

Socio-Economic and Climatic Controls on the Runoff of Fertilizer from Rice Cultivation in Sri Lanka

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Algal blooms, which usually follow periods of heavy rain, have been observed with increasing frequency in the lagoons on the west coast of Sri Lanka over the past decade. An assessment of available data showed that the fluxes of nitrogen were quite high and that fertilizer runoff was the most likely source. The results of detailed studies of fertilizer use and nutrient runoff in rice cultivation under rain-fed and irrigated conditions that were conducted to verify this conclusion and investigate the causes of the high fluxes are summarized in this paper.

The studies of rain-fed rice cultivation showed that about 50% of the nitrogen

applied as fertilizer was present in the surface runoff, with losses being nearly 90% during periods of heavy rain. The reasons for the high losses were a combination of over-application of Urea and poor surface water management. The high use of Urea was found to be due to a skewed fertilizer subsidy. A repeat survey of fertilizer use a year later showed that the use of Urea was reduced when the subsidy was reduced.

The studies of irrigated paddy showed that the runoff of nitrogen was less than 10% of the applied amount. While one reason for this low value is the severe drought that prevailed in the site during the studies, lower losses can be expected even during periods of normal rainfall because the movement of surface water is under better control. The amount of fertilizer used and the timing of applications were more in accordance with recommendations than at the rain-fed site. This is because of changes in the prices of fertilizer as well as better farming practices in general.

The results of the studies were then combined with 20 years of rainfall data to assess the relationship between the rainfall and the nitrogen runoff. The results showed that the runoff is dependent on both the quantity and timing of the rain, with the potential for high fluxes once certain thresholds are exceeded. Rain-fed rice cultivation is particularly vulnerable to variations in rainfall. It is concluded that the results of these studies can be used to link scenarios of changes in climate, fertilizer prices and farming practices to the runoff of nutrients and the resultant impacts on coastal water bodies.