Nitrate and phosphorus loss from agricultural land: implications for nonpoint pollution

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Abstract

The impact of agriculture on flood plains and surface water quality has received much attention in temperate countries in recent years. Little attention has been given to loss of nutrients and its impact on the quality of buffer zones and adjacent streams in many tropical environments due to the believe that fertilizer use is still very low compared to temperate countries. This may not be totally true especially in agricultural research stations and University experimental fields where a large amount fertilizers are used continuously for many years. This study was conducted in 2 years (Four seasons) to evaluate the accumulated effect of a long term fertilizer application of an agricultural land on an adjacent stream. Results showed that applied fertilizer significantly contributed to the high levels of nitrate and phosphorus in the stream water. Highest concentration of soil NO3-N and P were found in 0–15, 15–30 and 30–45 cm soil depths with about 75% reduction in these amounts in the 60–75 cm depth for NO3-N and 77% reduction at the same depth for soil available phosphorus, the topsoil constituting about 45% of the concentration of the two plant nutrients assessed. There were evident of leaching of basic cations below 15 cm soil depth as indicated in the increased soil pH. There were significantly ($P < 0.05$) higher soil NO3-N and P in the dry season relative to the wet season. The long term application of fertilizers to the sandy loam soil significantly contributed to nitrate and phosphate pollution of the stream in excess of the maximum level accepted for potable water. The stream's pH, temperature, nitrate and phosphate were significantly higher in the dry season. Correlation analyses indicated that agricultural runoffs from the topsoil contributed significantly to the pollution of the stream. There was also positive and significant correlation between the soil nitrate and soil phosphorus at different soil depths, thus indicating that the N and P might have been applied jointly as compound fertilizer and move down the slope through runoff.

Keywords Nonpoint pollution - Nitrate - Phosphorus - Fertilizer application