**ASIA-PACIFIC OUTLOOK**

**Organic phosphorus recycling and long-term phosphate fertilizer demand**

*by Patrick Heffer, IFA*

At the 2010 IFA Crossroads Asia-Pacific Conference, participants’ discussions included the outlook for organic phosphorus recycling and long-term phosphate fertilizer demand in Asia-Pacific. The half-day workshop on this topic featured three speakers who presented the situation in their respective countries: China, India and New Zealand.

**China**

In China, until the early 1950s all P inputs to agricultural land were of organic origin. It is estimated that some 1.2 Mt of P$_2$O$_5$ were applied through organic fertilizers in 1957, compared with only 0.05 Mt P$_2$O$_5$ through inorganic ones. The national P balance at that time was negative, estimated at -1.1 Mt P$_2$O$_5$. In 1980, total P inputs to crop land increased to 5.1 Mt P$_2$O$_5$, with 60 per cent coming from inorganic fertilizers. P balances have been improving steadily, to become positive in 1980 (+0.4 Mt P$_2$O$_5$).

The second national soil survey, carried out in the early 1980s, indicated that after mining of soil P reserves for several decades, some 80 per cent of China’s arable land contained less than 10 mg P$_2$O$_5$/kg of soil and half of it had a very low soil P level, below 5 mg P$_2$O$_5$/kg of soil. In order to cope with this high prevalence of P deficiency, domestic P fertilizer consumption continued to increase. In 2000, total P inputs had risen to 15.5 Mt P$_2$O$_5$, of which 74 per cent was of inorganic origin. The national P balance strongly increased, to 4.8 Mt P$_2$O$_5$. As a consequence, the occurrence of P deficiency in Chinese agricultural soils declined steadily.

With the progressive accumulation of P in arable soils, it is estimated that, over the 1995-2000 period, the proportion of soils with P deficiency declined to 45 per cent. There is a need to continue improving soil P levels in some 40 per cent of Chinese agricultural soils. This requirement can be met partly through higher fertilizer application rates and better recycling of organic P sources. Domestic P fertilizer consumption is forecast to rise to 13.1-13.6 Mt P$_2$O$_5$ in 2015. Beyond 2015, demand would increase only modestly.

**India**

In India, some 80 per cent of the soil samples tested show low or medium P levels, with a large variation among Indian states. Similarly to China, India had historically negative P balances, as P inputs were not sufficient to offset P exports with the harvested product. In 2007/08, it is estimated that 7.5 Mt P$_2$O$_5$ was applied to agricultural land, with 5.5 Mt coming from inorganic fertilizers and 2.0 Mt from organic sources. Out of the 2.0 Mt from organic sources, 47 per cent was from farmyard manure and 47 per cent from compost. Assuming a limited increase in the recycling of P fertilizer sources, P fertilizer demand in India is forecast to continue rising steadily, to some 12 Mt P$_2$O$_5$ in 2020 and 14 Mt P$_2$O$_5$ in 2030. In China and India, it is difficult to assess the potential supply through the recycling of P contained in sewage sludge and to what extent, and when, this could have an impact on P fertilizer demand.

**New Zealand**

In New Zealand, there is a long history of P fertilization. P fertilizer demand is highly influenced by the livestock sector (mostly sheep and dairy cows). It is estimated that some 95 per cent of the P fertilizer used in New Zealand is applied to pastures. Large amounts of P are recycled through animal manure. National P balances were positive in the 1990s and up to 2007/08. With the sharp drop in P fertilizer consumption in 2008/09, the P balance became negative, estimated at some -60,000 t P. With the recovery of demand, the P balances would progressively recover. P applications are, however, forecast to remain some 40,000 t P below maintenance levels in the medium term. To rebalance inputs and outputs, there will be a need to increase P fertilizer use as there is little scope to increase P supply from organic sources.


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**Nutrient balance in farmland in China**

**Evolution of the P balance in New Zealand**

**Outcome of the Fifth International Nitrogen Conference (N2010)**

*by James Galloway, Cheryl Palm, Manbir Sachdev, Yash Abrol, Mark Sutton, Nandula Raghuram and Martina Havlikova*

The overall objective of the INI is to optimize nitrogen’s beneficial role in sustainable food production and to minimize its negative effects on human health and the environment. In that context, N2010 focused on the following themes: Food Security, Energy Security and Industry, Human Health and Environmental Degradation, Ecosystem Health and Biodiversity, Climate Change, and Integration. Within these themes, there were 175 verbal and 130 poster presentations.

The conference noted that since the Fourth International Nitrogen Conference (Brazil, 2007) substantial progress had been made on: reducing emissions of nitrogen oxides (NOx); linking the nitrogen and carbon cycles; establishing the Global Partnership on Nutrient Management (GPNM); planning for regional nitrogen assessments; and developing communication tools, such as the nitrogen footprint calculator. At the conclusion of the conference, the attendees approved the Delhi Declaration, which, among other points:

- affirmed the scientific findings that the global nitrogen cycle is one of the most anthropogenically altered nutrient cycles on earth, that the adverse consequences of unabated accumulation of reactive nitrogen compounds (in our soil, water, air and atmosphere) are real, for our health, environment and climate change, and that it is possible to reduce them by concerted (local, regional and global) action through science-based practices and policies;
• recognized that the anthropogenic release of reactive nitrogen vary hugely between countries, between regions within countries and between different economic sectors, and that the nitrogen cycle is of critical importance to food security. However, leak- age of reactive nitrogen from crop, animal, aquatic and industrial produc- tion systems into the environment is a cause for concern, whether the leakages are of chemical, biological or organic origin. It is possible to minimize these leakages through scientific and technical solutions and enabling policy- making. This includes ways to optimize the efficient use of inorganic and organic fertilizers worldwide, and to facilitate enhanced access and sustain- able use of nitrogen inputs in the predominately nitrogen-deficient soils of Africa and parts of Latin America and Asia;

• restated that nutritional inequities, whether due to overnutrition among some populations (especially from protein-rich animal products) or undernutrition in a significant fraction of the world, affect the health and sustainable development of both populations, as well as exacerbating disturbances in the nitrogen cycle. This necessitates better management of food chains and food security, par- ticularly intensively managed live- stock production systems, which cause excessive losses from nitrogen- enous excreta (urine, dung and other biological wastes) unless properly recy- cled;

• acknowledged that while fossil fuel and biomass combustion are currently necessary to meet demands for elec- tricity, transportation and energy, reactive nitrogen by-products from these sources are a serious cause for concern;

• expressed concern that in a business- as-usual scenario, the problems associ- ated with inefficient production and use of reactive nitrogen will multiply in the coming years, as the demand for food, especially animal-based proteins, and biofuels increases, fossil fuel and biomass burning increases, and growing urban populations produce more waste;

• encouraged co-ordination for inter- disciplinary research, capacity build- ing and policy within and between countries, intergovernmental bodies, the INI and civil society: a) to ensure adequate nitrogen availability for food and nutrition security in differ- ent regions, and b) to understand and mitigate the adverse impacts of accumu- lation of excess reactive nitrogen. The attendees called upon United Na- tions bodies such as FAO, the UN De- velopment Programme (UNDP), the UN Environment Programme (UNEP), the UN Human Settlements Programme (UN-HABITAT) and the World Health Or- ganization (WHO), as well as regional organizations, national governments, scientific communities including the Consultative Group on International Ar- chitectural research (CGAIR), industries, policy-makers, the INI and civil society, to address nutrient deficiencies and move towards increased efficiencies in each segment of nitrogen cycle management, in order to reduce the adverse effects. Approaches should consider the use of incentives, make full use of recycling and reusing the treated wastes. In conclusion, the conference agreed that policies developed to address soci- etal issues should be “nitrogen proofed” to maximize the use of information to research and minimize the negative effects of reactive nitro- gen. There is a pressing need for na- tional governments to develop more integrated, rigorous and multi-disciplin- ary approaches for the management of sources, sinks, flows and effects of nitro- gen and other nutrients at the local and regional scales, and institutions must be based on consolidation and synthesis of existing data, identification of gaps to undertake necessary research, and the use of information to promote ap- propriate practices and technologies, with the accompanying policies encour- aging an increasing proportion of “nitrogen proofed” best practices.

In that regard, regional assessments such as the European Nitrogen Assess- ment are required so as to frame issues of nitrogen deficiencies and excesses and mitigation options in policy relevant contexts, based on expert judgements of scientific knowledge and uncertainties. These regional assessments should lead to a similar framing of issues and options in a comprehensive global assessment for policy-makers.

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N2010 Conference: www.n2010.org/ Delhi Declaration: www.ngb.net/ (UN-HABITAT) and the World Health Or- ganization (WHO), as well as regional organizations, national governments, scientific communities including the Consultative Group on International Ar- chitectural research (CGAIR), industries, policy-makers, the INI and civil society, to address nutrient deficiencies and move towards increased efficiencies in each segment of nitrogen cycle management, in order to reduce the adverse effects. Approaches should consider the use of incentives, make full use of recycling and reusing the treated wastes. In conclusion, the conference agreed that policies developed to address soci- etal issues should be “nitrogen proofed” to maximize the use of information to research and minimize the negative effects of reactive nitro- gen. There is a pressing need for na- tional governments to develop more integrated, rigorous and multi-disciplin- ary approaches for the management of sources, sinks, flows and effects of nitro- gen and other nutrients at the local and regional scales, and institutions must be based on consolidation and synthesis of existing data, identification of gaps to undertake necessary research, and the use of information to promote ap- propriate practices and technologies, with the accompanying policies encour- aging an increasing proportion of “nitrogen proofed” best practices.

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