FERTILIZER USE EFFICIENCY		
Land	**Agriculture**	

1. INDICATOR

(a) Name: Fertilizer use efficiency.

(b) Brief Definition: Extent of fertilizer use recovery in agriculture per crop unit.

(c) Unit of Measurement: kg/kg

(d) Placement in the CSD Indicator Set: Land/Agriculture.

2. POLICY RELEVANCE

(a) Purpose: The purpose of this indicator is to measure the recovery of plant nutrients from mineral fertilizer application in crop husbandry (agriculture) for resource use efficiency.

(b) Relevance to Sustainable/Unsustainable Development (theme/sub-theme): Production increases in the next three decades are to be no smaller in absolute terms than in the past three decades, although the growth rates will be significantly lower. These future increases must be achieved starting from a resource base that is today much more stretched than in the past. The task of obtaining these production increases while minimizing adverse effects is thus more arduous than in the past. The prospect that growing shares of the increments in world production will originate in the developing countries further enhances such risks. This means that pressures will be increasingly gathering in the agro-ecological environments of the tropics, which are more fragile than the temperate ones and contain much of the world's biodiversity. In addition, in the developing countries, conventional objectives of agricultural development (food security, employment, export earnings) usually take precedence over those of sustainability and environment conservation. The preservation of the productive potential of their agriculture, however, is much more critical than it is for the industrial countries where agriculture is a small part of the economy.

Given scarcities of suitable agricultural land in several developing countries, there is no escape from the necessity for a good part of the required production increases to come by extracting more output from each ha cultivated. That is, agriculture will be becoming ever more intensive. Obviously, what is required is intensification that can keep threats to the resource base and the wider environment within bounds not threatening the sustainability of the system. This indicator shows the potential environmental pressure from inappropriate fertilizer application. Intensive fertilizer application is linked to nutrient losses that may lead to eutrophication of water bodies, soil acidification, and potential of contamination of water supply with nitrates. The actual environmental effects will depend on the adoption of nutrient losses reducing commensurate with soil conditions and crop yields under prevailing meteorological conditions.

(c) International Conventions and Agreements: Not available.

(d) International Targets/Recommended Standards: Market forces drive the adoption of efficient fertilizer nutrient practices. Targets should be based on national situations.

(e) Linkages to Other Indicators: This indicator is closely linked to others in the agricultural, water (nutrient loads in ground water, surface water bodies and coastal aquatic ecologies), and atmospheric groups, such as, algae index, and emissions of greenhouse gases.

3. METHODOLOGICAL DESCRIPTION

(a) Underlying Definitions and Concepts: The concepts are available. Data on the quantities of fertilizers used are converted into the three basic nutrient components and aggregated. The three components are nitrogen (N), phosphorous (P_20_5), and potassium (K_20). Chemical composition of crops and their by-products are standardized. However, due to the limitations discussed in section 4(d) below, this indicator should be regarded as interim for sustainable development purposes.

(b) Measurement Methods: Data on fertilizers and yields are compiled from FAO statistics. Data for developing countries generally refer to domestic disappearance based on imported products. The derived figures in terms of nutrient application are then divided by the nutrient contents removed by harvested crops and their by-products.

(c) Limitations of the Indicator: Environmental impacts caused by leaching and volatilization of fertilizer nutrients depend not only on the quantity applied, but also on the condition of the agro-ecosystem, cropping patterns, and on farm management practices. In addition, this indicator does not include organic fertilizer from manure and crop residues. The indicator assumes even distribution of crop-fertilizer application in a country.

(d) Status of the Methodology: Described and applied in FAO: Agriculture, Towards 2015-2030.

(e) Alternative Definitions/Indicators: A more relevant and sophisticated indicator focuses on *nutrient balance* to reflect both inputs and outputs associated with all agricultural practices. This addresses the critical issue of surplus or deficiency of nutrients in the soil and captions system losses, ceteris paribus, over a period of time.

4. ASSESSMENT OF DATA

(a) Data Needed to Compile the Indicator: Data on fertilizer use for N, P_20_5, and K_20; and crop yields.

(b) National and International Data Availability and Sources: Data for all countries exist at the national level only. The data are updated on a regular basis. At the international level, the Food and Agriculture Organization of the United Nations (FAO) is the primary source.

(c) Data References: see 6(a).

5. AGENCIES INVOLVED IN THE DEVELOPMENT OF THE INDICATOR

(a) Lead Agency: The lead agency is the Food and Agriculture Organization of the United Nations (FAO). The contact point is the Assistant Director-General, Sustainable Development Department, FAO; fax no. (39 06) 5705 3152.

(b) Other Contributing Organizations: The USDA-ERS and the Fertilizer Institute – Washington are associated with the development of this indicator.

6. REFERENCES

(a) Readings:

FAO. 1996. *Fertilizer use by crop, 3*. International Fertilizer Industry Association, Paris (France); International Fertilizer Development Center, Muscle Shoals, AL (USA); FAO, Rome (Italy). Statistics Division, 49 pp.

FAO. 2000. *Fertilizer requirements in 2015 and 2030*. FAO Land and Water Development Division, 29 pp

FAO. 2001. *Global estimates of gaseous emissions of NH3, NO and N2O from agricultural land*. FAO Land and Water Development Division, 66 pp

FAO. 2004. *Scaling soil nutrient balances*. FAO Fertilizer and Plant Nutrition Bulletin no.15, 132 pp.

(b) Internet sites:

FAO Statistical Databases. http://faostat.fao.org/

International Fertilizer Association. http://www.fertilizer.org/

FAO Land and Water Development Division. FAO/AGL - Land and Water On-line documents