

Nutrients in runoff from Irrigated crops

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Land use and management practices largely determine the quality of surface runoff. As soil management systems develop for the difficult soils of the Riverine Plain, the area of irrigated cropland could increase at the expense of the predominate pastureland use. Nutrients in runoff from pasture are reported by Small, 1985 (this Conference) to be a minor hazard to stream eutrophication. Nutrient runoff from cropland is reported here for comparison.

Methods

A series of replicated experiments over two irrigation seasons examined runoff from sunflowers and wheat. Border check and furrow irrigation methods were used with superphosphate at 23 kg P/ha and ammonium nitrate at 50 kg N/ha. Runoff volumes were measured and samples taken from the bottom of 5 m x 80 m plots. The water samples were analysed for Total Phosphorus (TP), Dissolved Phosphorus (DP), Total Kjeldahl Nitrogen and Nitrate Nitrogen (ND3-N).

Results & Discussion

Fertilizer banded 50 mm beneath the soil surface did not effect N & P in runoff. Even ammonium nitrate broadcast immediately prior to the second irrigation of sunflowers, failed to produce a significant N load increase in runoff. This fertilizer was washed down the cracks formed at the end of the drying cycle. Fertilizers in cropping systems are not available to irrigation water that eventually runs off, particularly if placed beneath the surface. This contrasts greatly with pasture runoff where 4% of applied fertilizer dissolved in irrigation water that became runoff (Small, 1985) Nutrient loads in runoff were also unresponsive to irrigation method.

The only nutrient of any consequence lost in the experiments was N in runoff from fallows and from irrigations close to sowing. NO₃-N predominated leading to losses from 0.5 to 1.0 kg/ha total nitrogen. After the second irrigation low concentrations of N gave runoff losses less than 0.1 kg/ha/irrigation, similar to that from pasture.

TP in crop runoff was much lower than pasture runoff. Crop runoff concentrations seldom exceeded 1 mg/L and small loads totalled less than 0.1 kg/ha for sunflowers and 0.2 kg/ha for wheat. Most of this P was undissolved and associated with suspended soil particles and organic matter whereas DP predominated in pasture runoff.

Like pasture runoff total crop runoff loads were generally less than the nutrient supplied in the irrigation water. The low concentrations P indicate pollution hazards only at high volumes of runoff and N losses can be kept low by careful irrigation around sowing to minimize runoff.

1. Small, DER. (1985). Proc. 3rd Aust. Agron. Conf., Hobart.