Phosphorus Runoff in a Non-fertilized Soybean Production System of SW Uruguay

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Abstract

Since 2001/2002 there has been a formidable expansion of annual crops in Uruguay which has determined changes in land use, with a strong expansion of soybeans (*Glycine max*) under no-tillage. Improperly managed crop production systems can be an important nonpoint source of pollution, accelerating eutrophication of surface waters resulting from nitrogen and phosphorus (P) inputs. Nutrient losses depend on many factors such as climate, soil characteristics and management practices. Thus, the objective of this work was to estimate the annual P loss on a cropping system and to determine the main factors contributing to such losses. Runoff plots were located at the Experimental Station of the National Agricultural Research Institute in Colonia (INIA "La Estanzuela"), Uruguay (34º25´S, 58º0´W) during the period 2013-2014. Plots were under a Vertic Argiudoll soil with 18.5 mg/kg P-Bray I on the first 7,5 cm, a 3% slope and available water content of 92.7 mm on the first 56 cm of soil depth. The rotation established was soybean - fallow/cover crop, non-fertilized for over 5 years. The amount of runoff water was measured for 23 rainfall events and analyzed for soluble P. During that period the soybean yield was similar to the national average yield and the annual P loss was 0.5 kg/ha. Available water, precipitation, maximum rainfall intensity and runoff explained most of the variation in P runoff losses. Rainfall events of high magnitude and intensity on soils with high available water were identified as the events that produced higher water and P runoff. On the other hand, the model that best fitted P losses was just explained by rainfall and runoff (P = - 9.99 + 0.95*rainfall +21.56*runoff; R^2=0.73). Overall, our results indicate that these soybean-cover crop systems under no-tillage, on soils with proper nutrient status and non-fertilized for a long time seem to be economically and environmentally adequate management systems.

Keywords: nutrients, eutrophication, runoff plots, annual crops