REVIEW ON THE NITROGEN TRANSPORT MODELS IN SOIL

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ABSTRACT

This review of Nitrogen transport models provided an efficient way to integrate knowledge on the behaviour of Nitrogen in soil as it is an important tool when systematic reviews of primary studies are not adequate. Study of different models provided an understanding of biogeochemical processes and leads to the identification of research gaps and new experimentation on Nitrogen transport.

Models discussed in this review are based on a mechanistic description of processes such as leaching, volatilization of Ammonia, mineralization, immobilization, nitrification, denitrification and uptake by the roots. Such models related to Nitrogen transformation process are, DRAINMOD-N, DRAINMOD-N II, TOUGHTEACT-N, TRAMIN, HYDRUS-1D, CENTURY , NLEAP, LEACH M , SHETRAN , NCSOIL , NuCM, APEX, MIKESHED DNDC, REMM, SWATT, DRAINMOD-FOREST, HYDRUS-2D, NITROGEN-2D, FILTER, WHCNS, MODFLOW, WAVE and WANDA. The N cycling models studied are DRAINMOD-N, TOUGHREACT-N, TRAMIN, HYDRUS-1D, CENTURY, NCSOIL, NuCM, APEX, MIKESHE-DNDC, REMM, SWAT, DRAINMOD-FOREST and WHCNS.

The models discussed related to NO_3^--N leaching are NLEAP, LEACHM, SHETRAN, WAVE, HYDRUS-2D, NITROGEN-2D, FILTER, TOUGHREACT-N, DRAINMOD-N, CENTURY, HYDRUS-1D, MIKESHE-DNDC, APEX, REM and MODFLOW. The models studied related to soil N, plant uptake interaction are WHCNS, DRAINMOD-N, CENTURY, SHETRAN and WAVE. Furthermore, WANDA, DRAINMOD-FOREST, CENTURY, REMM, APEX, MIKESHE-DNDC and SWAT are models which are related to soil N and organic matter interaction.

There are some modifications and further research experiments needed in future because each model has limitations to simulate N transformation processes. DRAINMOD-II needs further research to take the independent measurements. TOUGHREACT-N has to be tested for coupling with atmospheric forcing and plant growth model components. The model TRAMIN needs studies on simulation from site specific calibration. For HYDRUS-1D, further studies need for N transformation processes under various salinity conditions. CENTURY model needs a technique to measure the pool size. LEACHM needs further studies under different field conditions. SHETRAN needs multidimensional simulation. For NCSOIL need a devise experimental method in future for free simulation from calibration. APEX needs multi scale approaches. MIKESHE-DNDC needs to be incorporated with anaerobic soil process to better substantiate in watersheds. DRAINMOD-FOREST and REMM need design for application at a large scale. SWATT needs forest growth component in future. WANDA needs experiment for simulate Nitrate fluxes and MODFLOW needs components to simulate runoff and unsaturated flows.

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