Cleaner Production and Use of Fertilizers and Pesticides
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Executive Summary

The fertilizer and pesticide industries are of vital importance to China's future food security and overall economic development. The demand for food and agricultural raw materials is increasing rapidly, but the use of manure is no longer sufficient to raise crop yield. The greater use of mineral fertilizers is the only way of meeting the demand for food and ensuring that soil fertility is endangered.

The fertilizer and pesticide industries are of vital importance for China's food production as the demand for food is increasing and also the demand for the products of these industries is growing strongly.

Since the environmental impact of both the production and the use of agrochemicals is already considerable, it has become a matter of urgency to apply the principles of "cleaner production" to the production process as well as the lifecycle of the products which comprises the use of fertilizers and pesticides in agriculture. With regard to production as well as use, important issues present themselves.

Problems encountered in the production are amongst other. (1) the large number of small factories which results in inefficient use of raw materials, more pollution and greater difficulty for environmental control process; (2) the high amounts of energy required by especially the nitrogen fertilizer industry; (3) the insufficient production capacity for phosphorous and potassium fertilizer, resulting in the need for expensive imports. Besides application of standard cleaner production methods, adapted to the Chinese situation, it will be necessary to mount an education and training program of considerable size in order to introduce cleaner production in all factories concerned, while at the same time compliance to NEPA standard should be more closely monitored.

In addition, R & D will be needed to innovate these industries with respect to products as well as manufacturing process so as to enable them to meet the future demands of agriculture. Since agriculture is in rapid development in China, the industries should carefully attune themselves to changing trends and follow the market rather than expect that agriculture will follow the industry.

The situation with regard to the use of agrochemicals is more complex as China's agriculture is now developing to a high production level which must, however, at the same time be sustainable in the long term. Experience in industrialized countries, especially in the European Union and the U.S.A., has shown that increasing indiscriminately the use of fertilizer and pesticide does raise the production on the short term, but that on the long term unacceptable environmental damage results like ground water pollution, surface water eutrophication and soil quality degradation. Consequently, agriculture has now shown in many countries to be the largest source of water pollution which is all the more serious because in contrast to industry it is a diffuse (non-point source) character and hence very difficult to deal with.

Thus instead of continuing the "more of the same" principle, several countries in the European union are now in the process of transforming their "high-input" agriculture into low-input agriculture in which the use of fertilizer and pesticide is drastically reduced. In order to do this, use is being made of modern ecological knowledge, of biotechnology and of genetic engineering to achieve this low-input agriculture (also called ecological agriculture or eco-farming) without serious loss in yield. At the same time, new university departments and institutes are being set up to support the required innovation by R & D.

China possesses a great deal of traditional eco-farming knowledge as well as capability in ecological sciences and genetic engineering. It is, therefore, in many regions of China in a position to skip the "high-input" phase in its agricultural development by combining upgrading of
traditional technologies with the results of research in modern ecology, genetic engineering and biotechnology.

Several recommendations to this effect are being made in the areas of regulations poling, legislation, research, technology development and education, including enhancing public awareness.

[It should finally be realized that the wise (restrained) use of fertilizer and pesticide, in harmony with the principles of cleaner production, is only one factor - although an important one - in the much wider picture of sustainable agriculture in China in which also factors like water resources, irrigation and drainage methods, soil quality preservation and enhancement, and last, but not the least, market demands play important roles. Thus a comprehensive study of all aspects of sustainable agriculture would seem to be a logical and appropriate next step.]