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Potassium availability in soils and the use of the Q/I approach – moving from theory to nation-wide realization

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Soil test methods for K availability in soils vary largely and so does the threshold values. Some of the availability indices are quantity (Q) factors, while other are intensity (I) factors. As such, guidelines for fertilization recommendations are ambiguous, and in many cases a dichotomic approach is followed – if soil test is low, recommendation are for large K application (i.e. 500 kg ha^{-1}), otherwise 0 application is recommended. This approach is based on the presumption that if given in access, K will cause no harm to plants or to the soil and the access will remain in the soil for next crop. This presumption however is often proved wrong and in other cases, the access is just too expensive for farmers. To attain and sustain soil fertility in terms of K availability, a Q/I approach was tested and adjusted for soil-test laboratories and is advocated for agronomist and fertilizing consultants in Israel.
As a Q factor, the adsorbed K^+ was considered. As the I factor we used the energy of K^+ to (Ca^{2+} + Mg^{2+}) exchange in soils, expressed as ΔF. The Q, I, and Q/I K-availability indices were tested in 14 soils, having a large variation in major soil properties (e.g., clay content, lime content, cation exchange capacity, specific surface area). Depending on the Q/I ratio of each soil different amount of fertilizer-K was shown to be needed to increase the I index of the soil from its original state to a given target value. Two target values were set for each soil and all soils were treated by K fertilization based on their buffer capacity (PBC). Five to 12 weeks after soil fertilization, ΔF values were tested again and were found to be very close to the target values. The PBC values were also changed, but overall, by using the three PBC values for each soils a rather good correlation was found with few clay-related soil properties. Adjustments to facilitate easy use of the approach in the consultant service for farmers will be presented.