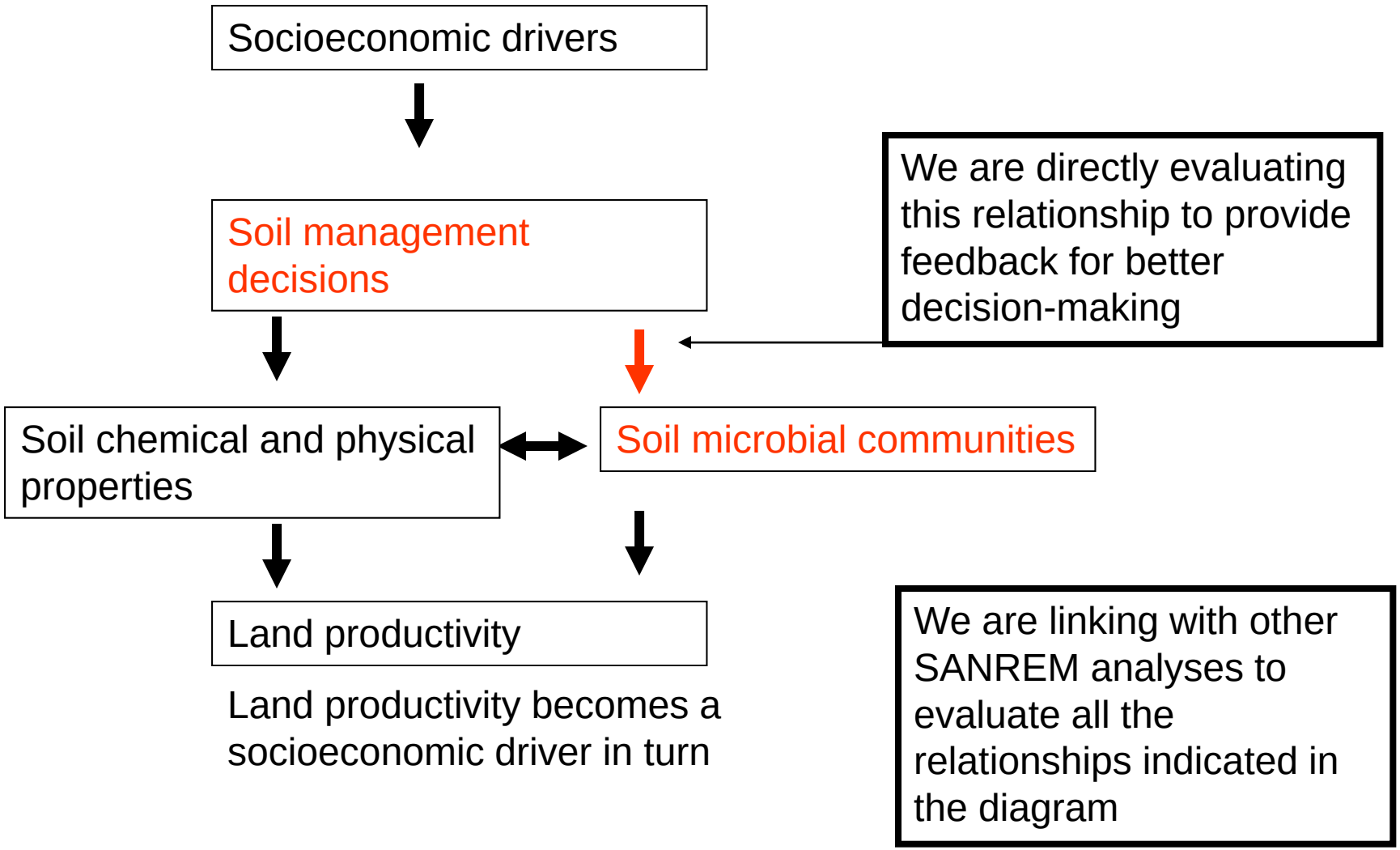
Soil metagenomics and tropical soil productivity

Motavalli

- To manage agricultural natural resources, we need to know what these resources are!
- Microbes that are difficult to culture are barely understood and make up a huge part of soil – sequencing techniques allow us to study them
- We need translational research to put new metagenomic tools to work for developing regions

Soil metagenomics and tropical soil productivity

- Soil productivity is an important limiting factor in many tropical systems
- Soil microbes such as mycorrhizal fungi and rhizobia are particularly important to support productivity in low-input systems
- Pathogens often increase in importance under reduced tillage systems such as Conservation Agriculture systems
- New DNA sequencing approaches make it much easier to study soil microbial communities in productive and degraded soils
- We are doing translational research to apply these tools for the benefit of agriculture in developing countries


Socioeconomic drivers
Soil management decisions
We are directly evaluating this relationship to provide feedback for better decision-making
Soil chemical and physical properties
Soil microbial communities
Land productivity
Land productivity becomes a socioeconomic driver in turn
We are linking with other SANREM analyses to evaluate all the relationships indicated in the diagram

SANREM activities

http://www.soilfoodweb.com.au

Soil sample

DNA extraction

Fragments of DNA from all the microbes

- In our SANREM cross-cutting project, students Lorena Gomez and Neshmi Salaues are evaluating microbial communities in the experimental contexts developed in these three LTRA projects
- They will have complete sequencing results for these experiments in the next few months

Treatments being evaluated for effects on microbial communities

- Valdivia LTRA: Effects of fallow period and plant cover
- Alwang LTRA: Effects of elevation and level of degradation
- Travis LTRA: Effects of soil management and amendments

Benefits of this new type of knowledge

- We anticipate that knowledge of the effects of soil management decision-making on microbial communities will allow us to
  - evaluate the effects of decisions on microbes known to have positive or negative effects on productivity
  - identify microbes that are indicators for higher and lower productivity
  - ultimately, identify microbes important to productivity whose role was not understood in the past