PRACTICE ABSTRACT NO. 32

SEA2LAND

INIA Instituto de Investigaciones Agropecuarias

Phosphorus use efficiency of alfalfa fertilized with aquaculture derived bio-based fertilizers in an Andisol

Main results / outcomes

Dried fish sludge (DFS) bio-based fertilizer (BBF) exhibited higher alfalfa forage yield (FY) and phosphorus use efficiency (PUE) than inorganic fertilizer (triple superphosphate) in an Andisol, which demonstrates the agronomic value of aquaculture waste derived BBFs.

Practical recommendations

Five fertilizer treatments were tested in a field experiment: Composted fish sludge (CFS), fish bone meal (FBM), dried fish sludge (DFS) and two control treatments (No-P and inorganic-P). The phosphorus use efficiency (PUE=ΔFY/ ΔP) corresponds to the increase in FY by units of P-fertilizer added. In this work, the PUE varied across harvests from 2.3 (H2) to 8.0 kg FY/kg P. The Total PUE throughout the experimental period was 18.5 kg FY kg P-1. The DFS treatment achieved the highest PUE and FY values across harvests (Figure 1). The CFS treatment affect negatively the FY and PUE of alfalfa. Results demonstrated that BBFs have great agronomic value and can improve the productivity of Alfalfa, which is the most important forage crop worldwide and has particularly high phosphorus requirements due to its role in biological nitrogen fixation.

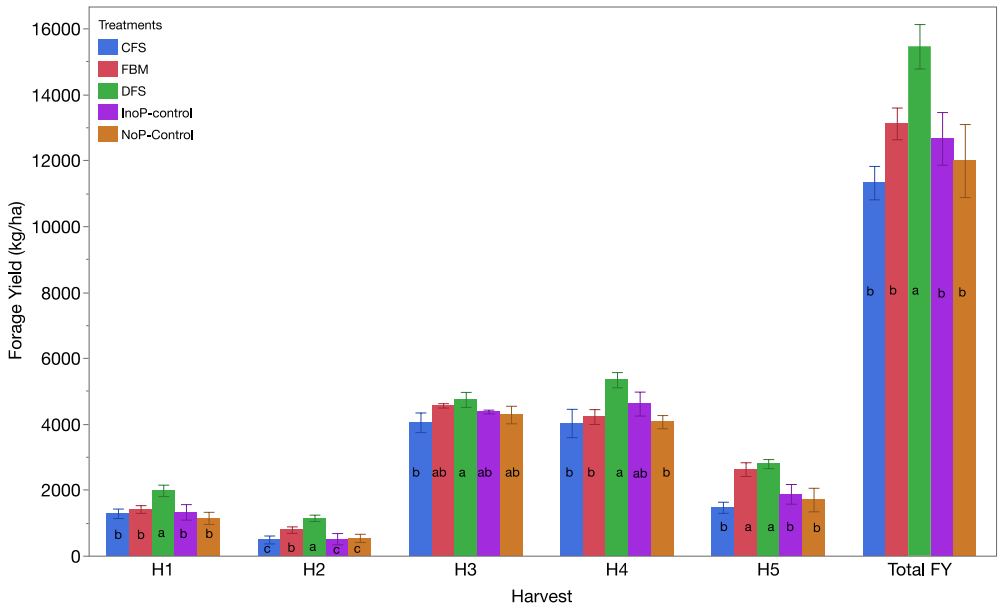

Figure 1: Forge yield of alfalfa grown in Andisol soil and fertilized with 100 kg/ha of P2O5 using three BBFs derived from aquaculture wastes and two control treatments (No-P and inorganic-P). The inorganic –P was triple superphosphate and BBFs treatments were: Composted fish sludge (CFS), fish bone meal (FBM) and dried fish sludge (DFS). FY and PUE was measured in five harvests (H1 to H5).

Further information

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About this abstract

Authors: Luis Inostroza, Juan Hirzel, and Francisco Salazar/ INIA-Chile

Date: May 2025

SEA2LAND project is a collaborative Innovation Action(IA) funded by the EU in the frame of the Horizon 2020 programme. The project aims to provide solutions to help overcome challenges related to food production, climate change and waste reuse. Based on the circular economy model, SEA2LAND promotes the production of large-scale fertilisers in the EU from own raw materials. This solution is expected to reduce the soil nutrient imbalance in Europe. The project is running from January 2021 to June 2025.

Website: www.sea2landproject.eu

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PRACTICE ABSTRACT NO. 32

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INIA Instituto de Investigaciones Agropecuarias

Eficiencia en el uso del fósforo de alfalfa fertilizada con biofertilizantes de la industria acuícola en suelo Andisol

Resultado principal

El biofertilizante lodo seco (DFS) mostró una producción de forraje (FY) y eficiencia en el uso del fósforo (PUE) mayor que un fertilizante inorgánico (superfosfato triple) en un suelo Andisol, lo que demuestra el valor agronómico de BBFs derivados de desechos de la industria acuícola.

Recomendaciones prácticas

Se evaluaron cinco tratamientos de fertilización en un ensayo de campo: lodo compostado (CFS), harina de hueso de pescado (FBM), lodo seco (DFS) y dos tratamientos control (No-P y P-inorgánico). La eficiencia en el uso del fósforo (PUE=ΔFY/ ΔP) corresponde al incremento en FY por unidad de P agregado por el fertilizante. En este trabajo, la PUE varió entre cosechas desde 2.3 (H2) a 8.0 kg FY/kg P. La PUE total, obtenida en todo el periodo experimental fue 18.5 kg FY/kg P. El tratamiento DFS logró la mayor PUE y FY en todas las cosechas (Figura 1). El tratamiento CFS afectó negativamente el FY y PUE de alfalfa. Los resultados demuestran que los BBFs tienen un alto valor agronómico y pueden mejorar la productividad de alfalfa en suelo Andisol. La alfalfa es la especie forrajera más importante a nivel global y presenta altos requerimientos de P debido al rol que este juega en el proceso de fijación de nitrógeno.

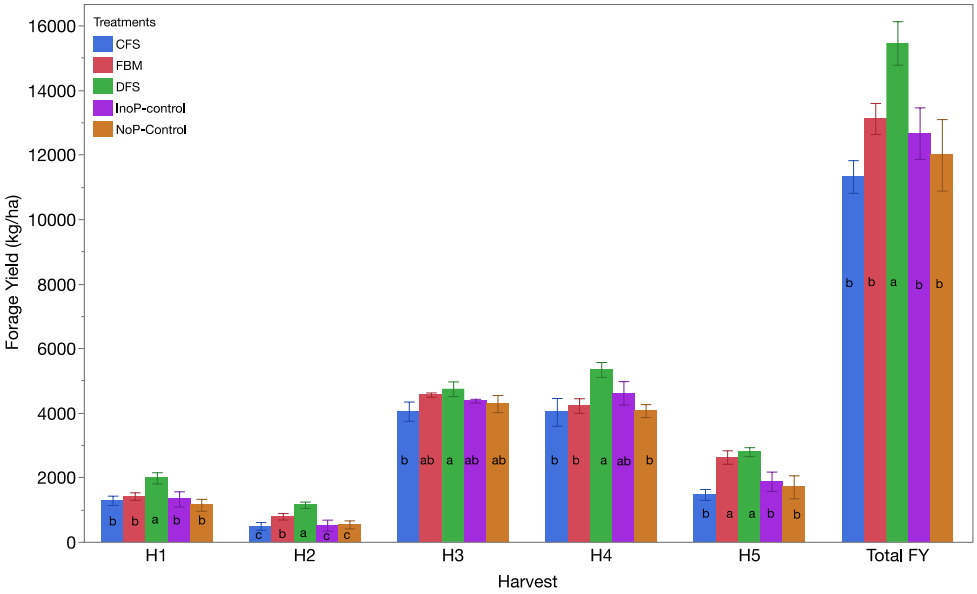

Figura 1: Rendimiento de forraje de alfalfa cultivada en suelo Andisol y fertilizada con 100 kg/ha de P2O5 con tres BBFs derivados de la industria acuícola y dos tratamientos control (No-P y P-inorgánico). El tratamiento P-inorgánico fue superfosfato triple y los BBFs fueron: lodo compostado (CFS), harina de hueso de pescado (FBM) y lodo seco (DFS). FY se evaluó en cinco cosechas (H1 a H5).

Información adicional

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Acerca de este resumen

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