

Loide,V., Köster,T., Penu,P., Rebane,J. The implementation of recommendations and restrictions for using nitrogen fertilizers in Estonia

Abstract

Leaching process is characteristic of the Estonian soils, caused by relatively high amount of precipitation which is exceeding the transpiration (evaporation). Soil water soluble

elements (especially N) which are removed by leaching from soil profile are becoming a threat for the environment. Nitrogen is forming approximately 60% of the load of nutrients originating from agriculture. In the Water Law, the requirement for the entire Estonian territory has been established that no bigger amounts that 170 kg nitrogen per one hectare of arable land with farmyard manure is allowed. For the Nitrate Vulnerable Zone, the stricter rule is applied, limiting the rates of nitrogen from mineral fertilizers and organic manure all together by 170 kg ha^{-1} and from that the mineral fertiliser nitrogen can be 140 kg ha^{-1}. Averagely 73 kg ha^{-1} N is used in Estonia; from that, 60 kg ha^{-1} is applied by mineral fertilizers. If the area is fertilized with organic fertilizers, much bigger amounts of nitrogen (146 kg ha^{-1}) will be added to the soil. The biggest amounts of nitrogen is leached by using mineral nitrogen fertilizers, followed by biologically fixed nitrogen, while nitrogen originated from organic fertilizers is less prone to leaching.

Key words: soil, nitrogen, leaching, environmental safety

Wiesler,F.,Armbruster,M. The application of the N_{min} soil test as an element of integrated nitrogen management strategies in agriculture

Abstract

This paper introduces in the use of the N_{min} soil test in German agriculture. Perspectives, limitations and modifications of this method are discussed and compared with other attempts to predict nitrogen (N) fertilizer demand, namely monitoring crop nitrogen status. It is concluded that accurate prediction of N fertilizer demand is a prerequisite to achieve high crop yields / qualities and to minimize concurrently N losses to the environment. However, efforts to improve N efficiency in agriculture should not be confined to the use of soil and plant test, but should also consider the design of environmentally friendly crop rotations, N efficiency of cultivars, form, timing and technique of N application, cultivation of cover crops, management of crop residues and timing, technique and depth of soil cultivation. These measures can be used to develop integrated nutrient management strategies.

Key words: crop N status, integrated N management, N balance, N efficiency, nitrate

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Loch,J., Szabó Emese,B., Pirkó,B. Nitrogen advisory fertilizer system and monitoring in Hungary

Zusammenfassung

In der Arbeit wird über die Entwicklung und Grundlagen der Stickstoffdüngeberatung in Ungarn berichtet. Die Düngeberatung beruht auf dem Bilanzprinzip, der Nährstoffbedarf wird aufgrund der Ertragserwartung und spezifischem Bedarf der Kulturen errechnet. Der Stickstoffversorgungsgrad wird aus dem Humusgehalt, mit Berücksichtigung der Standortverhältnisse (Bedingungen der Nitrifikation) geschätzt. Bei Sonderkulturen, z.B. Zuckerrüben wird der NO_3-N Gehalt im Herbst des Vorjahres und im Frühjahr bestimmt.

Der NO_3-N Gehalt wird in den Probeflächen des Bodenmonitoring Systems jährlich bestimmt. Entsprechend der EU Direktive 91/676 wurden in den Jahren 2004 und 2008 Landesberichte über die Wasserschutzmaßnahmen in Ungarn erstellt. In den Berichten wurde ausführlich über die Monitoring Ergebnisse referiert. Die Daten bestätigen, dass die Bodenwerte im Allgemeinen in den Schichten der Profile überwiegend unter 50 $mg.kg^{-1}$ liegen. Höhere Werte kommen nur in Sonderfällen, in kleinem Prozentsatz vor.

Aufgrund der vorgestellten Daten kann festgestellt werden, dass der Humusgehalt unter Berücksichtigung der Bodeneigenschaften zur Schätzung des N-Versorgungsgrades geeignet ist und in Ungarn jahrelang erfolgreich gebraucht wurde. Dennoch ist bei Sonderkulturen, sowie bei Verwendung höherer N-Gaben die Bestimmung des NO_3-N Gehaltes empfehlenswert.

Ausser der offiziellen Beratung wird über die Grundlagen der von mehreren Instituten erarbeiteten „Neue wirtschaftliche und umweltschonende Düngeberatung“ berichtet.

Schüsselworte: Beratung, N-Versorgungsgrad der Böden, Monitoring

Fuleky,G. Downward movement of fertilizer nitrogen in Hungarian soils

Abstract

The leaching process of nitrate was studied in a long-term field experiment at Gödöllő on a brown forest soil started by Debreczeni in 1980. 0, 90, 180, 270, 360 kg ha^{-1} y^{-1} N doses have been broadcasted as basal fertilization in the form of ammonium-nitrate for 16 years. The test plant was maize in monoculture. In 1986 the soils of the treatments were sampled in 6 replications from 0 to 3 meters depth at every 20 cms. The nitrate content of the sample was determined.The nitrate content of the soil samples in replications was rather different in spite

of the nearly flat area, so the data were evaluated by the help of the average of 6 replications. Increasing the dose of nitrogen fertilization nitrate content in the soil profile increased, as well. The 20-40% of the nitrogen fertilizer can be found in the 3 meter layer of the soil profile. The amount of this accumulated nitrate is equal to few hundred kgs of nitrogen. The maximum of nitrate accumulation front can be found at 160-260 cm. The place of maximum accumulation moves downward when increasing the dose of nitrogen fertilization. In the case of high nitrogen dose nitrate accumulation could be found below 3 meters depth, too.Results prove the necessity of a suitable technology preventing nitrate losses. As the experiment shows 100 kg N ha^{-1} fertilizer nitrogen enough for the maximum crop yield in this area. At higher fertilizer rates the residual fertilizer nitrogen and the nitrate released from sol organic reserves are lost by leaching. Climatic conditions in experimental area are unfavourable for nitrogen fertilizer application is autumn. The yearly water surplus is 116 mm and this is enough for leaching the amount of nitrate exceeding plant demand into 1-3 meter depth of soil or into deeper horizons.

The reasons for differences in the nitrate-N profiles of the various locations included in the National Long-term Fertilisation Trials appeared to be primarily dependent on the different rainfall conditions and soil texture and on the N fertiliser rates. In response to increasing rates of mineral fertiliser there was an exponential rise in the nitrate-N content of the soil, both in the root zone and in deeper soil layers. At annual fertiliser rates of 0 and 50 kg N $ha^{-1}y^{-1}$, no nitrate accumulation was observed, but the leaching of nitrate ions was already detectable at the 150 kg N rate, and increased considerably in the case of 250 kg $ha^{-1}y^{-1}$. Based on the exponential curve, a substantial increase in nitrate-N could be observed at an N fertiliser rate of 2000 kg/ha/20 years. In agreement with data from the literature, under the climatic and soil conditions in Hungary, nitrate accumulation can occur when fertiliser N rate more than 100 kg$ha^{-1}y^{-1}$.The depth of maximum nitrate-N accumulation after various rates of mineral fertilisation was nearer to the surface in heavier soils (greater values of K_A).A comparison of the roles of soil texture and rainfall on the basis of correlation coefficients revealed that the depth of maximum nitrate-N accumulation was influenced to a greater extent by soil texture.

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Timbare,R., Janevica,V., Busmanis,M., Eglite,K., Stalidzans,D. Monitoring of mineral nitrogen in soils in Latvia

Abstract.

In 2005 the monitoring of soil mineral nitrogen has been started in Latvia. Forty eight places of study were selected in the vulnerable zones, representing the soils of administrative districts of Bauska, Dobele, Jelgava and Riga. Coordinates and the height above the sea level have been determined in the places of study by the global position system receiver, the type of the soil (according to the soil maps of the State Land Service) and the soil texture, the historical data of fields have been recorded concerning the cultivated crops, its productivity, fertilizing, as well as the meteorological data from the meteorological stations, situated in the proximity of the study places. The soil samples were taken twice a year, in early spring and late autumn, before winter from the soil layers of 0-30, 30-60 and 60-90 cm. The content of nitrates and ammonium nitrogen was determined in all the layers of the soil, according to the method set out by ISO/TS 14256-2. The average content of N_{min} (nitrates and ammonium nitrogen) in the main plant root zone 0-60 cm in spring in different years (2006-2009) varied between 24 and 45 kg ha^{-1} in light soils (sand, loamy sand), and 32 and 60 kg ha^{-1} in heavy soils (loam, clay). The assessment of the nitrate nitrogen content in the soil layers in autumn of 2005-2009 showed the following: in soil layer 0-30 cm the low nitrate nitrogen content ($\leq$10 mg NO_3- N kg^{-1} soil) has been established in the 54%-94% of places. ”Pollution risk” (>50 mg NO_3- N kg^{-1} soil) has been found in 0-11% of places. In the deeper layers (30-60 and 60-90 cm) the low nitrate nitrogen content was stated in 67-98% of places. ”Pollution risk” has been found only in the lowland bog soil (2% of places).

Key words: soil, mineral nitrogen, monitoring, vulnerable zones.

Staugaitis,G., Mažvila,J., Vaišvila,Z., Arbačiauskas,J., Putelis,L., Adomaitis,T. Soil mineral nitrogen testing in Lithuania

Abstract

In 1987-2002 several scientific research programmes were implemented in Lithuanian Institute of Horticulture. The aim of these programmes was to evaluate the effect of soil N_{min} content on nitrogen fertilization of vegetable crops, accumulation of nitrates in vegetable production in dependence on nitrogen fertilization and soil N_{min} content. It was ascertained that N_{min} content in soils of vegetable crop rotations was higher than in soils of other agricultural crop rotations [Staugaitis 1997]. Based on the average data collected form 19 experiments the changes (in percents) of N_{min} in 0-60 cm soil layer were calculated. Plots not

fertilized with nitrogen contained 100 % in May, 125±30 in June, 108±33 in July, 88±27 in August, and 52±28 in October. The increase of N_{min} content (%) in plots fertilized with 120 kg ha^{-1} nitrogen before the vegetation period as compared to the not fertilized plots was determined as well: 173±21 in June, 139±36 in July, 108±33 in August, 85±36 in September, and 60±26 in October. Thus the largest nitrogen fertilization impact on soil N_{min} content was determined in June and July, while in October this effect was almost gone [Staugaitis 1997]. Based on the results obtained from the experiments, the optimal (helping to avoid an excessive accumulation of nitrates in vegetable production) sums (kg ha^{-1}) of nitrogen fertilizer rates and buffer N_{min} content in 0-60 cm layer of soil were calculated for the main vegetable crops: middle late and late white cabbage, cauliflower and leek – 300, broccoli – 280, Chinese cabbage – 260, red beet – 220, carrot – 130, Iceberg lettuce (0-30 soil layer) – 220. Nitrogen fertilizer rate is calculated by deducting the soil N_{min} content in spring from the sum indicated above [Staugaitis, Dris 2002].

Fotyma,M. Monitoring of N_{min} content in soils of Poland

Abstract

In the paper the results of 10 years monitoring program for the content of mineral nitrogen in the soils in Poland are presented. This program has been launched by Ministry of Agriculture and Rural Development in 1997 and carried out by Agrochemical Laboratories with the scientific support of the Institute. Monitoring program was executed in about 5000 sites randomly selected in the whole Poland and included soil sampling twice a year in spring and autumn, collection of additional information , setting a bank date at the Institute and final processing the date. Soil samples have been collected from the soil layers 0-30, 30-60 and 60-90 cm and analyzed for the content of ammonia and nitrate ions. Therefore in the course of 10 years about 50thousand soils analysis have been stored and processed. In this synthesis the comprehensive information including the content and reserves of mineral nitrogen in the soil layers and soil profile, losses of nitrogen in course of winter period, simulated concentration of nitrate in the ground water and regional distribution of soils particularly threatened with the excess of nitrate are given.

Key words : mineral nitrogen N_{min}, nitrates, ammonia, soil monitoring for N_{min}, fertilizer recommendations, environment protection

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Gaborik,S. Application of the Nmin soil test in fertilizer recommendations

Abstract

In the stationary trials, during the years 1987 - 2003, i.e. in two crop rotations, there was tested the effects of three intensities of NPK fertilization in combination with manure for the harvest of grown crops, the nutrients intake, technological parameters, as well as status and movement of soil agrochemical indicators. Based on the results, there was found highly significant effect of soil on crop from 65,74 to 93,06%, as well as the nitrogen intake, depending on soil-ecological conditions of sites, on average 68,63% in potato production area, respectively 80,34% in maize and beet production area. Although it was achieved positive interaction the yields toward increase intensity of NPK fertilization, both effectiveness and negative impacts on the quality of production suggests the need to optimize the planned dose N based on actual content Nan in the soil, as well as taking into account the prospective of mineralized nitrogen supply from soil. Based on the obtained results and from literature data, there was developed the calculation model of refinement N doses to individual crops.

Key words : stationary trials, nitrogen, soil, manure, nutrients, crops,

Ceh,B. Škerbot,J. Application of the N_{min} soil test in fertilizer recommendations in Slovenia

Abstract

To protect water against nitrates from agriculture the total area of Slovenia is defined as a vulnerable zone. In line with the Water Directive (Water Directive 1991) and other regulatory measures in Slovenia (Regulatory 2009), threshold values for total nitrogen inputs to soils from mineral and/or organic fertilizers were determined, as well as many other measures for lowering the level of or totally preventing water pollution, which is caused by nitrates from agricultural sources.

Budnakova ,M., Čermák,P. Fertilising recommendation system based on results of agrochemical soil testing

Abstract

In the paper possibilities of Land Parcel Identification System (LPIS) in the area of agrochemical soil testing are presented. LPIS is very important tool for whole agricultural sector and in frame of agrochemical soil testing can be used for nutrient content valuation in the soil and based on this valuation next for determination of fertilizers application dosses.

LPIS contains complete database concerning agrochemical soil properties from agrochemical soil testing. All sampling areas are fixed in national co-ordinate system S-JTSK. Based on results of agrochemical soil testing a free recommendation system of fertilising was established in LPIS. All results are available for government body and for farmers and are free of charge. The costs of soil sampling, analysing and data valuation are covered by state budget through Ministry of Agriculture of the Czech Republic.

Key words: soil testing, soil reaction, nutrients, LPIS, fertilizing, recommendation system

Kuchenbuch,R. Improving soil test interpretation for P and K fertilizer recommendations for arable crops

Abstract

Current K and P fertilizer recommendation schemes in Germany are built on the widely accepted “sufficiency level” concept which is based on standardized soil testing procedures. The results are classified into levels of soil nutrient contents and interpreted in terms of nutrient availability. The basic assumption is that there is a relation between soil nutrient level, plant nutrient level, and yield response to fertilization. Site specific soil and plant properties (e.g., clay and carbon content, pH, crop species) are well known to influence the relation between nutrient content of the soil and fertilizer effectiveness. However, most of these factors are not accounted for quantitatively when assessing fertilizer demand, and overwhelming weight is assigned to soil nutrient contents. Recent increases in fertilizer cost stimulated a re-evaluation of field observations which suggests that even for soil nutrient concentrations well within the range considered to indicate P or K deficiency, fertilizer applications often resulted in no yield increases. This led us to re-analyze field fertilization trials encompassing several thousand experimental harvests conducted during the past decades in Germany and Austria, using a non-parametric data mining procedure which consists of a successive segmentation of the data sample.

The results of the analysis indicate that, besides nutrient content of the soil, fertilizer application rates, plant nutrient use efficiency, and site properties such as pH, clay content and soil organic matter, have a distinct influence on yield increase compared to an unfertilized control. The results may be used in a novel approach to predict the probability of yield increases for a specified combination of crop type, fertilizer application rate and site specific data. The approach and the results of the analyses should be transferable to different sites worldwide.

KEY WORDS: phosphate; potassium; yield; yield increase; soil test; plant nutrient response; clay content; pH; organic carbon; fertilizer application rate; arable crops

Szabó, E,B.,J. Loch,J., Pirkó,B.Experiences with the determination of nitrogen by 0,01 M $CaCl_2$ extractant in Hungarian soils and long-term experiments.

Abstract

During our research the $CaCl_2$ and KCl extractable N content of 632 Hungarian soils, originating from the Hungarian Soil Information and Monitoring System, and $CaCl_2$ extractable N content of soils from two long term fertilization experiment were studied.

From the results of the examination it was concluded as follows:

- Our comparative studies on 632 Hungarian soils confirmed that there is close correlation (r=0.83) between the $CaCl_2$ and KCl extractable nitrate content of soils.
- From these soil samples we determined the average amount of $CaCl_2$ extractable N fractions of soils and the proportion of these N-forms in the most important production site categories of Hungary. Our results proved that the amount of N_{org} fraction of different categories is in good agreement with the intensity of mineralization under different conditions.
- The N fractions of the soil determined in $CaCl_2$ gave a good reflection of fertilization in each long-term fertilization experiment.
- On the trial site of Karcag on meadow chernozem soil we found significant relationship between N_{total}, NO_3-N, NH_4-N and the agronomic nutrient balance.
- Our results confirmed that the N_{org} fraction contains the readily mineralizable nitrogen reserves of soil which is mainly originated from the plant residuals.
- The depth distribution of $CaCl_2$-NO_3 on the trial site of Látókép clearly demonstrated the difference in leaching conditions in the irrigated and non-irrigated treatments. On non-irrigated plots the highest NO_3-N value was measured at a depth of 200 cm. The NO_3-N content of irrigated plots was less than half that of non-irrigated plots and presumably the accumulation maximum was at a lower depth.
- It is clear from both the yield data and soil analysis that the 240 kg ha^{-1} N rate was not utilized by the crop. The $CaCl_2$-NO_3 content recorded in the soil profile was a sensitive indicator of N accumulation.
- According to our results the $CaCl_2$ method is recommended to apply for the precise estimation of fertilizer rates taking into account the N_{org} fraction.

Key words: 0.01 M $CaCl_2$ extractable N fractions, Hungarian soils and long-term experiments

Jadczyszyn,T. Polish fertilizer recommendations system Naw-Sald

Abstrakt

NawSald jest najbardziej rozpowszechnionym w Polsce systemem doradztwa nawozowego. Narzędzie to w postaci programu komputerowego jest wykorzystywane w doradztwie przez wszystkie okręgowe stacje chemiczno-rolnicze, ośrodki doradztwa rolniczego, doradców prywatnych, bezpośrednio przez producentów rolnych, a także do celów dydaktycznych w szkołach rolniczych. System doradztwa NawSald jest zgodny z koncepcją zrównoważonego rolnictwa. Celem nawożenia jest uzyskiwanie plonu osiągalnego w określonych warunkach glebowo-klimatycznych oraz utrzymanie wysokiego poziomu żyzności gleby. Nawożenie mineralne jest uzupełnieniem nawożenia organicznego oraz innych źródeł składników pokarmowych. Dawki nawozów mineralnych wyznacza się na podstawie bilansu składników, w którym po stronie rozchodu uwzględnia się pobranie składników mineralnych z plonem, a po stronie przychodu – ich dopływ z nawozów i innych źródeł. W pracy omówiono sposób obliczania poszczególnych elementów bilansu oraz przedstawiono wewnętrzne bazy danych programu.

Grzebisz,W. , Szczepaniak, W., Cyna,K., Potarzycki,J. Fertilizers management in the CEE Countries - consumption trends - effect on current and future wheat yields performance

Abstract

Central-Eastern European Countries (CEEC) have been facing for decades economical as well as political challenges, which directly shaped changes dealing with food production and concomitant production means. The current study outlines long-term trends of fertilizers consumption in four CEEC: Hungary (HU), Poland (PL), Romania (RO) and the Slovak Republic (SR) and their impact on wheat yield performance for the period 1986-2005. The hypothesis relies on the assumptions, that the current state of crop production in the CEEC follows the degree of nitrogen fertilizer productivity, which is governed by i) the amount of N fertilizer applied, ii) weather course during the growth season and iii) phosphorus and potassium management as nutritional factors responsible for N uptake and utilization by cultivated crops. Therefore, in order to get a reliable answer, statistical data

(www.faostat.fao.org) on actual yields of wheat - in each of the studied country were analyzed.

In the period 1986-2005, the deepest decrease of all fertilizers consumption took place at the beginning of 90s (XX century). The recognized trends following the occurred collapse are nutrient and country specific. Hungary and Poland, since the year of the lowest N use, follows the restoration model, while other two countries – a stagnation one. With respect to phosphorus only PL, and in the case of potassium also HU and the SR have increased their use, but annual rate is low. Moreover, the relationships between amounts of main nutrients (P:N and K:N) underwent manifold widening. The main reasons of these negative changes are attributed to relatively high annual rates of fertilizer nitrogen consumed and concomitant low annual rates of phosphorus and potassium fertilizers use. Long-term trends of wheat yield reflects to some extent patterns of fertilizer's use. Strikingly important is the size of the yield gap (YG. This parameter was calculated by using the partial factor productivity of applied fertilizer N: real (rPFP$_N$) and modified (mPFP$_N$) indices. Based on these indices a temporary yield gap (TYG) has been calculated, defined as the virtually un-harvested portion of grain yield. The general long-term trend of the TYG can be divided into three consecutive phases: i) declining (the first 6(9) years), ii) defined turning point-year iii) repeated increase. The found trends clearly point out a wrong strategy of N, P, and K fertilizer management in the CEEC, relying on unbalanced N use. In this study, Authors have attempted to formulate a prognostic concept based on the PFP$_N$ indices. The only improved PFP$_N$ index, i.e., m PFP$_N$ seems to be a useful tool in making any reliable prognosis of wheat grain yields. Therefore, a greater knowledge about crop response to balanced plant nutrition is required at the country level to create successful food and environmental policies at the farm and *vice versa*.

Key words: Fertilizer consumption, P:N and K:N ratios, CEE countries, wheat, yield gap, partial factor N productivity, yield prognosis.