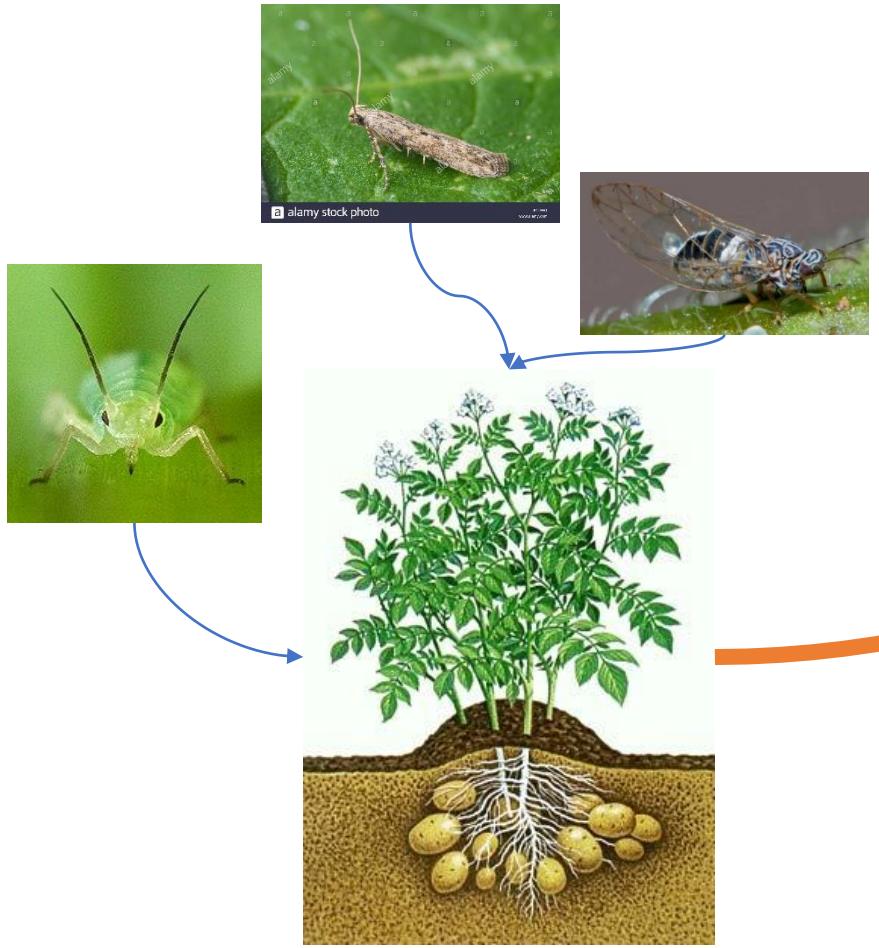
Potato seed degeneration in the tropical Highlands of the Andes in Ecuador

The beginning

Introduction

- Potato seed degeneration is:
  - The accumulation of seed-borne diseases over time
  - Consequently, the yield of the potato crop is reduced

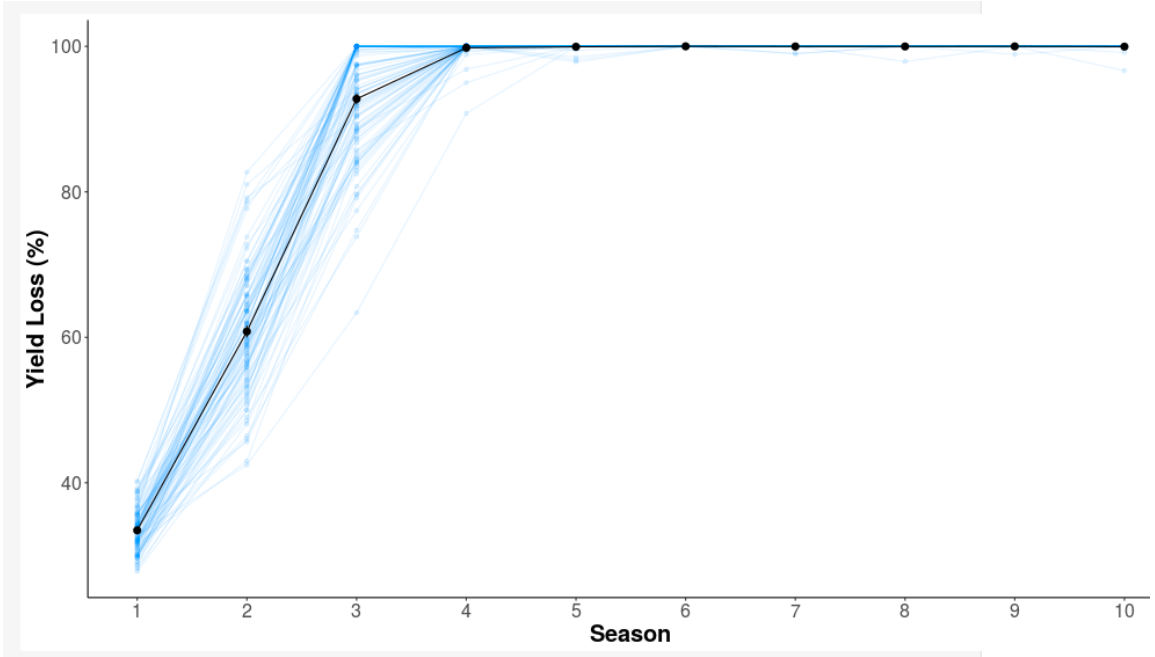


Seed multiplied vegetatively

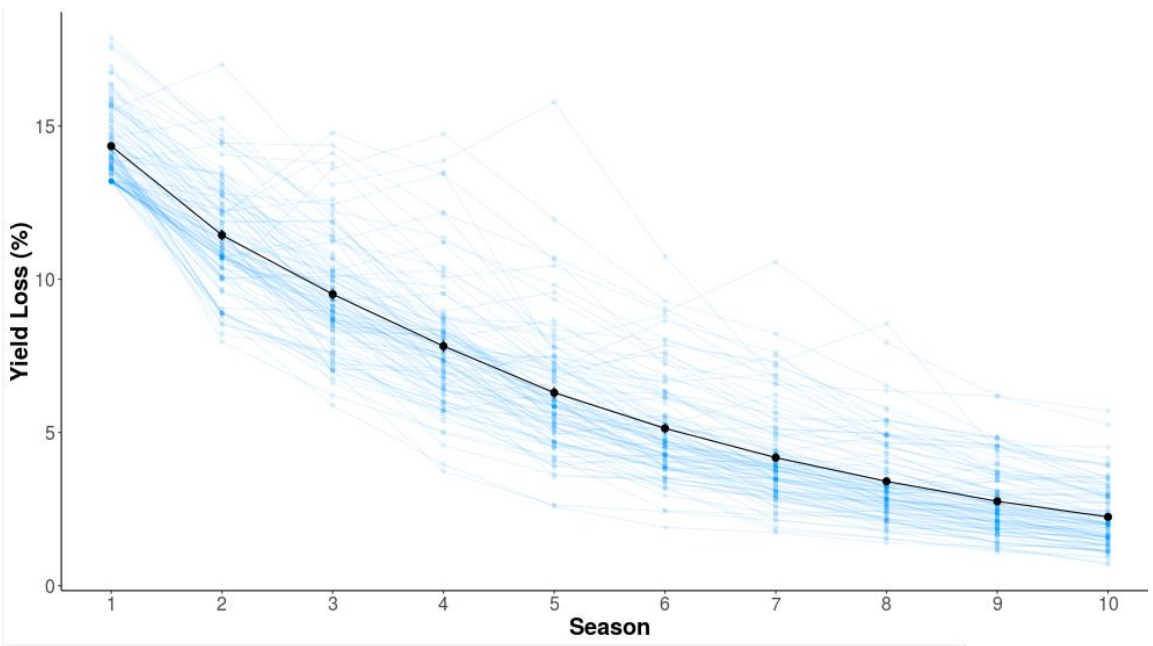
Sharma et al., 2016;
Sharma et *al.,* 2017;
Bertschinger et al., 2017;
Schulte-Geldermann 2012
and many others..

Introduction

Potato seed degeneration



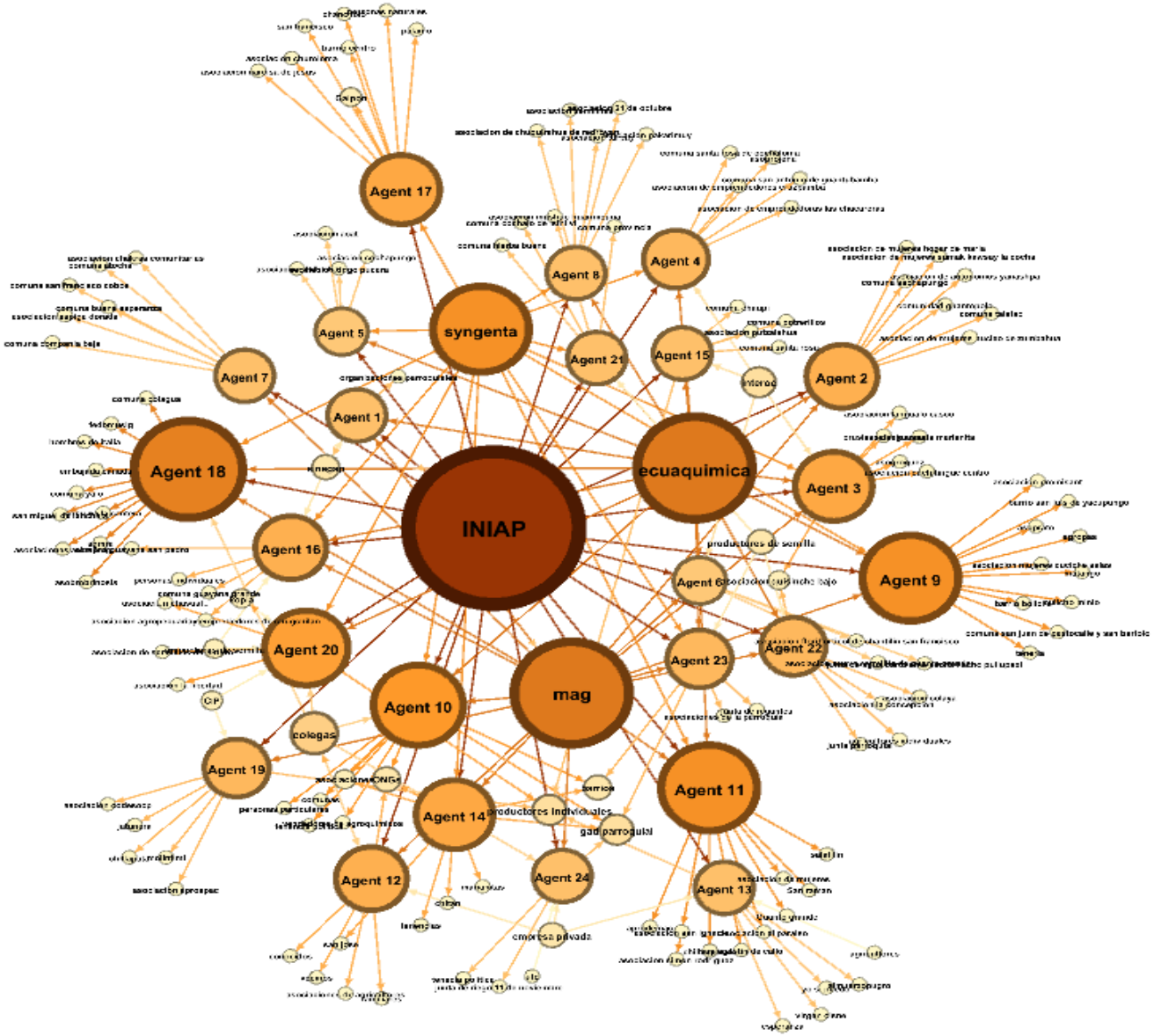
In theory!!!



Sharma et *al.,* 2017

Farmers?

- They are not in the previous picture.
- Can we see any influence?



Activities of a seed system

- Breeding
- Seed Multiplication
- Management
- Seed replacement
- Seed dissemination

Introduction

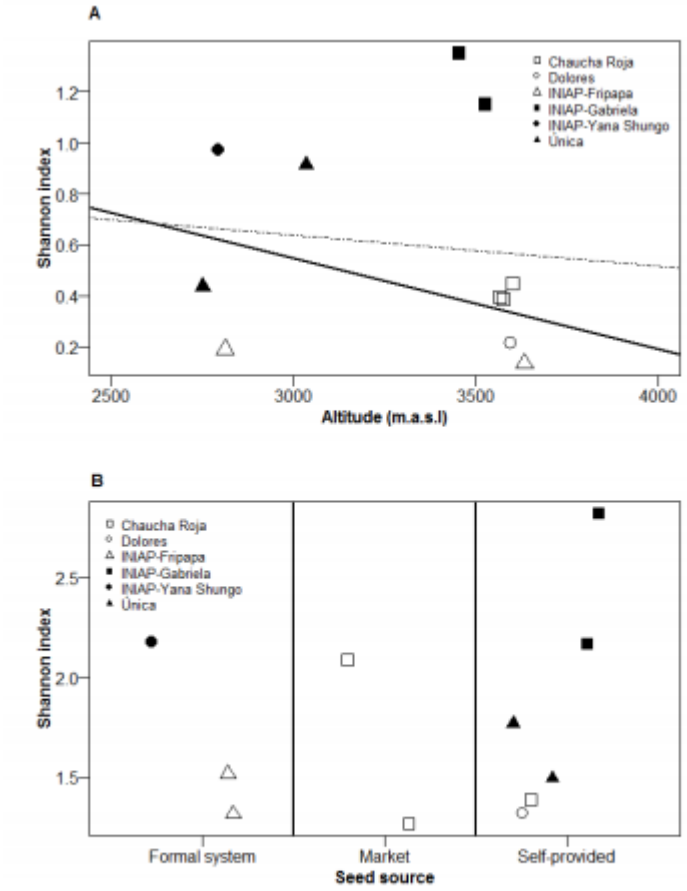
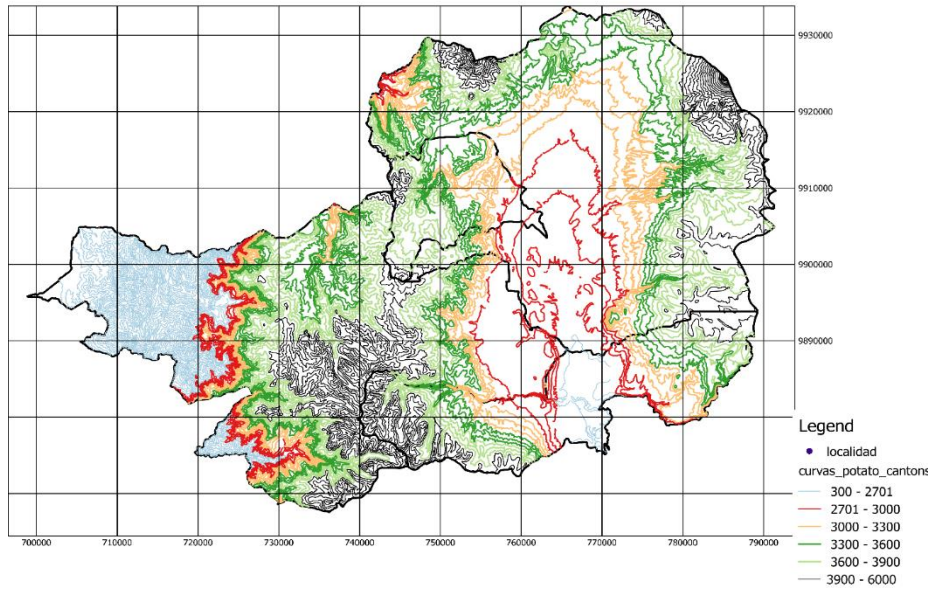


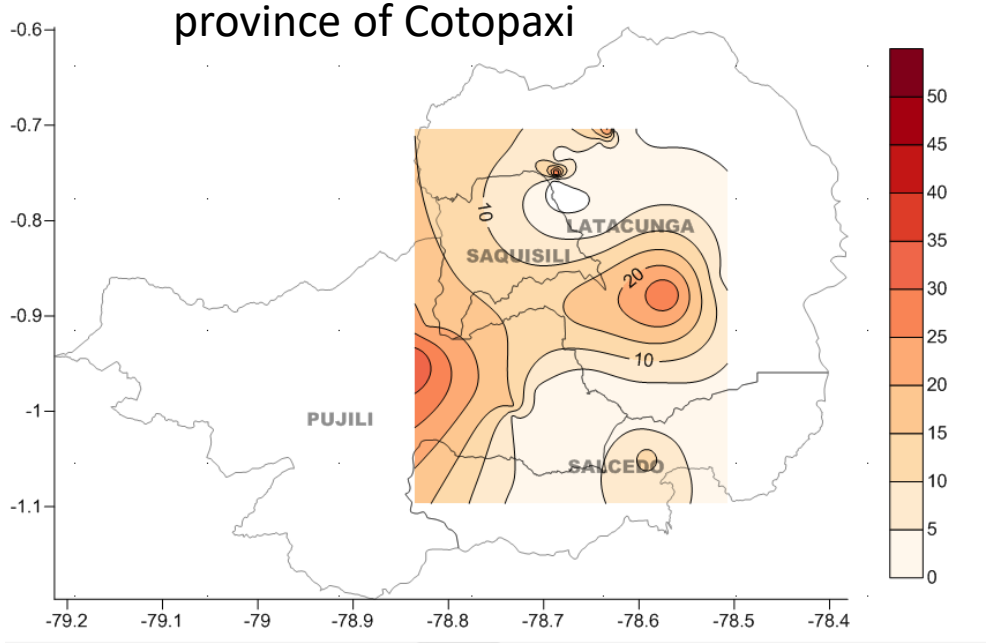
Figure 1. Seed borne pest diversity on seed tubers surveyed in three provinces in Ecuador. A. Effect of the altitude on virus diversity: dashed line represents a model including all varieties ($R^2 = 6\%$), and full line a model excluding INIAP-Gabriela ($R^2 = 22\%$). B. Pest diversity on tubers according to the three seed sources.

Virus diversity in the seed of potato producers.

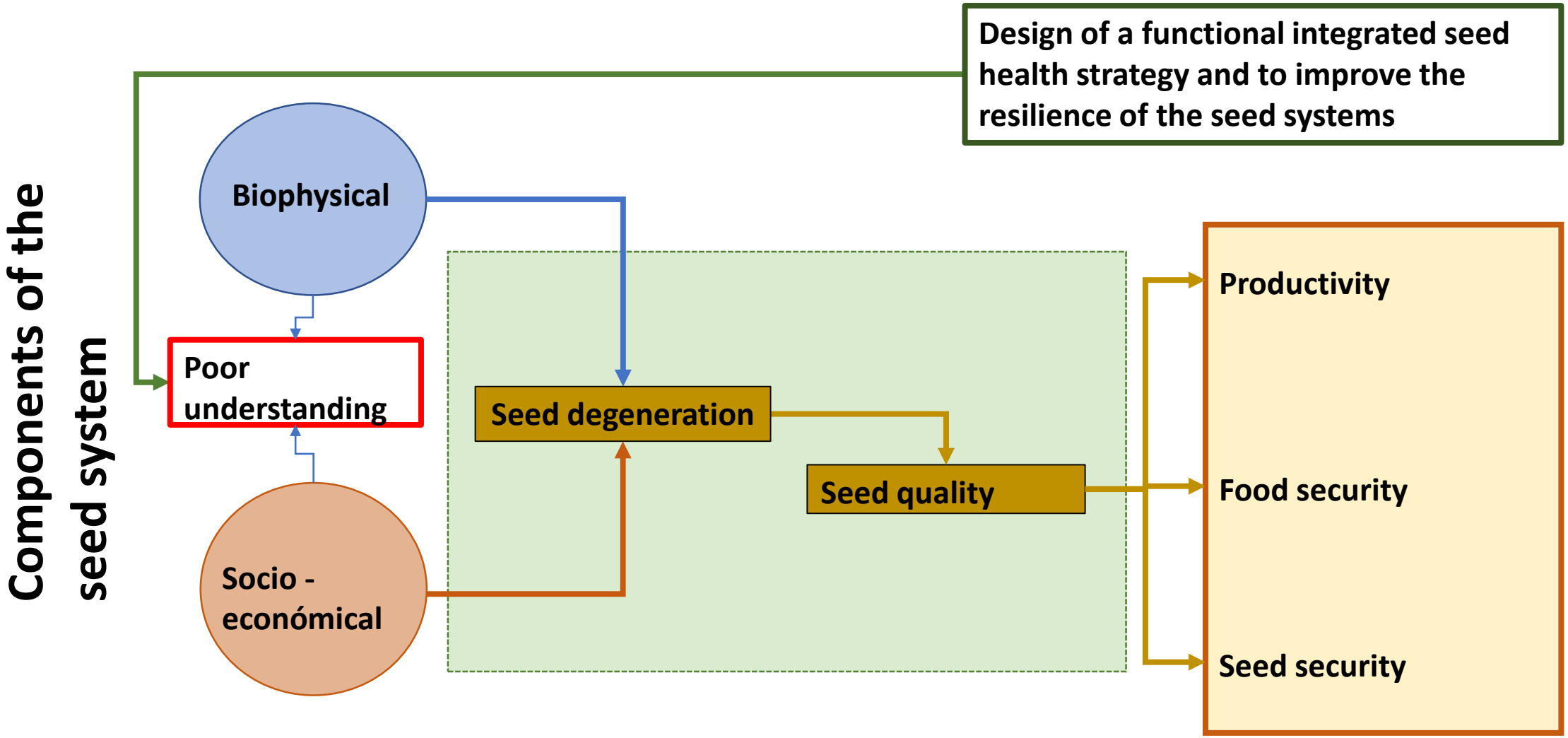
Altitude



Seed renovation rate in the province of Cotopaxi



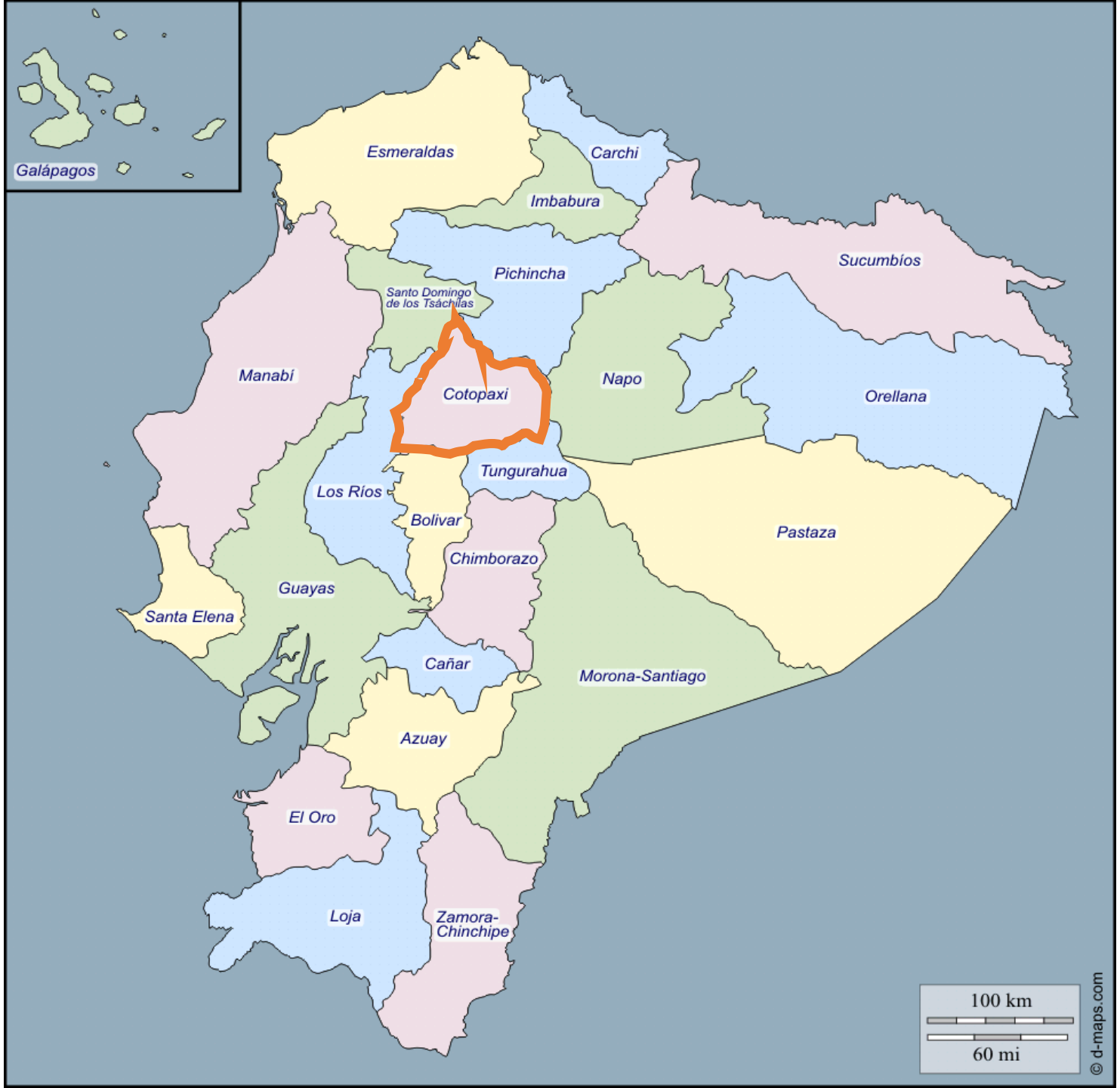
Introduction



My research questions are?

- What are the social and ecological drivers altering potato seed degeneration rates?
- What on-farm management practices are available to improve seed degeneration? And under which conditions?

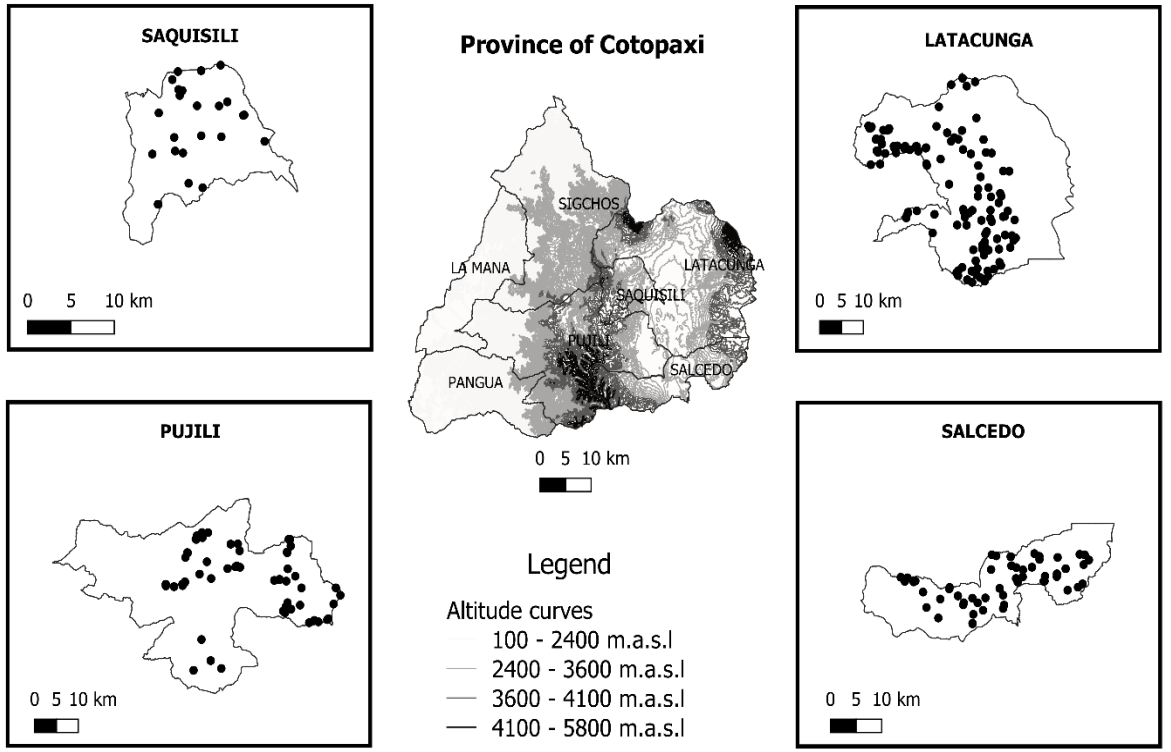
Methodology: Study site


Galápagos
Esmeraldas
Carchi
Imbabura
Pichincha
Sucumbíos
Santo Domingo de los Tsáchilas
Manabí
Napo
Cotopaxi
Orellana
Tungurahua
Los Ríos
Bolivar
Pastaza
Chimborazo
Guayas
Santa Elena
Cañar
Morona-Santiago
Azuay
El Oro
Loja
Zamora-Chinchipe
100 km
60 mi
© d-maps.com

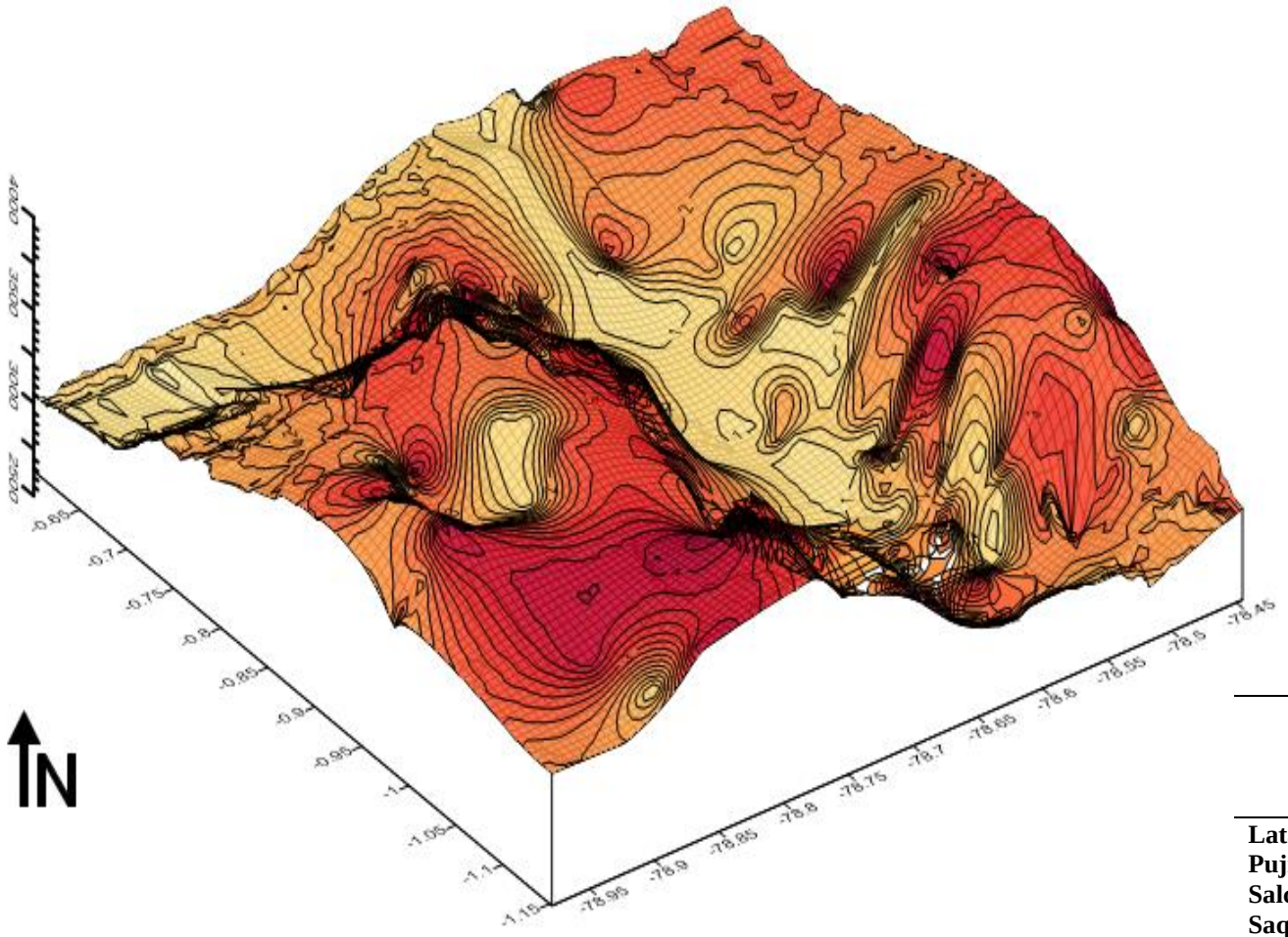
What we did?

- The Multi-stakeholder framework for intervening in RTB seed systems
- Survey (pilot + n=260). “Rhomis”
- Seed sampling (1-10 seed tubers)
- Soil sampling (close field to the house)

Focus Group Discussions



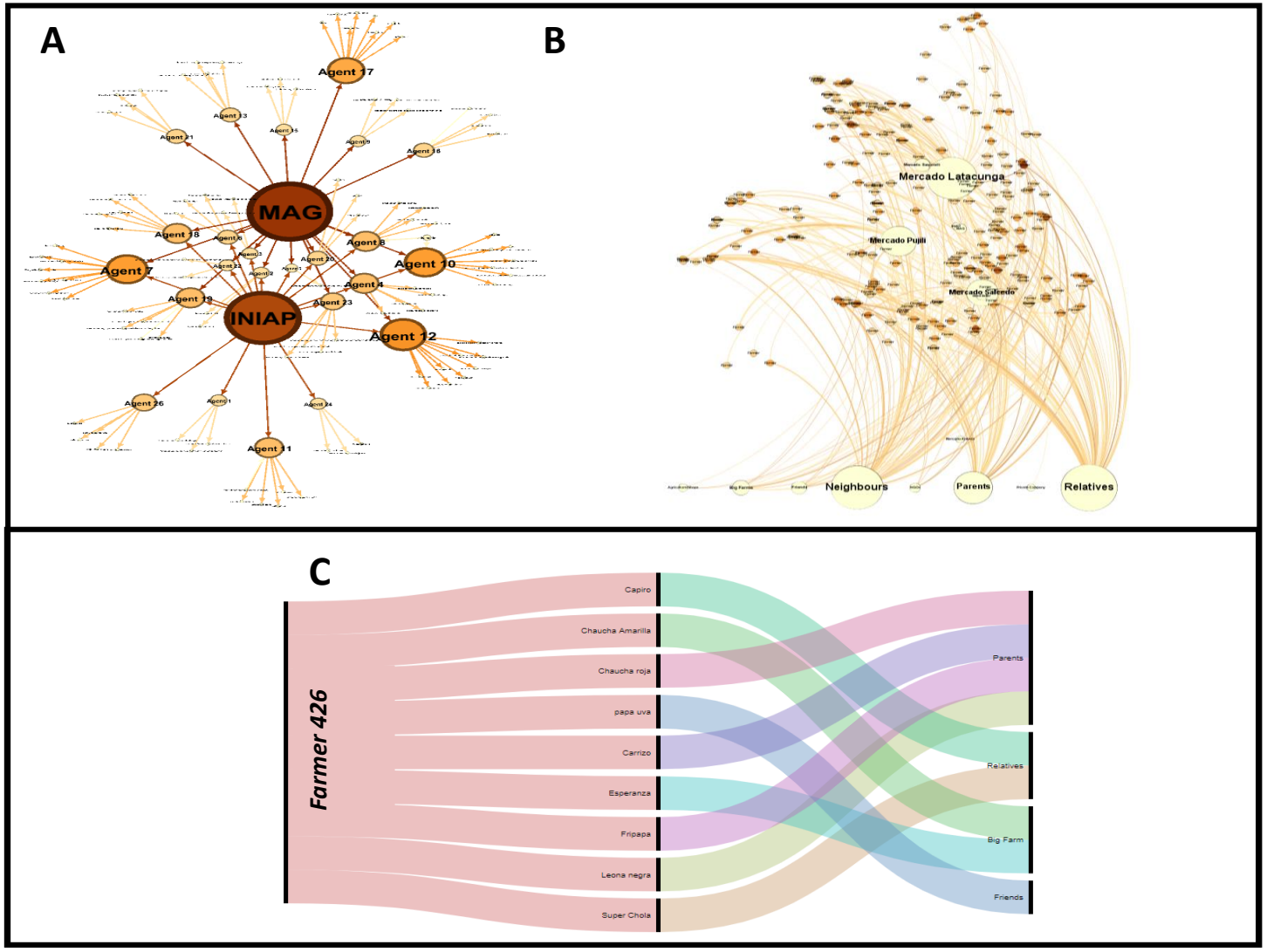
Highlights

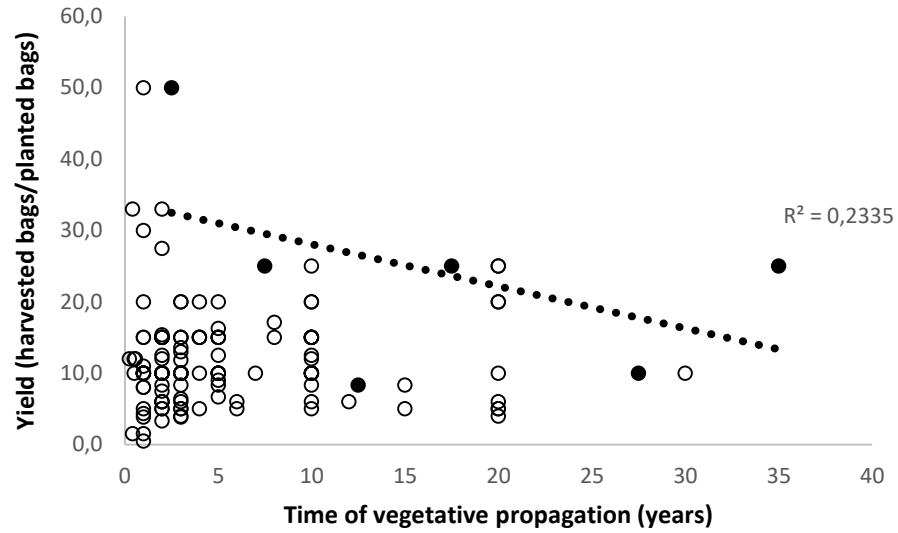


	Number of respondants	Farmers perceiving seed degeneration	Gender dis-aggregated perception	
Cantons		Total percentage	Female farmers	Male farmers
Latacunga	109	50.9 (n=56)	48.2	51.8
Pujili	67	43.3 (n=29)	44.83	55.2
Salcedo	54	59.3 (n=32)	46.87	53.12
Saquisili	19	52.6 (n=10)	30.0	70
SubTotal	249	51.0 (n=127)		

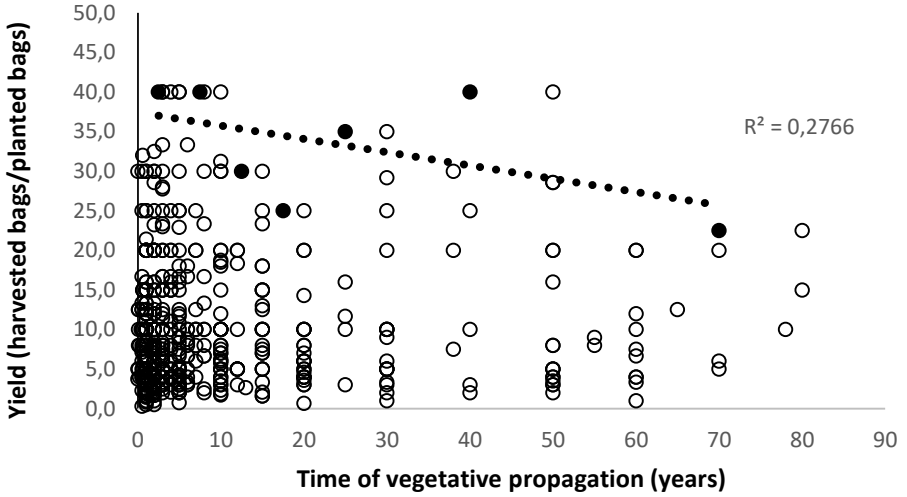
*The remaining 10 farmers not considered in this analysis described nutrient depletion as seed degeneration

	OBS	**Change of physical appearance**	**Change on the physiological seed status**	**Plants become more susceptible to diseases**	**Increase of agricultural inputs**	**Reduction in yields**
Latacunga	56	26.6	0	1.56	3.1	68.8
Pujili	29	0	3.4	3.4	0	93.1
Salcedo	32	9.1	0	0	3.0	87.9
Saquisili	10	18.2	9.1	9.1	0	63.6
Average		**11.4**	**3.1**	**3.5**	**1.5**	**78.4**





Data 2010 (n=137 seed lots)

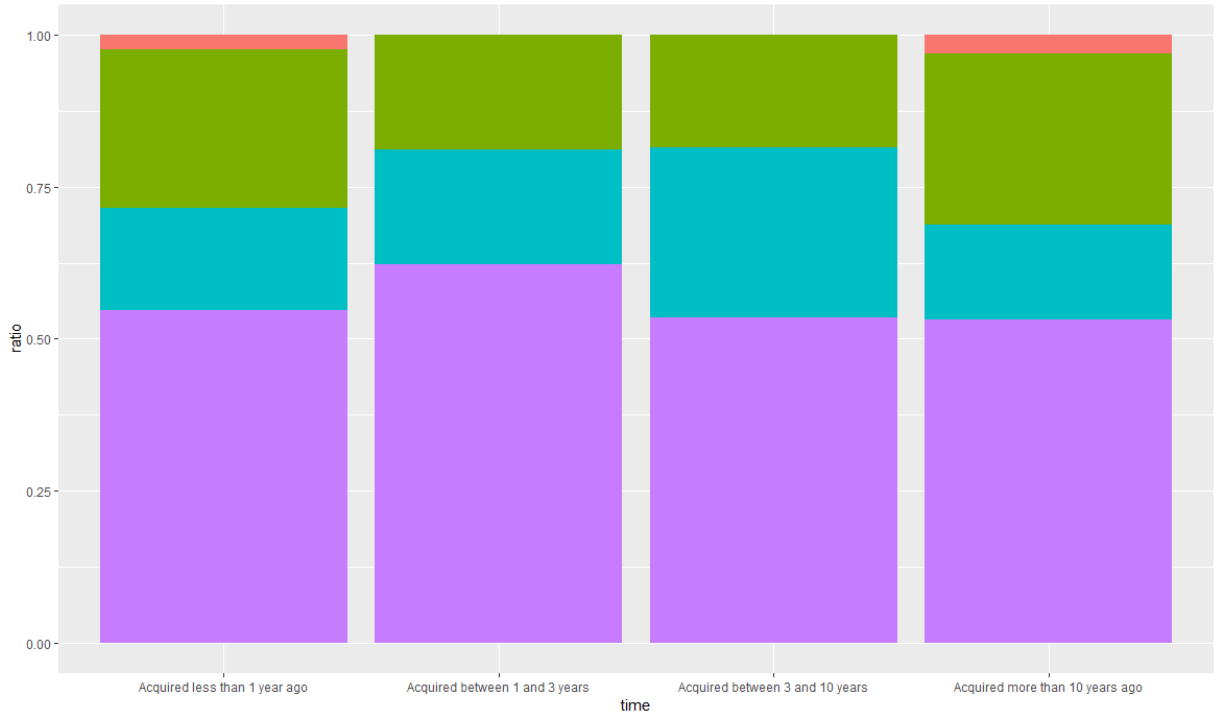


Data 2018 (n=564 seed lots)

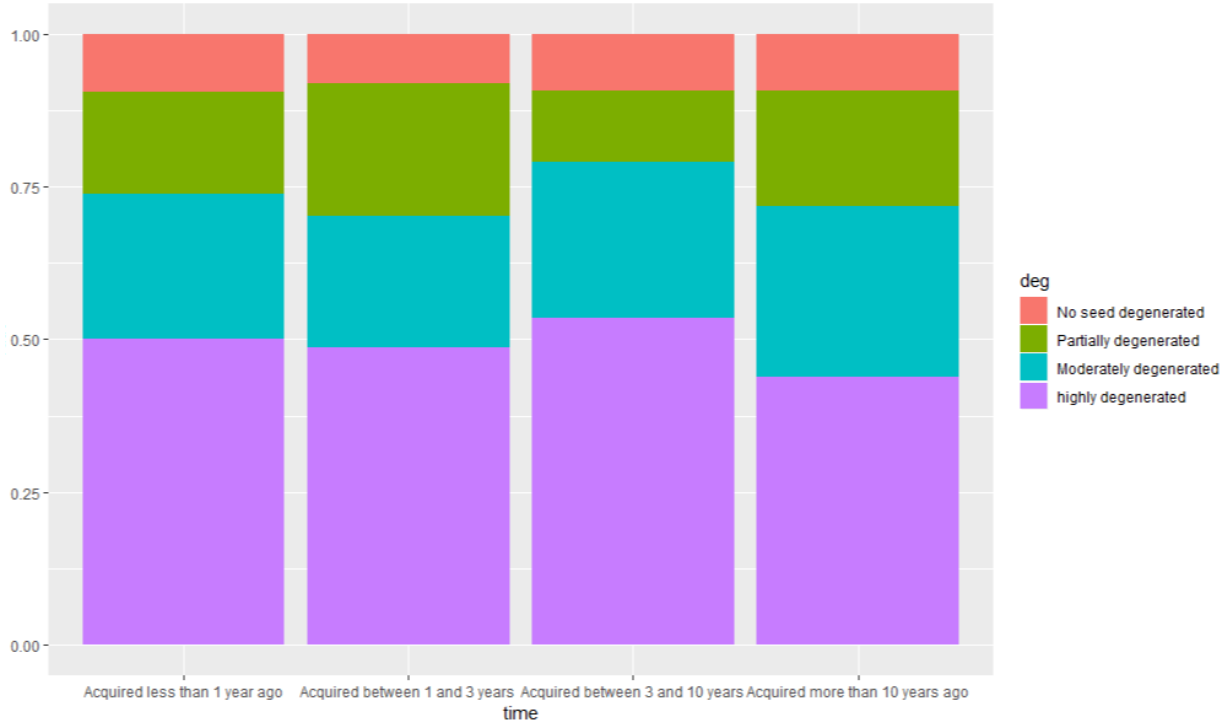
- 53 varieties (native, bred, and unknown origin varieties)
- Formal system focused on one variety “Super chola”. Limited seed supply and access.
- Local seed systems are diverse. Farmers have in average 2.4 varieties of different seed sources.
- Multiple problems in the seed: Tuber moth, black scurf, PVX, PVS and *G. pallida.* Current problem: *Purple top*
- Time of farmers reusing the seed might need to be reconsidered when related to yield decline.
- Exploring this indicator as proxy for seed-borne pests and pathogens accumulation.

Highlights

Seed-borne pests



Seed-borne virus



Nematodes

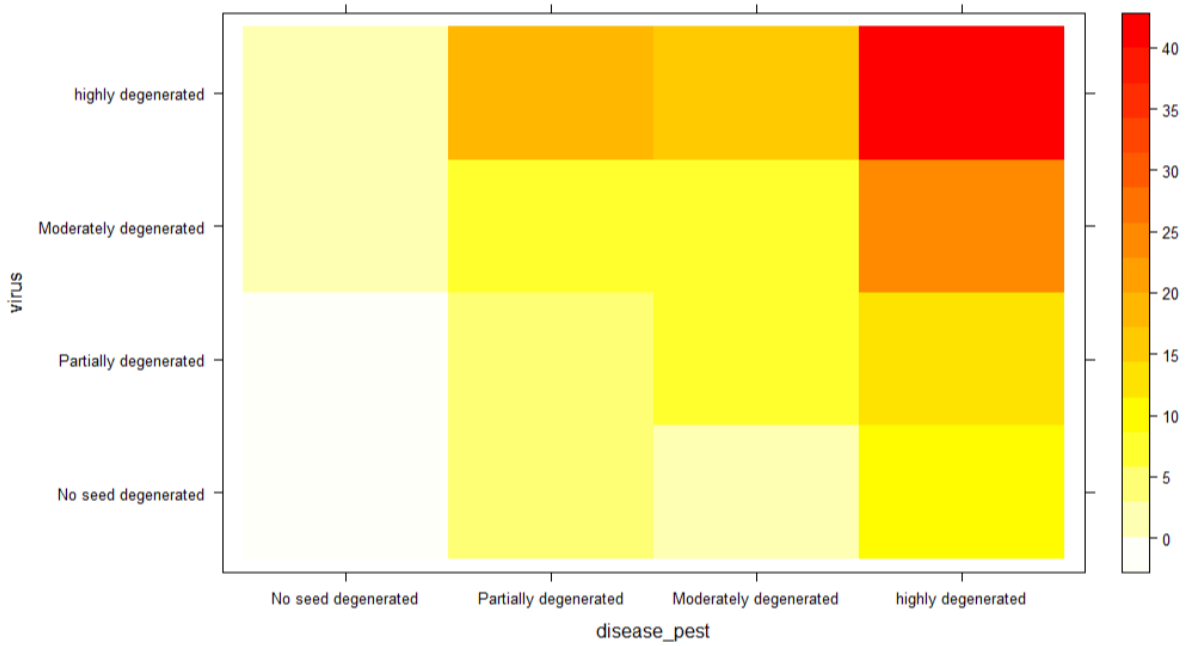
- *Globodera pallida* is the main nematode present in the region.
- 40% of the samples are free of this nematode
- 60% of the samples have different concentrations of this nematode

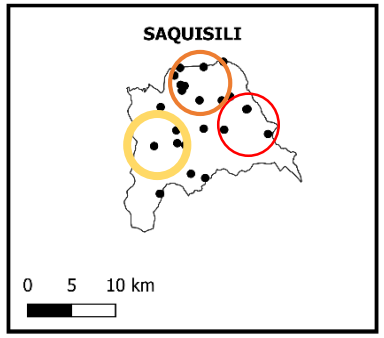
Next steps

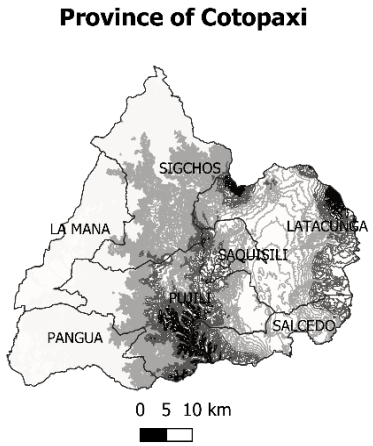
Farm types are designed at the moment based on the pest prevalence and farmers' social characteristics

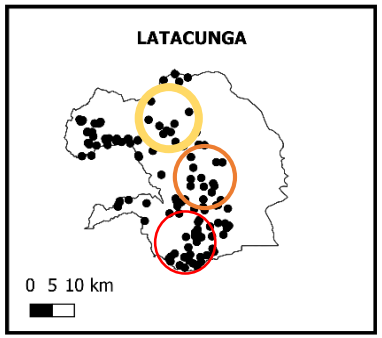
Farms will be selected and invited to participate in the FRNs

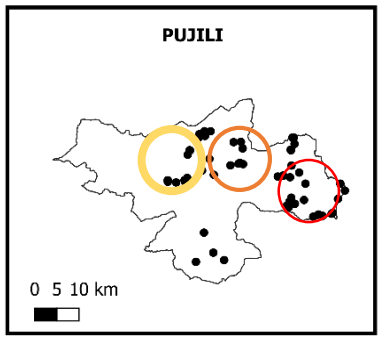
Experiments to identify degeneration rates and effective on-farm management practices will be carried out and designed with them

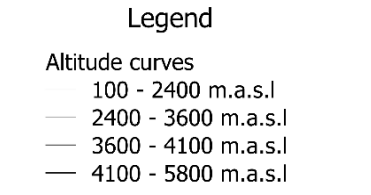


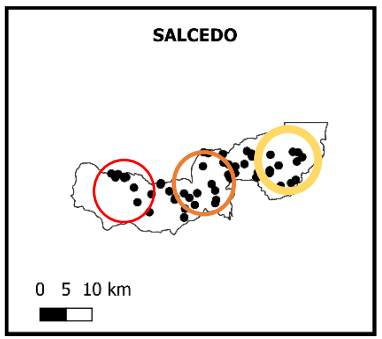










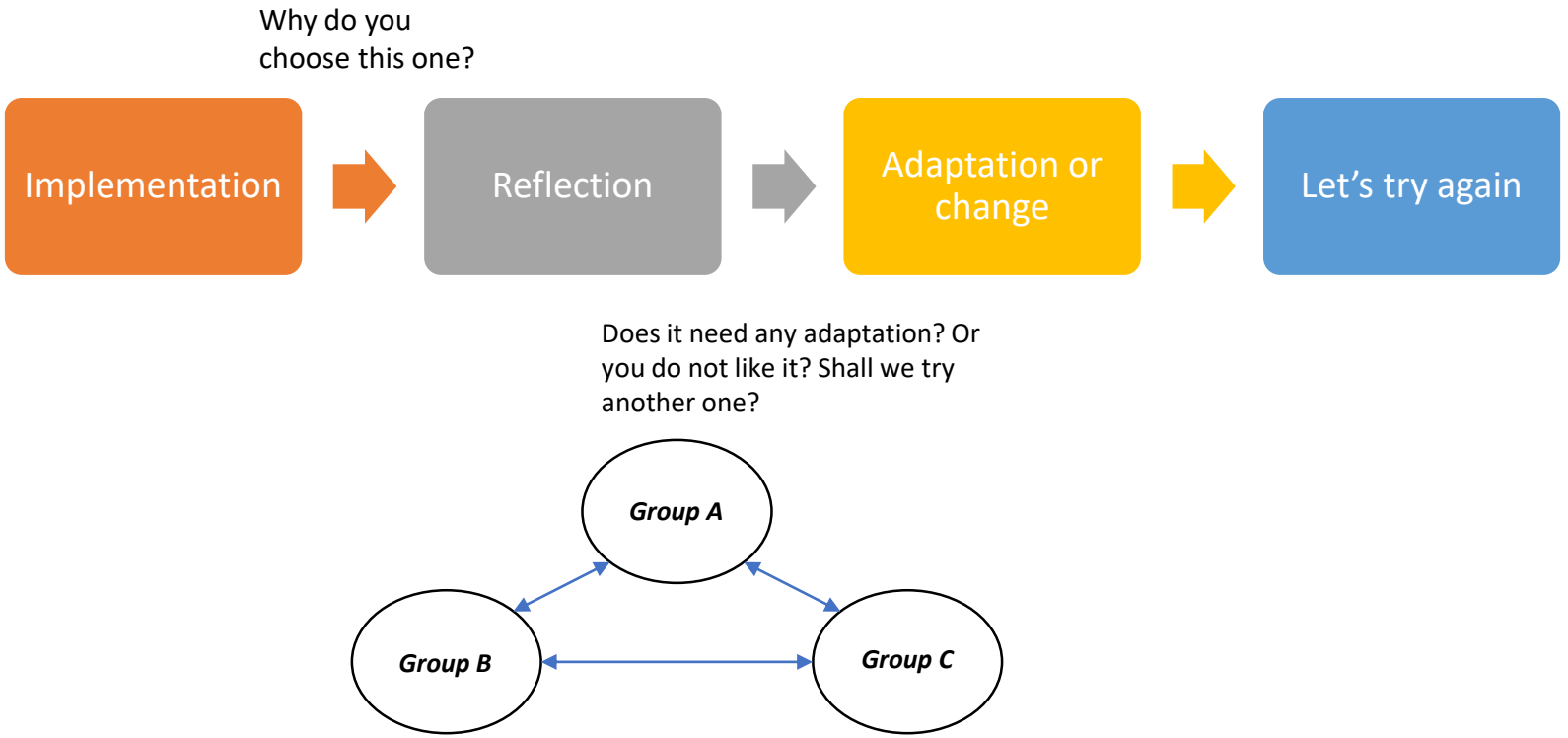


Next steps

- I will have a control plot to measure potato seed degeneration rates in each FRN,
- My initial suggestion is to invite them to test and “learn” different on-farm management practices.
- Variables I will measure are presence or absence of seed-borne diseases and pests. Plus, variables discussed with farmers

Portfolio of on-farm management practices

- Field selection
- Varietal resistance (is it possible?)
- Positive selection
- Roguing (Negative selection)
- Use of high quality seed
- Seed selection
- Seed plot
- Potato seed bank
- Push and pull systems (with local species)
- Crop rotation



Who is involved?

Agradecimientos

THE MCKNIGHT FOUNDATION

CGIAR RESEARCH PROGRAM ON Roots, Tubers and Bananas

Questions to discuss

- Could the different farmers' groups involved be called FRNs?
- Is my project contributing to AEI? Why? And Why not?
- How to improve this protocol to generate evidence between AEI and FRNs?
- How can "FRNs" in my project develop a data pipeline to keep it for them and to share it?
- Was this exercise useful?.. How to improve it?