Diverse Farming Systems: Theory and Practice  
(NRE 553)  
3 credits

Note: The last day of class will be on December 8. Students are required to attend a workshop on ecological games that will take place Saturday October 29 half a day.

Instructor: Ivette Perfecto  
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3541 Dana  
Tel: 734-764-8601  
Office Hours: Tu 4:00-5:30

Meeting time: Tuesday and Thursday 2:30-4:00 in room 1028 Dana

Course Description: In this interdisciplinary course, we will critically explore an intersecting literature on agroecology, biodiversity, ecosystem services, diversified farming systems, agroforestry, and farmer’s livelihoods. The first part of the course will focus on the application of ecological theory to diverse farming systems including intercropping and agroforestry. The second part will emphasize biodiversity both in terms of how agricultural landscapes affect biodiversity and how biodiversity contributes to the sustainability, productivity and resilience of agroecosystems and farming communities. The third part of the course will focus on management aspects of agroforestry and diverse farming systems including traditional systems and animal-based systems. Finally, the last part will discuss the concept of “the new peasantries” as developed by van der Ploeg (2009) and its connection with diverse farming systems as well as the rural social movements that promote diverse farming systems, agroecology and food sovereignty.

Class Format: most class meetings will involve lecture and discussion in addition to a half day workshop on ecological games

Course Schedule:

| Part I. A Theoretical Framework for Intercropping and Agroforestry |
|---|---|
| 6 Sep | Introduction: An overview of diverse farming systems |
| 8 Sep | Definitions and quantitative evaluations of intercrops and agroforestry |
| 13 Sep | Competitive production principle |
| 15 Sep | Facilitative production principle |
| 20 Sep | Potential set and environmental grain |
| 22 Sep | Permaculture: what’s the fuzz? Guest: Charlie Brennan |
| 27 Sep | Facilitation through environmental modification: nutrient utilization |
| 29 Sep | Facilitation through environmental modification: herbivores and natural enemies |
| 4 Oct | Facilitation and competition in alley cropping systems |
### Part II. Diverse Farming Systems and Biodiversity

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
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<tbody>
<tr>
<td>6 Oct</td>
<td>Biodiversity conservation in agroecosystems</td>
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<tr>
<td>11 Oct</td>
<td>Exam I</td>
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<tr>
<td>13 Oct</td>
<td>Yield and biodiversity</td>
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<tr>
<td>18 Oct</td>
<td>Fall Break</td>
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<tr>
<td>20 Oct</td>
<td>Estimating biodiversity in agroecosystems (Using EstimateS)</td>
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<tr>
<td>25 Oct</td>
<td>Biodiversity and ecological complexity: The <em>Azteca</em> network</td>
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<td>27 Oct</td>
<td>The agricultural matrix</td>
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<tr>
<td>29 Oct</td>
<td>Azteca Chess tournament (Saturday 9:00 am – 1:00 pm)</td>
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<tr>
<td>1 Nov</td>
<td>Land sparing/land sharing debate</td>
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<tr>
<td>3 Nov</td>
<td>Biodiversity and ecosystem function</td>
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<td>8 Nov</td>
<td>Biodiversity and ecosystem services (pollination and pest control)</td>
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<tr>
<td>10 Nov</td>
<td>Biodiversity and ecosystem services (resilience, resistance, soils and carbon storage)</td>
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<tr>
<td>15 Nov</td>
<td>Multiple ecosystem services: tradeoffs or synergies?</td>
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<tr>
<td>17 Nov</td>
<td>Diverse farming systems in practice: Traditional systems</td>
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<tr>
<td>22 Nov</td>
<td>Diverse farming systems in practice: Integration of animals in agriculture</td>
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<td>24 Nov</td>
<td>Thanksgiving</td>
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### Part III. Diverse farming systems in changing environments

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<tr>
<th>Date</th>
<th>Topic</th>
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</thead>
<tbody>
<tr>
<td>29 Nov</td>
<td>Diverse farming systems in practice: Integration of animals in agriculture</td>
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### Part IV. Socio-Political Aspects of Diverse Farming Systems

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
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<tbody>
<tr>
<td>29 Nov</td>
<td>Diverse farming systems and the new peasantries approach: Part I</td>
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<tr>
<td>1 Dec</td>
<td>Exam II</td>
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<tr>
<td>6 Dec</td>
<td>Diverse farming systems and the new peasantries approach: Part II</td>
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<tr>
<td>8 Dec</td>
<td>Final thoughts and course evaluation</td>
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*Saturday 29 October: Azteca Chess Tournament*

**Required Books:**

**Recommended Books:**

**Evaluation:**

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<tr>
<th>Component</th>
<th>Weight</th>
<th>Due Date</th>
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<tbody>
<tr>
<td>Exam 1</td>
<td>20%</td>
<td>Oct 11</td>
</tr>
<tr>
<td>Exam 2</td>
<td>20%</td>
<td>Dec 1</td>
</tr>
<tr>
<td>Paper 1 (models for agroforestry)</td>
<td>15%</td>
<td>Oct 20</td>
</tr>
<tr>
<td>Paper 2 (open topic)</td>
<td>15%</td>
<td>Dec 8</td>
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Paper 1:
For this paper you should choose some ecological theory and applied it to diverse farming systems. For example, you can take some aspects of the theory developed for intercropping and adapt it to an agroforestry system or you can choose some ecological theory not covered in class and apply it to the analysis of a particular diverse farming system. The use of equations is encouraged but not required. The paper should be 10-12 pages long (doubled spaced). On October 11 you should hand in your selected topic, a brief explanation of what you plan to do, a tentative outline of the paper, and a list of references. The paper is due on October 20.

Paper 2:
The topic for this paper is wide open as long as it has to do with diverse farming systems. Choose a topic of your interest. You should have a hypothesis and use the available literature to test your hypothesis. The paper should be 12-15 pages long (doubled spaced). On November 17 you should hand in your selected topic, your hypothesis, a tentative outline of the paper, and a list of references. The paper is due on December 8.

Both papers should be written in a publishable form using the scientific format and standard format for reference.

*Discussion participation grade will be based on the level of participation, summaries of key points of assigned readings, and submitted questions for each reading.

Late Assignment Policy:
For the sake of fairness to all students in the course, deadlines will be strictly enforced. Unless you’ve made prior arrangements, lateness will impact your grade (10% for every day). If you have trouble completing a particular assignment, this must be discussed with me before the deadline. At the end of the semester, students with will be assigned a letter grade on the basis of the work that has been completed. “Incompletes” will be given only in extenuating circumstances under special permission.

Academic Honesty:
All students are responsible for maintaining the highest standards of honesty and integrity in every phase of their academic career. The penalties for academic dishonesty are severe; ignorance of what constitutes dishonesty is not an acceptable defense.
**Readings:**

**September 6** (Introduction to diverse farming systems)
http://www.ecologyandsociety.org/vol17/iss14/art44/
Atangana et al., Chapter 2

**September 8** (Definitions and quantitative evaluations of intercrops and agroforestry)
Vandermeer, Chapters 1 and 2
Atangana et al., Chapters 3 and 4

*Additional optional readings:*

**September 13** (Competitive production principle)
Vandermeer, Chapter 3

**September 15** (Facilitative production principle)
Vandermeer, Chapter 4 (pages 46-51)
Atangana et al., Chapter 7

**September 20** (Potential set and environmental grain)
Vandermeer, Chapter 4 (pages 52-67)

*Additional optional readings:*
Vandermeer, Chapter 5

**September 22** (Permaculture: what’s the fuzz?)
Check Canvas site for readings for this week

**September 27** (Facilitation through environmental modification: nutrient utilization)
Vandermeer, Chapter 6 (pages 86-93)
Atangana et al., Chapter 8

**September 29** (Facilitation through environmental modification: herbivores and natural enemies)
Vandermeer, Chapter 6 (pages 93-105)
Atangana et al., Chapter 12
Hassanali et al., 2008. Integrated pest management: the push-pull approach for controlling insects pests and weeds of cereals and its potential for other agricultural systems including animal husbandry. *Philosophical Transactions Royal Society* 363: 611-621


**Additional optional readings:**

**October 4** (Facilitation and competition in alley cropping systems)

**Part II: Diverse Farming Systems and Biodiversity**

**October 6** (Biodiversity conservation in agroecosystems)


Additional readings:


October 13 (Yield and biodiversity)


October 20 (Estimating biodiversity)


October 25 (Biodiversity and ecological complexity: The Azteca network)


October 27 (The agroecological matrix)


Atangana et al., Chapter 11

November 1 (Land sparing / land sharing debate)


**November 3** (Biodiversity and ecosystem function/services)


**November 8** (Biodiversity and ecosystem services (pollination and pest control))

NOTE: These papers will be for student group presentations.

**Pollination**


**Biocontrol**


**November 10** (Biodiversity and ecosystem services (resilience, resistance, soils and carbon storage))

NOTE: These papers will be for student group presentations.

**Resilience and resistance**


**Soil Processes**


**November 15** (Multiple ecosystem services: tradeoffs or synergies?)


**Part III: Diverse Farming Systems and Biodiversity**

**November 17** (Diverse farming systems in practice: traditional systems)

Atangana et al., Chapter 4 and Chapter 5


November 22 (Integration of animals in agriculture)

Part IV. Socio-Political Aspects of Diverse Farming Systems

November 29 (Diverse farming systems and the new peasantries approach: part I)

December 6 (Diverse farming systems and the new peasantries approach: part II)

Journals of Interest:
Acta Horticulturae
Agriculture (Open Access Journal)
Agriculture and Human Values
Agriculture Ecosystems and Environment
Agroecology and Sustainable Food Systems (Journal of Alternative Agriculture)
Agroforestry Systems
Agronomy for Sustainable Development
Ambio
Aspects of Applied Biology
Culture, Agriculture, Food and Environment
Ecology and Society (Open Access Journal)
Experimental Agriculture
Food Policy
Forest Ecology and Management
Forest Trees and People
Forest Science
Forestry Abstracts
Gastronomica – Journal of Critical Food Studies
HortScience
HortTechnology
Human Ecology
International Journal of Agricultural Sustainability
Journal of Agrarian Change
Journal of Agriculture and Environmental Ethics
Journal of Forestry
Journal of Peasant Studies
Journal of Sustainable Agriculture
Journal of the Science of Food and Agriculture
Journal of World Forest Resource Management
Land Use Planning for Sustainable Food Systems
Livestock Science
Natural Resources and Society
Plant and Soil
Renewable Agriculture and Food Systems
The Journal of Agriculture, Food Systems and Community Development
The Journal of Agricultural Sciences
Unasylva

Databases:
Available at UM Library:
AgEcon Search
AGRICOLA
AGRICOLA Articles (NAL)
BioOne Abstracts and Indexes
Biological Abstracts
Biological and Agricultural Index Plus
BIOSIS
CAB Abstracts
Ecology Abstracts
Encyclopedia of Food and Culture
FAOSTAT
Food Environment Atlas
Global Health (CABI)
International Political Science Abstracts (EBSCO)
Humanities and Social Sciences Index
Organic Agriculture Information Access
Science Citation Index (Web of Science)
Social Science Abstracts
Sociological Abstracts
UN Data

Not available at UM Library:
Agroforestry Abstracts - http://www.cabi.org/publishing-products/online-information-resources/agroforestry-abstracts/
Social Sciences in Forestry (SSIF) - http://www.lib.umn.edu/cgi-bin/forestry/index.cgi


Websites:
1st World Congress of Agroforestry - http://conference.ifas.ufl.edu/WCA/
Agri Cultures Network (Center for Learning on Sustainable Agriculture) - http://www.agriculturesnetwork.org/
Agroforestry Net - http://agroforestry.net/
Association of Temperate Agroforestry - http://www.aftaweb.org/
Bioversity International - http://www.bioversityinternational.org/
Center for Agroforestry of the University of Missouri - http://www.centerforagroforestry.org/
Center for Diversified Farming Systems - http://food.berkeley.edu/dfs/
Center for International Forestry Research (CIFOR) - http://www.cifor.org/
Farm Woodland Forum - http://www.agroforestry.ac.uk/
International Federation of Organic Agriculture Movements (IFOAM) - http://www.ifoam.org/
Land Institute - http://www.landinstitute.org/
Leopold Center for Sustainable Agriculture - http://www.leopold.iastate.edu/organic
Research Institute of Organic Agriculture (FiBL) - http://www.ifoam.org/
Rodale Institute - http://rodaleinstitute.org/
Sustainable Agriculture Research and Education - http://www.sare.org/
USDA Alternative Farming Systems Information Center (AFSIC) - http://afsic.nal.usda.gov/
USDA National Agroforestry Center - http://nac.unl.edu/
World Agroforestry Center - http://www.worldagroforestrycentre.org/