Combining farmer experience and academic knowledge: summer agroecosystems analysis course

MARY WIEDENHOEFT[1], PAUL PORTER[2], ROBERT DEHAAN[3], CHARLES FRANCIS[4]

Key words: Experiential learning, team projects, on-farm education, phenomenology

Abstract

To understand multiple facets of today's complex farming systems requires us to move beyond the narrow disciplinary focus found in most university agriculture courses. Learning from farmers who are intimately involved with daily decision making on the farm is highly instructive. Experienced at designing systems and choosing appropriate practices season after season, farmers can provide valuable knowledge to complement lessons taught in the academic classroom. Traditional agricultural departments are human constructs developed for our convenience, and thus scarcely represent valid lenses through which to view the complex ecological structure of farms. To adequately delve into mechanisms of crop/weed, crop/animal, product/market, and myriad other interactions involved in agriculture, it is essential that we draw on methods from the biophysical and social sciences to help us understand the human activity system of farming. We call this approach agroecology analysis.

Introduction

For more than a decade, we have led a summer course using experiential learning to help students understand the complexity of farming systems. Students visit and interview farmers in Iowa, Minnesota, South Dakota, and Nebraska, with students taking responsibility for designing the inquiry, processing information collected, and evaluating what they learn in the context of each farm. In addition, students design potential options for farmers to consider for improving the sustainability of their operations. Team projects provide a measure of learning about farming systems, while individual reflection documents provide a place for self-evaluation and personal reflection. We describe this course as a bridge between farmer-based and academic knowledge, an integration of disciplines and methods, and a discovery process that builds student capacity to understand complex, dynamic farm processes. The phenomenological approach features an open-ended case method to study the farms (Francis et al. 2009).

Material and methods

The heart of this course is a series of interviews with farmers about their operations. In the midwestern United States, this includes field crops, vegetables, beef and dairy cattle, swine, sheep and goats, and various combinations of these enterprises. Starting education on the farm has been called phenomenology (Østergaard et al., 2010). When students conduct interviews and tour farms together, they build a common context in which to compare and contrast farming operations as well as their own methods of evaluation. Students bring prior schooling and personal experiences in agriculture to this analysis. Each project team benefits from the collective experience and diverse academic history as the course unfolds over the week.

Foundationally, we believe that a multidisciplinary perspective is useful to understand the many biological interactions, economic dimensions, environmental impacts, and social elements of each farm, and also how the farm family relates to the local community. Education and research using this perspective should be termed *agroecology: the ecology of food systems* (Francis et al. 2003). Therefore, the course includes multiple methods for studying and evaluating farms. Some key tools are introduced early in the course so students can clarify their pre-course assigned readings and develop questions for their farmer interviews (Francis et al., 2009). The process includes biological, economic, and environmental review in a process described in *Agroecosystems Analysis* (Rickerl and Francis, 2004). Experiential learning has a rich history in U.S. academia (Moncure and Francis, 2011), and we have been especially happy with the open-ended case learning strategy that students use to put farmers' questions into a whole farm perspective (Francis et al., 2011). In addition, when students, instructors, and farmers work together to discuss the challenges on a farm, this can provide a rich, real-world opportunity for learning. We find that four threads weave through the

[1] Iowa State University, USA, eMail: mwiedenh@iastate.edu
[2] University of Minnesota, USA, eMail: pporter@umn.edu
[3] Dordt College, USA, eMail: rdehaan@dordt.edu
[4] University of Nebraska – Lincoln, USA, eMail: cfrancis2@unl.edu [contact person]

course and help students build bridges across gaps between former classes—what could be called the boundary areas or *ecotones of learning*.

Results

Four themes that appear particularly important in the success of this summer course in the analysis of farm agroecosystems include: 1) valuing farmer experience, limitations, and wisdom; 2) focusing on multidisciplinary study and learning to sort out complexity in related farming systems; 3) using methods of analysis from the biophysical and social sciences, and 4) studying each farm as an open-ended case study in which the challenges must be discovered by the students and potential future changes explored with the farmers.

1. Phenomenology: bridging farmer experience and academic knowledge

While many courses start with the history of the discipline and study of theory from a particular perspective, phenomenology begins with the farm and the experience itself (Østergaard et al. 2010). Armed with minimal tools and often useful prior experience in such fields as agronomy, horticulture, economics, and plant protection, teams of students spend an evening discussing what questions they should ask farmers to uncover details of crop and animal production, market options and economic outcomes of different enterprises, environmental challenges created by current production systems, and the critical labor, family, and community issues that impact a farm's success. For each farm visit (typically 6 to 9 farms in four separate states), a brief tour of fields and facilities and in-depth interview with the farmer/farm family provides an overview of enterprises, integration of activities, and the key economic factors that contribute to sustainable operations. Through personal observations and listening to the farmer, students begin to understand major enterprises and activities and piece together key interactions that relate the farm to its natural resource base. After multiple team discussions, the student groups prepare a document that compares and contrasts the farms, using metrics and indicators derived by each team. It is intriguing to see the different methods used and results achieved by creative students each year, and their abilities to discuss differences of opinion and arrive at some consensus in their reports.

2. Multidisciplinary learning: moving out of our silos of knowledge

Another important bridge encountered by students during this on-farm learning adventure is spanning the disciplines they have experienced in prior university courses. They learn to appreciate the different lenses through which farms can be viewed, depending on one's focus or prior education, and to learn the terms and perspectives used by others on their teams. The instructors collectively represent more than 125 years of research and teaching experience in prairie ecology, genetics, plant physiology, agronomy, horticulture, soils and forage crops, animal science, international agriculture, and food systems, plus practical farming experience and decades of working with farmers. We could describe the week as a process of helping students move away from their prescribed silos (represented by major departments of study) in the university, and welcoming them to the complex world of the farmer and the real-world context in which he or she makes decisions. At times this real-world context can be an arduous and confusing journey, but one that students appear to appreciate in the end.

3. Biophysical and social science variables: bridges in methodology

Agronomists and animal scientists are accustomed to recording hectares of each crop, livestock numbers, production inputs and practices, and yields/weight gains, while economists look at costs and returns and alternative marketing opportunities. Environmental scientists measure water quality, soil erosion, and biodiversity on the farm and in the landscape. Rural sociologists observe family and community dynamics, including how the strength of local institutions and infrastructure relates to size of farm and quality of life. These are but four examples of focus that students can bring to the study of farms in this course. What they all discover is the need for many types of measurements and different methods of viewing and evaluating the farm and its enterprises. For example, they must add the skills of interviewing and social system evaluation to what they already knew about recording crop varieties and fertilizer rates. More important than specific measurements and methods are the perspectives students gain from other major fields of study, and how to focus broadly on the total context of the farm, an entity not easily defined by any single set of criteria.

4. Open-ended cases: experiential learning and discovery

The use of the case study as a learning technique has grown from its initial application in business schools. In fact, the University of Minnesota has developed a number of agriculture decision cases that are well respected and widely used (American Society of Agronomy, 2005). In most case studies, the answers to a particular inquiry are already known to the client and the instructor, and the students must be clever enough to figure out the correct answer. In contrast, the open-ended case approach explores situations in which the answers are not known, and even the questions may be poorly defined (Francis et al., 2009). In our course, students are responsible, through their interviews with farmers, for discovering the issues and defining the key questions. They must explore the situation in enough detail to evaluate present enterprises and system designs and evaluate the relative sustainability of different strategies, and explore possible changes. This can be challenging for students who come from an academic environment where they are charged with figuring out the one right answer on an exam. Here they are put into an imaginary role as advisors who learn as much as possible about the farm in a short time, perform an evaluation, and consider potential modifications of current systems. This is a real-world situation that most will face in a future job, where often the goals are loosely defined and there is never full information for making decisions.

Conclusions

Evaluation of student learning in this summer travel course has been integral and ongoing. This involves continuous assessment through one-page questionnaires completed each evening, and frequent interactions with students at meals, during travel, and at farm visits. A faculty mentor is assigned to each group, and instructors meet each evening to share observations and modify next-day activities. Insight on learning was summarized (Wiedenhoeft et al., 2003), and a graduate student evaluated daily evaluation sheets over seven years (Harms et al., 2009). This hands-on, minds-on immersion in farm operations was highly successful in providing students new ideas about how farms work and how farmers make decisions. One recent student said, " I learned more in one week on farms than in a full semester of courses back on campus." While this may not always be the case, we are encouraged by student feedback that this is an effective way to study complex systems.

References

American Society of Agronomy (2005): Case Studies, in Journal of Natural Resources and Life Sciences Education, 1992-2005. American Society of Agronomy, Madison, Wisconsin, USA.

Francis CA, Jordan N, Porter P, Breland TA, Lieblein G, Salomonsson L, Sriskandarajah N, Wiedenhoeft M, DeHaan R, Braden I, & Langer V (2011): Innovative education in agroecology: experiential learning for a sustainable agriculture. CRC Critical Reviews in Plant Science 30(1&2), 226-237.

Francis C, King J, Lieblein G, Breland TA, Salomonsson L, Sriskandarajah N, Porter P, & Wiedenhoeft M (2009): Open-ended cases in agroecology: farming and food systems in the Nordic Region and the U.S. Midwest. Journal of Agricultural Education & Extension 15(4), 385-400.

Francis C, Lieblein G, Gliessman S, Breland TA, Creamer N, Harwood R, Salomonsson L, Helenius J, Rickerl D, Salvador R, Wiedenhoeft M, Simmons S, Allen P, Altieri MA, Flora C, & Poincelot R (2003): Agroecology: the ecology of food systems. Journal of Sustainable Agriculture. 22(3), 99-118.

Harms K, King J, & Francis C (2009): Behavioral changes based on a course in agroecology: a mixed methods study. Journal of Natural Resources and Life Science. Education 38,183-194.

Moncure S & Francis C (2011): Foundations of experiential education for agroecology. NACTA Journal 55(3), 75-91.

Østergaard E, Lieblein G, Breland TA, & Francis C (2010): Students learning agroecology: phenomenon-based education for responsible action. Journal of Agricultural Education and Extension 16(1), 23-37.

Rickerl D & Francis C, editors (2004): Agroecosystems analysis. Agronomy Monograph No. 43, American Society of Agronomy, Madison, Wisconsin, USA.

Wiedenhoeft M, Simmons S, Salvador R, McAndrews G, Francis C, King J, & Hole D (2003): Agroecosystems analysis from the grass roots: a multidimensional experiential learning course. Journal of Natural Resources & Life Science Education. 32, 73-79.