

NITROGEN LOSSES THROUGH MAJOR SOIL PATHWAYS IN OIL PALM PLANTATIONS ON ROLLING TERRAIN

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ABSTRACT

Global area planted with oil palms is estimated to be in the region of 20 million hectares with approximately 12 million in Indonesia, 5.8 million in Malaysia and the balance in tropical Asia, Africa and Latin America. The major nutrients required by the oil palm are nitrogen (N), phosphorus and potassium and with the extensive areas planted, potential environmental pollution caused by the use of fertilisers including N fertilisers is a concern. N losses from the oil palm ecosystem is quite often estimated using models although most of these models were derived from annual crops or those from temperate climate. Direct measurements of N losses in oil palms are tedious and cumbersome to carry out due to factors such as the need for long term data in view of the oil palm being a perennial crop, large differential conditions from young to older palms, high variability of different microsites within the oil palm agro-ecosystem, high amount of rain where oil palms are grown, high evapotranspiration rate, numerous rain days in a year etc. Long-term erosion trials to directly quantify nutrient losses via the major soil pathways of runoff water, eroded sediments as well as leaching were set up to study the effects of oil palm replanting, leguminous cover crops, fertiliser applications and overall agro-management practices. Results from one of these long-term erosion trials are discussed which will elucidate the impacts of various agro-management practices in particular those related to fertiliser applications on N runoff losses, leaching as well as losses via soil sediments or erosion. Effect of different ground cover on N losses will also be compared. The results discussed are neither modelled nor simulated but rather derived directly from tedious field experiments, mimicking various real plantation situations and practices. This attempt to quantify the amount of N losses through the above-mentioned major soil pathways can be used to help close the N-cycle in an oil palm ecosystem, provide useful insights to minimise N losses and to optimise agro-management practices so that highest fertiliser use efficiency can be realised with the end objective to improve oil palm sustainability endeavours. Agro-management practices to improve fertiliser efficiency which

are non-science based but merely grounded on short-term, limited personal perceptions are often tempting for plantations to put into practice. Nevertheless, such practices quite often contradict the original objectives or have little or non-consequential improvements at best. On a similar note, extrapolating laboratory derived data or from data obtained on rather distinct situations can result in extreme values being adopted, which can either result in complacency to tighten agro-management practices or portray the oil palm industry in a rather negative perception.

Keywords: Nitrogen losses in oil palm via run-off, leaching and soil sediment losses, improve agro-management practices, ground cover management.