Nitrogen fertilizer

Title	**Chronic nitrogen addition induces a cascade of plant community responses with both seasonal and progressive dynamics**
Author Name	XiaobingZhou, Matthew A.Bowker, YeTao, LinWu&Yuanming Zhang
Journal Name	Science of The Total Environment
Year	2018
Volume and Issue	626
Pages	Pages 99-108
Abstracts	Short-lived herbaceous plants provide a useful model to rapidly reveal how multiple generations of plants in natural plant communities of sensitive desert ecosystems will be affected by N deposition. We monitored dynamic responses of community structure, richness, evenness, density and biomass of herbaceous plants to experimental N addition (2:1 NH4+:NO3− added at 0, 0.5, 1, 3, 6 and 24 g N m− 2 a− 1) in three seasons in each of three years in the Gurbantunggut desert, a typical temperate desert of central Asia. We found clear rate-dependent and season-dependent effects of N deposition on each of these variables, in most cases becoming more obvious through time. N addition reduced plant richness, leading to a loss of about half of the species after three generations in the highest N application level. Evenness and density were relatively insensitive to all but the greatest levels of N addition for two generations, but negative effects emerged in the third generation. Biomass, both above and below ground, was non-linearly affected by N deposition. Low and intermediate levels of N deposition often increased biomass, whereas the highest level suppressed biomass. Stimulatory effects of intermediate N addition disappeared in the third generation. All of these responses are strongly interrelated in a cascade of changes. Notably, changes in biomass due to N deposition were mediated by declines in richness and evenness, and other changes in community structure, rather than solely being the direct outcome of release from limitation. The interrelationships between N deposition and the different plant community attributes change not only seasonally, but also progressively change through time. These temporal changes appear to be largely independent of interannual or seasonal climatic conditions.
Keywords	Arid; Biodiversity-productivity relationship; Ephemeral plant; Evenness; Global change; Species richness

Title	**Effects of glyphosate application and nitrogen fertilization on the soil and the consequences on aboveground and belowground interactions**
Author Name	ElodieNivelle, JulienVerzeaux, AmélieChabot, DavidRoger, QuentinChesnais, ArnaudAmeline, JérômeLacoux, Jose-EdmundoNava-Saucedo, ThierryTétu&ManuellaCatteroua
Journal Name	Geoderma
Year	2018
Volume and Issue	311
Pages	45 - 57
Abstracts	The application of nitrogen (N) and herbicides are commonly used to fertilize crops and protect them against weed development, but are also considered as soil and environment pollutants. Even so, the individual and combined non-target effects of N fertilizers and herbicides on multitrophic interactions within agrosystems are not well known. From soil samples collected in the field, we examined the effects of the direct application of glyphosate and/or N fertilization on microbial activities and soil nutrient status. In addition, we investigated the increase in biomass and, nutrient acquisition of the bean (Phaseolus vulgaris) and the consequences of the applications of N and glyphosate on the performance of the herbivore aphid (Aphis fabae). From soils that did (N +) or did not receive (N0) synthetic N fertilization over a 6-year period, we assessed the effects of glyphosate (CK, without glyphosate; FR, field rate of glyphosate) and N fertilization (N +, with N fertilization; N0, without N fertilization) applications in a mesocosm experiment for 75-days. Following the 75 day treatment, the biological and physiological consequences, both belowground and aboveground were determined. The growth of arbuscularmycorrhizal fungi (AMF) and dehydrogenase activity, were negatively affected following N + fertilization and the application of the FR of glyphosate, while in the absence of glyphosate, alkaline phosphatase (AIP) activity was reduced. Functional microbial responses were unaffected by both N and glyphosate, even when applied in combination. Conversely, the N fertilization significantly increased the nitrate content (NO_3^-) in the CK soils and the total N in the FR soils, compared to CK/N0 and FR/N0 soils. The combined effects of glyphosate and nitrogen fertilization (FR/N +) significantly decreased the soil C:N ratio, but significantly increased nitrification compared to CK/N0 and FR/N0 soils. The FR/N + treatments positively affected plant performance, improving the total chlorophyll, sucrose, ammonium, amino acid content, and pod biomass, compared to the CK/N0 and FR/N0 soils. Unlike glyphosate, which did not appear to exert an effect when applied alone or in combination, N fertilization significantly increased aphid nymph survival. The non-metric multidimensional scale allowed us to establish belowground and aboveground interactions with glyphosate and N fertilization. We conclude that glyphosate and N fertilization have negative effects on soil microflora and potential pests, but do not necessarily affect belowground and aboveground interactions, and may offer equal or superior benefits to crop productivity.
Keywords	Nitrogen fertilization; Glyphosate herbicide; Soil functional activities; Soil nutrients; Plant performance; Aphid nymph survival

Title	**The effects of organic and mineral fertilizers on carbon sequestration, soil properties, and crop yields from a long-term field experiment under a Swiss conventional farming system**
Author Name	Alexandra Maltas, HediKebli, Hans Rudolf Oberholzer, Peter Weisskopf&SokratSinaj
Journal Name	Land Degradation & Development
Year	2018
Abstracts	The effects of mineral fertilizers and organic amendments on soil properties, carbon (C) sequestration, and crop yields are studied in a 37-year field experiment, Phosphorus–Potassium-balanced design, in Switzerland.Treatments included a control (mineral fertilization) without nitrogen (N) fertilizers (Min-N0) and with optimal N (Min-Nopt) and 5 organic amendments (green manure [Gm], cereal straw [Str], fresh cattle manure in 2 doses 35 and 70 t ha−1 [Ma35 and Ma70] and cattle slurry [Slu]) all receiving the same optimal N fertilization as Min-Nopt. All mineral and organic treatments received optimum P–K fertilization.Nitrogen fertilization (Min-Nopt vs. Min-N0) increased soil organic C, microbial activity, and microporosity but decreased pH, magnesium, and macroporosity. All organic treatments with optimal mineral N resulted in higher soil organic C content compared with Min-Nopt, however, these effects were significant only for the highest dose of manure. The organic amendments supplied 25% to 80% additional C input to the soil compared with Min-Nopt, and their amendment-C retention coefficients ranged from 1.6% (Gm) to 13.6% (Ma70). Chemical, physical, and biological soil properties were not or slightly significantly different among organic treatments. Nevertheless, soils fertilized with farmyard manure produced generally higher grain yield (up to 7.3%) compared with Min-Nopt whereas the opposite effect was noted for Gm (−2.2%) and Str (−5.2%) treatments due to their negative effect on N availability. In conclusion, Gm and Str treatments were as effectives as Ma35 and Slu treatments to prevent soil degradation but required higher chemical fertilizer to maintain crop yield.
Keywords	crop yields; farmyard manure; green manure; mineral fertilizers; soil organic carbon; soil properties

Title	**Nitrogen effects on plant species richness in herbaceous communities are more widespread and stronger than those of phosphorus**
Author Name	Merel B. Soons, Mariet M. Hefting, EduDorland, Leon P.M.Lamers, CarmenVersteeg & RolandBobbink
Journal Name	Biological Conservation
Year	2017
Volume and Issue	212
Pages	390-397
Abstracts	Both nitrogen (N) and phosphorus (P) enrichment are known to impact plant diversity globally. Recent studies suggest that P enrichment may be as important, or even more important, as a driver of terrestrial plant species loss as N enrichment. However, the generality and relative contribution of these critical nutrients to species losses remains unclear. Here, we quantitatively compared effects of N, P and combined NP enrichment on species richness of natural and semi-natural herbaceous ecosystems across the world in a meta-analysis of 189 long-term nutrient addition experiments in the field. Our experiment-based approach shows that, across terrestrial and wetland ecosystems, N and NP enrichment had widespread and strong negative effects on plant species richness. N reduced plant species richness across experiments by on average 16% ($p < 0.001$), while P did not (on average 3%, NS). Combined NP enrichment also reduced species richness, by on average 16% ($p = 0.009$), with the dominant effect statistically attributed to N. N enrichment effects were greater in China than in Europe and America, which may be explained by background atmospheric N deposition rates and earlier species losses in Europe and America. P enrichment reduced species numbers only in the most species-rich communities and even increased species numbers at high latitudes. All nutrient enrichment combinations (N, P, NP) stimulated aboveground biomass production, and biomass-mediated mechanisms are likely to have contributed to reported species losses. Our findings demonstrate that for the protection of the world's herbaceous plant diversity, it is of the highest priority that N loads be drastically reduced.
Keywords	Biodiversity; Eutrophication; Meta-analysis; Nitrogen deposition; Nutrient enrichment; Phosphorus release

Title	**Increased plant uptake of native soil nitrogen following fertilizer addition – not a priming effect?**
Author Name	María Teresa Muñoz-Quezada, Boris Lucero, Verónica Iglesias, Karen Levy, MaríaPía Muñoz, Eduardo Achú, Carlos Concha, Ana MaríaBrito and Marcos Villalobos
Journal Name	Applied Soil Ecology
Year	2017
Volume and Issue	114
Abstracts	Fertilizer inputs affect plant uptake of native soil nitrogen (N), yet the underlying mechanisms remain elusive. To increase mechanistic insight into this phenomenon, we evaluated the effect of fertilizer addition on mineralization (in the absence of plants) and plant uptake of native soil N. We synthesized 43 isotope tracer (15N) studies and estimated the effects of fertilizer addition using meta-analysis. We found that organic fertilizer tended to reduce native soil N mineralization (−99 kg ha−1 year−1; p = 0.09) while inorganic fertilizer tended to increase N priming (58 kg ha−1 year−1; p = 0.17). In contrast, both organic and inorganic fertilizers significantly increased plant uptake of native soil N (179 and 107 kg ha−1 year−1). Organic fertilizer had greater effect on plant uptake than on mineralization of native soil N (p < 0.001), but inorganic fertilizer had similar effects. Fertilizer effects on mineralization and plant uptake of native soil N were not influenced by study location (laboratory or field) and duration, soil texture, carbon and N content, and pH. Fertilizer addition variably affected native soil N mineralization but consistently increased plant uptake of native soil N. The positive effect of organic fertilizer on plant uptake of native soil N can not be explained by its negative effect on native soil N mineralization, suggesting that increased plant uptake of native soil N was caused mostly by plant-mediated mechanisms (e.g., increased root growth, rhizosphere N priming) rather than by soil microbe-mediated mechanisms.
Keywords	^{15}N isotope tracer; Added nitrogen interaction; Mineralization and immobilization; 15N labeled fertilizer; Plant-soil interaction; Rhizosphere priming