Balancing economic and environmental tradeoffs for dairy production in California and New Zealand
Background: Developing a Concept Map

Dr. Rachael Garrett and Dr. Meredith T. Niles

One of the core activities within this case study is for students to develop a concept map of their respective systems. These concept maps are critical in helping students trace the complexities of a social-ecological system and to begin to understand the feedbacks and tradeoffs of the dairy system. Concept maps should include a diverse set of actors, many of which will likely be considered in the first class module, as well as consideration for the resources within the system, and the economic, social and political governance systems. Existing frameworks (Ostrom 2009; Liu et al. 2007) may be relevant to consider for this exercise and in a class such as the one in which this would be taught would be useful reading for earlier in the semester.

It is useful if students have space and materials to facilitate an interactive and visual process. Large poster board or paper sheets and markers as well as physical space for groups to spread out will be most helpful. It may be useful to ask the students to brainstorm their list of key actors, resources, and economic, social and political governance system before they begin to sketch the dairy system map. You should also explicitly ask the students to consider the feedbacks and connections between the different resources, users, governance systems and potential outputs.

Ultimately students will be assessing their own concept maps through self-assessment but also providing feedback to the other group. These assessments may require students to consider the following:

1) Did we include all relevant stakeholders? Did we adequately connect stakeholders to systems, resources and dairy outputs?
2) Did we consider all governance systems both formal (regulations) and informal (social norms?)
3) How does your group's visual compare to the other group? What is your favorite aspect of your map? What is your favorite part of the other group's map?
4) How can we improve this concept map?

The assignment may be altered such that student groups present their concept maps to the other group during class time. This would provide additional opportunities for students to practice their public presentation skills and defending their perspectives or decisions.

References:
Liu, et al. 2007. Coupled Human and Natural Systems. Ambio. 36: 639- 649.
Ostrom, E. 2009. A general framework for analyzing the sustainability of social-ecological systems. Science.