

EFFICIENT UTILIZATION OF NATIVE NUTRIENT SOURCES

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Abstract. *Positive phosphorus (P) and nitrogen (N) balances are common in most EU15 countries and Norway while much lower balances dominate in the more recent member states. Strongly positive balances are prevalent in intensive domestic animal production, where imported feed stuffs create a steady inflow of nutrients. N and P contained in manure stand for the largest single flows of these nutrients in the food production and consumption system, much larger than the flows in sewage. Even in Finland, not among the countries of the most intensive animal production, it has been estimated that manure P could satisfy all P fertilization need by the crops. Owing to logistic reasons, this is however not feasible in practice. Abundant use of P and N has been recognized as a problem in the European Union already for years, both from the environmental point of view and for P as an issue of wasteful utilization of a limited natural resource. This concern has resulted in projects such as Baltic Manure, and more stakeholder oriented Baltic COMPASS and Baltic Deal, and the European Sustainable Phosphorus Platform has been established. Attention has been paid to the excessive P status of many fields but still almost all countries have also fields of low P supplying capacities. These low P soils were common in Estonia, Latvia and Lithuania already in early 1990s and their proportion has likely increased during the last 25 years owing to low P use, probably resulting in yield deficit. The divergence between the countries and between fields within a country calls upon site-specific nutrient management.*

Agriculture around the Baltic Sea is not the most intensive user of plant nutrients in Europe but our Sea is highly vulnerable to eutrophication. In spite of still deficient wastewater treatment in a few major cities, agricultural land is recognized as a major source of N and P transported to the Baltic Sea. Our agriculture should focus on more efficient use of domestic nutrient sources. Substance flows such as manure, sludge, organic wastes, and different industrial by-products contain N and P and we cannot decide to produce them or not; they by and large inevitably exist. Instead, mineral fertilizers are deliberately produced, and we can reduce the production if the desired nutrients can be obtained from alternative sources in an economically feasible manner. Political decisions and new innovations are needed to facilitate a more even distribution of manure nutrients in particular.

Moreover, for certain time period, there are obvious possibilities to take the advantage of P stocks accumulated into the soil in past fertilizations with manure or mineral P; starting from medium P status, only minor or non-existent responses have been obtained with new P additions. Soil testing should be used for monitoring how long this nutrient mining is sustainable in a field concerned. In high P soils negative P balances cannot be considered non-sustainable, while that is not the case in low P soils where negative balances more rapidly result in adverse effects on yield. There is also evidence that some soils contain substantial stocks of mineral N in the subsoil and hence show exceptionally low response to N fertilization. These observations have been made on the western coast of Finland on acid sulfate soil where unfertilized potato yielded 41 t ha⁻¹ with a highly negative N balance and only a 2 - t ha⁻¹ yield increase upon N application. Potassium (K) used to be the least expensive of the three major nutrients but its price has drastically increased since 2008. Fine and medium textured soils commonly have abundant K reserves. If these soils have a coarse or organic plough layer and only the topsoil is analyzed, these reserves go unnoticed and more than adequate amounts of K may be applied.

This presentation calls upon more efficient utilization of native N, P and K resources from different substance flows or those present in soil. More work is required to guarantee the fertilizer effect of these sources, and to safeguard that soil quality is not compromised by the use of waste materials. Soil testing is needed to monitor how long nutrient mining can be pursued in a sustainable manner and to recognize areas and soil types with abundant N, P and K reserves.

Key words: nitrogen, phosphorus, potassium, nutrient balances, sustainability.