AGROECOLOGY II

APBI 360 – W2017 Term 2
Tuesday/Thursday 1:00-4:00 pm
Mcml 258

Course Instructor

Andrew Riseman – andrew.riseman@ubc.ca
Office: Mcml 323

Teaching Assistant (TA):

Carla Hick – carla.hick@ubc.ca

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Course Description:

This is the second course in the Food & Environment core series. This next experience in agroecology focuses on the application and analyses of integrated plant and animal production systems. The aim of the course is to further enhance your abilities to effectively use the knowledge you acquired in Agroecology I towards refining, enhancing, and ultimately creating new sustainable production systems.

Through this course, we will target your abilities to think critically and skills associated with critical thought. I have included an introduction to Critical Thought within this document. If developing stronger critical thought skills is of interest to you, I highly recommend visiting http://www.criticalthinking.org/.

Students will use Canvas for announcements, assignments and discussions. To reduce costs & waste, all course materials will be made available electronically. If agreed by the class, there will be opportunities for field trips to visit agricultural operations and events.

Learning Outcomes - Agroecology II:

Upon completion, students will be able to:

- Assess the integration of basic ecological services in the context of an agroecosystem's sustainability;
- Illustrate the structures (e.g., biotic and abiotic) and ecological functions (e.g., energy flow, nutrient cycling) of an integrated agroecosystem;
- Choose relevant determinants of crop and animal health within an integrated system;

- Report the impacts and interrelationships between agricultural systems and associated ecosystems;
- Prioritize agroecological principles for an integrated food production system towards maximizing ecological service provision;
- Improve your ability to work efficiently in teams to solve complex problems;
- Demonstrate an ability to reflect on and connect hands-on (i.e., real life) experiences to theoretical learning towards developing problem solving, critical thinking, and leadership skills;
- Effectively and professionally communicate information, in both written and spoken English, using a variety of methods including writing, presenting, and small group discussions.

Suggested Readings (to be read throughout the term):

- Agroecology: the Ecology of Sustainable Food Systems – Stephen Gliessman
- Field and Laboratory Investigations in Agroecology– Stephen Gliessman
- Agroecology: A Transdisciplinary, Participatory and Action-oriented Approach - V. Ernesto Méndez and Christopher M. Bacon
- Various primary literature sources including journal articles, conference and symposia proceedings, and other peer-reviewed publications. Topical journals include:
    - Agriculture, Ecosystems & Environment (Elsevier)
    - Agroecology and Sustainable Food Systems (Taylor & Francis)
    - Agronomy for Sustainable Development (EDP Sciences)
    - BioControl, 2001 (Springer)
    - Journal of Agricultural and Environmental Ethics (Springer)
    - Journal of Agricultural Science (Cambridge University Press)
    - Journal of Agricultural Sustainability (Taylor & Francis)
    - Journal of Applied Ecology (Wiley)
    - Journal of Crop Improvement (Taylor & Francis)
    - Mycorrhiza (Springer)
    - Science (AAAS)
- Plus many more traditionally disciplinary-focused journals as research in agroecology and applied ecology become more common.

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Additional Resources:

- The Critical Thinking Community (http://www.criticalthinking.org/)
- The Skills You Need (http://www.skillsyouneed.com/learn/critical-thinking.html)
- Google Scholar (https://scholar.google.ca/)

Grade Profile:

Critical Thinking Assignments (x)	%
Review Presentations (x)	%
Active Skilled Participation	%
Project Proposal	%

Grade Component Descriptions:

Listed here is a brief description of each component of the final course mark. For full descriptions of the assignments and their marking rubrics, please see the assignment documents posted on Canvas (still in progress).

Critical Thinking Assignments

These assignments are designed to assess your critical thinking, problem solving, and communication skills. Your submissions will be judged on clarity, relevance, coherence, logic, depth, consistency, and fairness. More specifically, the reader will be asking the following questions:

- Is the question at issue well stated? Is it clear and unbiased? Does the expression of the question do justice to the complexity of the matter at issue?
- Does the writer cite relevant evidence, experiences, and/or information essential to the issue?
- Does the writer clarify key concepts when necessary?
- Does the writer show a sensitivity to what he or she is assuming or taking for granted? (Insofar as those assumptions might reasonably questioned)?
- Does the writer develop a definite line of reasoning, explaining well how he or she is arriving at his or her conclusions?
- Is the writer's reasoning well-supported?
- Does the writer show sensitivity to alternative points of view or lines of reasoning? Does he or she consider and respond to objections framed from other points of view?
- Does the writer show sensitivity to the implications and consequences of the position he or she has taken?

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Assignment #1:

Assignment #2:

Assignment #3:

Review Presentations

Each student will give three, 3-5 min, oral presentations. Each presentation is to cover a different component of a specific trophic level within an animal:crop system. If desired, they may relate to each other so when completed, a whole system is envisioned. However, you may choose to present three unconnected components.

Two of the three presentations must focus on peer-reviewed primary literature as sources.

Please keep in mind the "Template for Analyzing the Logic of an Article (or presentation)" when constructing your presentations.

Guiding questions:

1) What is the specific structural component?
2) What are the ecological requirements for the component?
3) What is the financial feasibility of the component
4) What are the ecological services provided or impeded by the component?
5) What assessment criteria should be used when considering inclusion of the component?
6) How does the component interact with other components within the system?
7) What assessment criteria should be used to determine the component's contribution to the system's overall sustainability?
8) Why did I present this information?
9) How does this information increase my understanding of integrated production systems?
10) What assumptions have I made about the usefulness of this information to my understanding?

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Active Skilled Participation

Class attendance is required, and students are encouraged to contribute to class discussion. Participation is the key to a lively class. Twenty-five percent (25%) of the course grade will depend upon contributions to our class sessions. Class participation provides the opportunity to practice speaking and persuasive skills, as well as the ability to listen. Comments that are vague, repetitive, unrelated to the current topic, disrespectful of others, or without sufficient foundation will be evaluated negatively. What matters is the quality of one's contributions to the class discussion, not the number of times one speaks.

Guidelines for Evaluating Critical Thinking from Class Participation (and for the course)

Outstanding Contributor: Contributions in class reflect exceptional preparation. Ideas offered are always substantive, and provide one or more major insights as well as direction for the class. Challenges are well substantiated and persuasively presented.

Outstanding work demonstrates real achievement in grasping what agroecological thinking is, along with the clear development of a range of specific agroecological thinking skills or abilities.

Participation is, on the whole, clear, precise, and well-reasoned, though with occasional lapses into weak reasoning. The work demonstrates a mind beginning to take charge of its own ideas, assumptions, inferences, and intellectual processes.

An outstanding student often analyzes agroecological issues clearly and precisely, often formulates information accurately, usually distinguishes the relevant from the irrelevant, often recognizes key questionable assumptions, usually clarifies key agroecological concepts effectively, typically uses agroecological language in keeping with established professional usage, frequently identifies relevant competing agricultural points of view, and shows a general tendency to reason carefully from clearly stated premises, as well as noticeable sensitivity to important implications and consequences.

Outstanding work displays excellent agroecological reasoning and problem-solving skills. An outstanding student's work is consistently at a high level of intellectual excellence.

Good Contributor: Contributions in class reflect thorough preparation. Ideas offered are usually substantive, provide good insights, and sometimes direction for the class. Challenges are well substantiated and often persuasive.

Good work represents demonstrable achievement in grasping what agroecological thinking is, along with the clear demonstration of a range of specific agroecological thinking skills or abilities.

DRAFT

Good work at the end of the course is, on the whole, clear, precise, and well-reasoned, though with occasional lapses into weak reasoning.

On the whole, agroecological terms and distinctions are used effectively. The work demonstrates a mind beginning to take charge of its own ideas, assumptions, inferences, and intellectual processes.

The student often analyzes agroecological issues clearly and precisely, often formulates agroecological information accurately, usually distinguishes the relevant from the irrelevant, often recognizes key questionable assumptions, usually clarifies key agroecological concepts effectively, typically uses agroecological language in keeping with established professional usage, frequently identifies relevant agroecological competing points of view, and shows a general tendency to reason carefully from clearly stated premises, as well as noticeable sensitivity to important implications and consequences.

Good work displays good agroecological reasoning and problem-solving skills.

Adequate Contributor: Contributions in class reflect satisfactory preparation. Ideas offered are sometimes substantive, provide generally useful insights but seldom offer a new direction for the discussion. Challenges are sometimes presented, fairly well substantiated, and are sometimes persuasive. If this person were not a member of the class, the quality of discussion would be diminished somewhat.

Adequate work illustrates some but inconsistent achievement in grasping what agroecological thinking is, along with the development of modest agroecological thinking skills or abilities.

Adequate work at the end of the course shows some emerging agroecological thinking skills, but also pronounced weaknesses as well. Though some assignments are reasonably well done, others are poorly done; or at best are mediocre.

There are more than occasional lapses in reasoning. Though agroecological thinking terms and distinctions are sometimes used effectively, sometimes they are used quite ineffectively. Only on occasion does adequate work display a mind taking charge of its own ideas, assumptions, inferences, and intellectual processes. Only occasionally does adequate work display intellectual discipline and clarity.

An adequate student only occasionally analyzes agroecological issues clearly and precisely, formulates agroecological information accurately, distinguishes the relevant from the irrelevant, recognizes key questionable assumptions, clarifies key agroecological concepts effectively, uses agroecological language in keeping with established professional usage, identifies relevant agroecological competing points of view, and reasons carefully from clearly stated premises, or recognizes important

DRAFT

agroecological implications and consequences. Sometimes the adequate student seems to be simply going through the motions of the assignment, carrying out the form without getting into the spirit of it.

On the whole, adequate work shows only modest and inconsistent agroecological reasoning and problem-solving skills and sometimes displays weak reasoning and problem-solving skills.

Non-Participant: This person says little or nothing in class. Hence, there is not an adequate basis for evaluation.

Non-participant work shows only a minimal level understanding of what agroecological thinking is, along with the development of some, but very little, agroecological thinking skills or abilities.

Non-participant work at the end of the course, on the whole, shows only occasional agroecological thinking skills, but frequent uncritical agroecological thinking. Most assignments are poorly done. There is little evidence that the student is "reasoning" through the assignment.

Often the student seems to be merely going through the motions of the assignment, carrying out the form without getting into the spirit of it. Non-participant work rarely shows any effort to take charge of ideas, assumptions, inferences, and intellectual processes. In general, non-participant thinking lacks discipline and clarity.

In non-participant work, the student rarely analyzes agroecological issues clearly and precisely, almost never formulates agroecological information accurately, rarely distinguishes the relevant from the irrelevant, rarely recognizes key questionable assumptions, almost never clarifies key agroecological concepts effectively, frequently fails to use agroecological language in keeping with established professional usage, only rarely identifies relevant competing agroecological points of view, and almost never reasons carefully from clearly stated premises, or recognizes important implications and consequences.

Non-participant work does not show good agroecological reasoning and problem-solving skills and frequently displays poor reasoning and problem-solving skills.

Unsatisfactory Contributor: Contributions in class reflect inadequate preparation. Ideas offered are seldom substantive, provide few if any insights, and never a constructive direction for the class. Integrative comments and effective challenges are absent.

The work at the end of the course is as vague, imprecise, and unreasoned as it was in the beginning. There is little evidence that the student is genuinely engaged in the task of taking charge of his or her agroecological thinking.

DRAFT

Many assignments appear to have been done pro forma, the student simply going through the motions without really putting any significant effort into thinking his or her way through them.

Consequently, the student is not analyzing agroecological issues clearly, not formulating agroecological information accurately, not distinguishing relevant from irrelevant information, not identifying key questionable agroecological assumptions, not clarifying key agroecological concepts, not identifying relevant agroecological competing points of view, not reasoning carefully from clearly stated premises, or tracing agroecological implications and consequences.

The students work does not display discernable agroecological reasoning and problem-solving skills.

Guidelines for Evaluating Critical Thinking from Class Participation

Critical thinking involves several sequential steps which may allow students to effectively discuss concepts with their peers. As agreed in class, all comments made by students in the course are subject to an assessment in order to gauge progress and determine a final participation grade. Critical thinking will be assessed on a weighted scale which includes both the level of thought contributed by the student and how well this particular level was achieved. The varying levels of critical thinking are hierarchical with each sequential step reliant on lower levels. Below is a description of 1) the ordered levels of critical thinking and 2) associated criteria used to evaluate how each level was met.

1. **Levels of Critical Thinking (based on Bloom's Taxonomy of Learning; lowest to highest)**
    - **Knowledge (K):** Student recalls or recognizes information, ideas, and principles in the approximate for which they have learned (list, label, name state define).
    - **Comprehension (C):** Student translates, comprehends or interprets information based on prior learning (explain, summarize, paraphrase, describe, illustrate).
    - **Application (AP):** Student selects, transfers, and uses data and principles to complete a problem or task with a minimum of direction (use, compute, solve, demonstrate, apply construct).
    - **Analysis (A):** Student distinguishes, classifies, and relates the assumptions, hypotheses, evidence, or structure of a statement or question (analyze, categorize, compare, contrast, separate)

DRAFT

- **Synthesis (S):** Student originates, integrates and combines ideas into a product, plan or proposal that is new to him or her (create, design, hypothesize, invent, develop)
- **Evaluation (E):** Student appraises assesses, or critiques on a basis of specific standards and criteria (judge, recommend, critique, justify)

2. **<u>Criteria used to Evaluate Level of Achievement</u>**

- **Outstanding (5):** Exceptional preparation, always substantive ideas and major insights, grasping what agroecological thinking is. Whole, clear, precise, and well-reasoned, own ideas, uses agroecological language, identifies relevant competing agricultural points of view, and reason carefully, as well as sensitivity to important implications and consequences. Displays excellent agroecological reasoning and problem-solving skills**.**
- **Good (4):** Thorough preparation, usually substantive ideas and major insights, grasping what agroecological thinking is. Whole, clear, precise, and well-reasoned, own ideas, uses agroecological language, identifies relevant competing agricultural points of view, and reason carefully, as well as sensitivity to important implications and consequences. Displays good agroecological reasoning and problem-solving skills.
- **Adequate (3):** Satisfactory preparation, sometimes substantives ideas, generally useful insights. Add quality to the discussion. Some, but inconsistent achievement in grasping agroecological thinking. Modest agroecological thinking skills and abilities. Some good and bad assignments, as well. More than occasional lapses in reasoning. Only, occasionally analyzes agroecological issues clearly and precisely. Shows only modest and inconsistent agroecological reasoning and problem-solving skills and sometimes displays weak reasoning and problem-solving skills.
- **Non-participant (2):** Says little or nothing in class, minimal level of understanding and agroecological thinking skills. Uncritical, assignments poorly done, lack own ideas and accuracy, no discipline and clarity. A groecological reasoning and problem-solving skills are not adequate

Unsatisfactory (1): Inadequate preparation, few if any insights, never a constructive direction for the class, work is vague, imprecise, and unreasoned, no substantive ideas, no genuine engagement, no significant effort into thinking.

DRAFT

Project Proposal

Each student will prepare a proposal that describes their integrated production system. The system must contain at least three trophic levels. It should demonstrate your understanding and use of agroecological knowledge. It should be both creative and realistic. The report should demonstrate your mastery of the intended learning outcomes. You may assume the reader is familiar with the subject.

Sections:

1) Summary or abstract (<300 words)
2) Introduction (i.e., context, problem statement)
3) Literature review (i.e., what information is available supporting your proposed design?)
4) System Design
    a. What are the primary structural components of the design?
    b. What are the ecological requirements of the system?
    c. How do the components interact with each other within the system?
    d. What is the financial feasibility of the design (i.e., cursory estimate only)
    e. What are the ecological services provided and impeded by this design from the UBC Farm's perspective?
    f. What assessment criteria should be used when considering inclusion of this design into UBC Farm operations?
5) Key Assumptions
    a. What key assumptions have I relied on for my design?
    b. What are the implications for these assumptions if found incorrect?
6) Next steps (i.e., what needs to be done to move the design towards implementation?)

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COURSE SCHEDULE:

The course schedule is subject to changes throughout the term.

	HOUR 1	HOUR 2	HOUR 3
Week 1: Jan 4	Introduction to 1) course framework and Bloom's Taxonomy of Learning, 2) syllabus, and 3) critical thinking.	Discussion: Agroecology and integrated crop-livestock systems; reasons for the industry to segregate livestock and crop, the benefits of integrating livestock and crop, ecosystem services provided by integrated, and spatiotemporal element of integration	Discussion: Plants and soils (brief topic as plant production is already covered in APBI260). Brief refresher of key processes and factors that are important for plants in an agricultural context (nutrients, water, temperature) Crash course on soils and physical, chemical parameters of soil health and fertility
Week 2: Jan 9	Topic: Animals in agriculture Discussion "Prospects from agroecology and industrial ecology for animal production in the 21st century". Focus on the benefits, implications, and difficulties of integrated animals into a crop-based operation. Delineate between industrial ecology and agroecology	Topic: Animals in agriculture (1) Lecture and discussion on the impact of animal diversity on agroecosystems (among livestock and for wildlife) and (2) discuss "Reconsidering Integrated Crop–Livestock Systems in North America", Focus on how to overcome challenges in re-integration, environmental benefits and economic profitability	Critical Thinking Assignment 1: Op-Ed article on benefits and difficulties of ICLS (newspaper style to a broad audience)
Week 2: Jan 11			

DRAFT

Week 3: Jan 16	Topic: Compost and Matter transformation Lecture on (1) nutrient cycling and management of composting to control nutrient availability, (2) difference between aerobic and anaerobic decomposition, (3) matter transformation in terms of volume reduction and nutrient mineralization, (4) management strategies to mitigate environmental hazards	Topic: Compost and decomposition Discussion on how to integrate composting into an integrated system and how to maximize synergies among composting and other components	
Week 3: Jan 18			
Week 4: Jan 23	Topic: Animal Welfare Guest speaker: Animal Welfare in animal production, effect on productivity, social equity	Lecture on how animal welfare is assessed (the 3 spheres of welfare)	Critical Thinking Assignment 2: The role of Animal Welfare in agroecology and ICLS (intersection between welfare and productivity)
Week 4: Jan 25			
Week 5: Jan 30	Topic: Ecological services and indicators of sustainability	Presentation 1 (individual): the effect of animal welfare on a system's animal component (e.g., broilers, laying hens, salmon farming, dairy)	
Week 5: Feb 1			
Week 6: Feb 6	Topic: Subsistence farming (Integrated aquaculture agriculture), read papers on IAAs	Class discussion: assessment of the sustainability, synergies, and economics of subsistence IAA farming	Critical Thinking Assignment 3: (essay) Assess and evaluate the intersection between agroecology and social sustainability in food systems
Week 6: Feb 8			

DRAFT

Week 7: Feb 13	Field Trip to UBC Farm: Chicken and potential animal expansion	Topic: UBC Farm w/ guest speaker (Tim?) and debriefing	
Week 7: Feb 15			
Spring Break	**Spring Break**	**Spring Break**	**Spring Break**
Week 8: Feb 27	Class discussion: assessment of the sustainability, synergies, and economics of UBC Farm	Topic: Intensive, indoor aquaculture/IAA farming, read papers on intensive aquaculture	Critical Thinking Assignment 4: Assessment report on the sustainability and synergies of UBC Farm
Week 8: Mar 1			
Week 9: Mar 6	Class discussion: assessment of the sustainability, synergies, and economics of intensive, in door aquaculture farming	Introduction of term report, assigning/ choosing an ICLS. Topic: Social equity in agroecosystems and food system	
Week 9: Mar 8			
Week 10: Mar 13	Presentation 2 (3 group): assessments of the impact of animal integration in (1) subsistence IAA farming, (2) UBC Farm (assess theoretical integration of another animal), and (3) intensive IAA (in preparation for the term report)	Free time for research and contacting operation	Critical Thinking Assignment 5: Report on the key challenges and barrier against projecting agricultural operations towards sustainability (identify and justify)
Week 10: Mar 15			
Week 11: Mar 20	Free time for research and contacting operation	Free time for research and contacting operation	
Week 11: Mar 22			

DRAFT

Week 12: Mar 27	Free time for research and contacting operation	Free time for research and contacting operation	Critical Thinking Assignment 6: Literature review on articles related to topic, identify gaps in knowledge and key assumptions
Week 12: Mar 29			
Week 13: April 3	Presentation 3 (individual): on assessment and report on a commercial integrated crop-livestock system	Presentation 3 (individual): on assessment and report on a commercial integrated crop-livestock system	
Week 13: April 5	Term Report: Assessment of an existing ICLS, report on the satisfaction of ecological services and other services (e.g., social), and improvements		

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Questions to consider when assessing a specific integrated animal plant production system:

1) What are the goals associated with this designed integrated system?
2) What are the criteria used to assess achievement of these goals?
3) What is this specific structural component?
4) What are the ecological requirements for this component?
5) What is the financial feasibility of this component
6) What are the ecological services provided or impeded by this component?
7) What assessment criteria should be used when considering inclusion of this component?
8) How does this component interact with other components within the system?
9) What assessment criteria should be used to determine this component's contribution to the system's overall sustainability?

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Critical Thinking Assignment Weighting Rubric

Clarity	15%
Accuracy	10%
Precision	15%
Relevance	15%
Depth	10%
Breath	5%
Logic	15%
Significance	10%
Fairness	5%
Total	100%

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Review Presentation Rubric

Presenter: _____
Date: _____

	Poor <<< Excellent				
PRESENTATION SKILLS	**1**	**2**	**3**	**4**	**5**
Were the main ideas presented in an orderly and clear manner?	,	,	,	,	,
Did the presentation fill the time allotted?	,	,	,	,	,
Were the visuals appropriate and helpful to the audience?	,	,	,	,	,
Did the talk maintain the interest of the audience?	,	,	,	,	,
Were the conclusions clear and substantive?	,	,	,	,	,
How well did the presenter respond to audience questions?	,	,	,	,	,
KNOWLEDGE BASE					
Was proper background information on the topic given?	,	,	,	,	,
Was the material selected for presentation appropriate to the topic?	,	,	,	,	,
Was enough essential information given to allow the audience to effectively evaluate the topic?	,	,	,	,	,
Was irrelevant or filler information excluded?	,	,	,	,	,
Did the presenter have a clear understanding of the material presented? ...	,	,	,	,	,
CRITICAL THINKING					
Were the main issues of the topic clearly addressed?	,	,	,	,	,
Were both theoretical positions and empirical evidence presented?	,	,	,	,	,
Was clear logic used to support the conclusions made?	,	,	,	,	,
Did the presenter make statements about 'next steps'?	,	,	,	,	,
Did the main conclusions of the presentation follow from the material presented?	,	,	,	,	,

OVERALL IMPRESSION ..... _____

COMMENTS

TOTAL SCORE _____ / 100

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Talk topics

Abiotic factor
Adaptation
Allelopathy
Alpha diversity
Aquaculture
Aquaponics
Autotroph vs. heterotroph
Beneficials
Beta diversity
Biochemical cycle
Biological nitrogen fixation
Biotic factor
Carbon fixation
Carbon partitioning
Carbon sequestration
Climax (ecological theory)
C:N ratio
Commensalism
Community
Compensating factor
Competition
Compost
Consumer
Cultural energy inputs vs. ecological energy inputs
Cycles
Decomposer
Density-dependent vs. density independent
Detritivore
Diversity
Dynamic equilibrium or balance
Ecological niche
Ecological services
Ecological structure
Emergent properties
Entomophagy
Environmental complex
Generalist vs. specialist
Herbivore vs. omnivore vs. carnivore
Host
Indicators of sustainability
Intercropping
Integrated crop management
Integrated animal and crop system
Limiting nutrient
Mineralization
Mutualism
Networks
Niche amplitude
Niche diversity
Nitrogen cycle
Nutrient cycles
Overyielding
Partnership
Polyculture
Producer
Productivity index
Protocooperation
Solar energy
Trophic structure

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