Agrochemical runoff from Rain fed Paddy and Coconut cultivation at Sandalankawa –NWP

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Abstract

Seasonal agrochemical discharges from agricultural lands are considered to be the main source of nutrient inputs to coastal water bodies. Paddy cultivation – especially rain-fed paddy cultivation - is thought to be the source of a considerable amount of nutrients and pesticides into inland water ways. Therefore, nutrient and pesticide/weedicide run off into surface waters from selected rain fed paddy cultivation is quantified with respect to precipitation and fertilizer application.

A small catchment (100 ha) with rain fed paddy and coconut cultivation that drains to the Koswatu Oya in the Maha oya river basin was studied during the Maha season of 2001/2002. Surface water discharge and nutrient fluxes (Nitrogen and Phosphorus) were quantified based on discharge data obtained from a stage-discharge relationship using velocity measurements (Vale port 801) and laboratory analysis of nutrient concentrations (NO_3-N, NH_4-N, PO_4-P) using the HACH spectrophotometer 2010.

Pesticides and weedicides in surface run off and drinking water wells were analyzed using Gas Chromatography. Water sampled from the fields and from the groundwater below the clay layer of the fields was used to study the degradation of urea and the leaching of nitrogen to the ground water. Rain water analysis was conducted to figure out the nutrient gains from monthly precipitation. Fertilizer inputs were quantified by a detailed, weekly questionnaire survey of 107 farmers in the catchment.

77 farmers had used agrochemicals for the paddy while agrochemical usage for coconut was negligible. Three dressings of fertilizers were applied for paddy cultivation: Phosphorus (P), Nitrogen (N) and potassium (K), as Bim pohora, Urea, and TDM respectively. The results of the questionnaire survey showed that fertilizer application for paddy was done in a haphazard manner, especially in quantity and timing. Average application ratios to recommended amount were greater than 1 for all types of fertilizer and the average application of Urea was 2.5 times the recommended quantity.

The estimated average monthly drainage water flow to the lower catchment was 1.515 m^3/day and the highest discharge was 0.55 m^3s^{-1}. The total rain fall, (534mm) was considerably lower than past 20-year average rainfall for the same season. However, each rainfall event produced a significant flow for several days.

Out of a total 5404kg of fertilizer applied, total nitrogen and phosphorus amounts were 1665kg and 437 kg respectively for the paddy. The total loss of fertilizer in run off as nitrogen (NO_3-N, NH_4-N) and phosphorus, (PO_4-P) was about 874 kg (52%) and 24 kg (6%) respectively. The run off varied with rainfall and 90% of applied N was lost during two weeks of heavy rains. Rain-fed paddy is particularly vulnerable to unexpected heavy rains as the farmers have to wait for some rain before applying the fertilizer. Out of the agrochemicals, 35% and 31% were MCPA and Paraquat respectively but no agrochemicals were found in the run off at the level of detection.

The findings confirm that high nutrient loads in rivers are from fertilizer run off and that those fluxes are the result of the flooding of recently fertilized paddy field by heavy rainfall. High run off losses were also due to the disproportionate application of Urea, which was due to the skewed fertilizer subsidy structure, and uncoordinated farming practices.