

Balanced Fertilizer Practices in Taiwan – Fertilizer Application and Balance in the Field

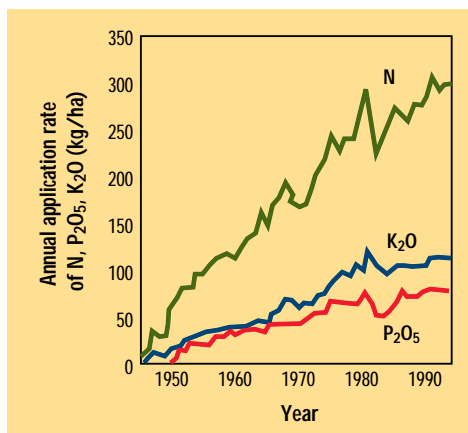
By Wang Yinpo

Crop production in Taiwan has outstripped domestic demand for food because modern farming technologies, including the balanced use of nitrogen (N), phosphorus (P), potassium (K) and other fertilizer nutrients, have been practiced. More than 10 times the amounts of NPK are used today than in 1945. The N:P₂O₅:K₂O ratio being applied approximates that of developed countries. A good fertilizer program is measured by its ability to provide a balanced nutrient supply at the appropriate physiological stages in adequate quantities over the crop's growing period. Taiwan has a strong extension service and strong government support to supply all essential nutrients to farmers so they can practice balanced fertilization.

Modern agriculture in Taiwan began early in this century. During that period, agricultural research institutions were established and land was surveyed and classified according to its productivity. New crops and varieties, field management practices, and inorganic fertilizers were introduced as new agricultural technologies.

In the past five decades, Taiwan's agricultural production increased rapidly so that it greatly exceeds domestic food demand. Before crop diversification was introduced in 1984, rice production virtually increased in proportion to increases in NPK application. Yields went from 0.58 million tonnes to over 2.5 million tonnes.

Figure 1. Annual application rate of chemical fertilizer in Taiwan (per hectare of land area).



Presently, Taiwan's annual fertilizer consumption is 265,000 tonnes N, 74,000 tonnes P₂O₅ and 105,000 tonnes K₂O, with a country-wide ratio of 1:0.28:0.4. Annual application rate of N-P₂O₅-K₂O is 304-85-120 kg/ha of cultivated land, or 256-72-101 kg/ha/crop. Annual consumption is 10 times higher than in 1945 (Figure 1).

The purpose of nutrient balance is to maintain high soil fertility and high productivity over a long period and to supply balanced nutrients to

crops at each growth stage. For high yielding cropping systems, it is essential to provide adequate, balanced nutrition over the growing season to satisfy requirements at each physiological stage of crop development.

The use of Rhizobium inoculation for soybeans is effective in reducing N fertilizer needs. Its effectiveness is enhanced by proper use of P and K. In northern Taiwan, where soils are acid and have a low nutrient content, inoculation alone increased yields by only 8 percent, whereas inoculation along with applications of P and K boosted yields by 29 percent.

Studies in Taiwan have shown when other essential nutrients were adequate, increasing supply of a deficient or less than sufficient nutrient increased yields. That means balanced use of all nutrients increases the use efficiency of each nutrient for a combined positive effect. In contrast, if all plant nutrients are not applied in a balanced manner, efficiency of those applied is reduced and economic losses occur.

Extension of research results to farmers is as important as the research itself. In other words, to practice knowledge is as important as the knowledge itself. Taiwan has made great efforts to follow this philosophy, using the following:

- Teaching the concepts of balanced fertilization in classes to students, farmer groups, and advisors.
- Transferring knowledge by mass media.
- Supporting field demonstrations and workshops.
- Making conditions easier for farmers to practice balanced fertilization by providing adequate supplies of all fertilizers at appropriate times. **BCI**

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Taiwan uses balanced fertilization - 429 kg/ha/crop at the balanced N:P₂O₅:K₂O ratio of 1:0.28:0.40.