

# Soil health: Plot diversification 2012-2017

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**Traditional soil management systems based on crop rotations with extended fallows to restore soil fertility are becoming less viable in the face of agricultural intensification.**

**Shortening fallows** are a principal challenge to maintaining soil health and ecosystem services in the high Andes. Increased **frequency of planting**, as well as **soil erosion** in mountainous landscapes, exposes fields with shortened fallows to soil degradation. At the same time reduced grazing area/resources in many Andean communities may become **insufficient to meet forage needs** and to support the return of nutrients to soils via **manure** on more extensive cropped areas. In many areas **closer** to the communities, fallows range from only 0-2 years. Farther from the community, fallows are longer and input rates are lower, a common pattern of **near and far fields** that has been seen both in the Andes and in Africa.



A Peruvian farmer sharing the rotational history of his plots on a topographic map.  
Photo author: Yanapai

Integrate farmer knowledge in the research

Farmers in Tapacari, Bolivia processing soil macrofauna samples  
Photo author: Steven Vanek

Make the research process empowering

## Addressing socioeconomic and agroecological trade-offs

**Farmer evaluations** largely mirror yield and nutritional quality measurements.

They emphasized the **benefits of increased forage production more than soil health**, which could lead to overall soil degradation and nutrient mining if manure or nutrients are not returned to the soil and forage is overharvested/grazed.

In general, there was an appreciation for the high quality forage and **productivity of seeded vs. natural fallows**.

There were not many differences in how men and women perceived the fallow options except that men rated lupine-based fallows higher, suggesting a **greater value towards crop production for men**. This would support the hypothesis that men are more interested in grain versus livestock production in these communities.

Gender

Utilization focused

## Farmers adapt options to their contexts

2016: As a result of seeing trial results a **community seeded** several large areas in forage fallows

## Contextualize and refine crop and landscape management options

2016-2017: **Options for forage-based fallows were tested in 58 collaborating farmers' fields** in 2 communities in Peru. Fallow interventions were selected in **community planning workshops** and were comprised of predominantly **grass/legume mixtures of annuals and perennials** with an emphasis on forage provision.

- Across the trials in the 1st year, seeded fallows exceeded the biomass and nutrient uptake of the unseeded, status quo controls. In a mid-elevation zone **biomass increases ranged from 160 to 390% of the unseeded control (p<0.05)**, while in another higher-elevation community biomass was approximately 8x the control. However, in another high-elevation site the local unseeded control was more competitive in establishing cover within the first 2 months. **Fallow performance was associated with site soil fertility and the success of legumes within mixtures**, indicating a need to consider soil contexts when selecting fallow options.

- In 2nd year, **under drier conditions the effect of soil context was less important** and consistent across sites in terms of biomass production, since in a dry year water is more the limiting factor than nutrients

- Those site with **greater legume proportion had dramatically higher P and N concentrations in fallow biomass (p<0.05)** Annual legumes (which will tend to dominate the biomass in this first sampling) did not regrow and in the second year of the experiments, especially at high elevations and in sites further from the community, and legumes were less abundant in many of the treatments during the second year. However, a perennial legume like alfalfa improved greatly in performance over the multiyear experiment, and clover was also successful in some of the sites over time.

- The managed fallows greatly **improved forage nutritional quality** relative to the unseeded control.

Value heterogeneity; Interactions between multiply pathways



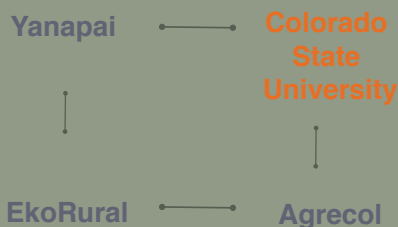
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