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## Regulating Non Point Source Pollution from Agriculture

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This paper studies the set of policy options to regulate non point source pollution from agriculture in Jaffna district. Studies are oriented towards comparing the effects of input oriented measures (Fertilizer tax) and policy measures directed towards more direct changes in the agronomic practices on the farm. The trade-offs between and regulation costs are discussed. Ground water, the most vital but vulnerable resource in Jaffna, has got polluted with several well-known pollutants resulting in depletion of quantity of potable water as well as deterioration in quality. Nitrates and Phosphates quality of ground water had been monitored at critical locations (such as Thirunelvely, Kondavil, Vadamaradchy and Jaffna city wells) for several years. Alarming increases in concentration of nitrates,(above 66ppm) well beyond limits of tolerance according to WHO standards ( permissible-50ppm) have been recorded in the early eighties. The concentration of nitrates (mg/liter) in well water from several villages in Jaffna district has been recorded. It shows that water from araly, chavakacheri, Delft, Jaffna-Hospital, Kaithady, Karaveddy, Kayts, Kondavil, Thirunelvely, Vaddukoddai, Valvettiturai has above the tolerable concentration of nitrates (50mg/litre) and water from Manthuvil, Tellippalai has below the tolerable concentration of nitrates. This has been attributed to leachate from agrochemicals percolating down to ground water table. This is a non point source pollution.

In the case of non point source pollution, monitoring costs make taxes on emissions prohibitively expensive. Because of this, input taxes, such as a tax on N in mineral fertilizers, are an interesting alternative but effect of such taxes is heavily disputed. Still, there are several arguments in favour of such a solution that could be tested with the help of a properly developed inter-disciplinary analytical system.

An N tax should lead to reduced fertilization levels, and thus should indirectly reduce N leaching. Second, the changes in relative prices brought about by fertilizer tax may lead to the substitution of mineral fertilizer by

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other N source such as manure, reducing the potential losses from this source. In general a tax should make agronomic practices that facilitate higher plant uptake, and thus lower losses, more profitable. It may make it more interesting for the farmer to adopt split fertilization ( to adjust fertilization levels to stochastic changes in the plant growth potential). Since higher losses of N tend to occur in years with low plant growth, split fertilization may reduce nutrient losses.

Another example is catch crops. Most losses of nitrates take place outside the growing season of the main crop. Catch crops may guard against losses (1) through increased total plant uptake of N and (2) through increased microbial immobilization of mineral N prone to leaching in the period after the catch crop is incorporated into the soil. This N will become available for plant growth in later years through mineralization process. An N tax will increase the value of this N pool, and thus may motivate the use of catch crops.

Due to the character of the problem, Policy analyses in the field of environmental problems will generally involve aspects covered by several disciplines. Fertilizer inputs, crop growth and various soil processes affect leaching individually and jointly. Thus not only do the levels of input influence leaching but also the incorporation of organic matter in the soil, the length of the growing season, tillage practices, pesticide use etc. through their effects on crop growth and dynamics of the soil N pools.

No simple solution exists for reducing non point source pollution from agriculture. N tax , which in principle could capture the effects of all the variations, are mostly of theoretical interest. If variability is of greater significance, measures directed towards changes in agronomic practices may be preferable since this type of instrument can be differentiated even down to the farm level. An input tax can, on the other hand, hardly be distinguished within the same market. A major problem with an N tax is its fairly large distribution effects. It should also be noted that it is difficult to vary input taxes between regions, as this would result in trade leakages between regions. A system with tradable N quotas may be of interest. If initial quotas are issued free to farmers, at least farmers as a group would not be worse off. Another option might be a standard lump sum transfer or a subsidy on catch cropping through money raised by the tax. However, the gains of increased precision have to be compared to the increased level of administrative costs.