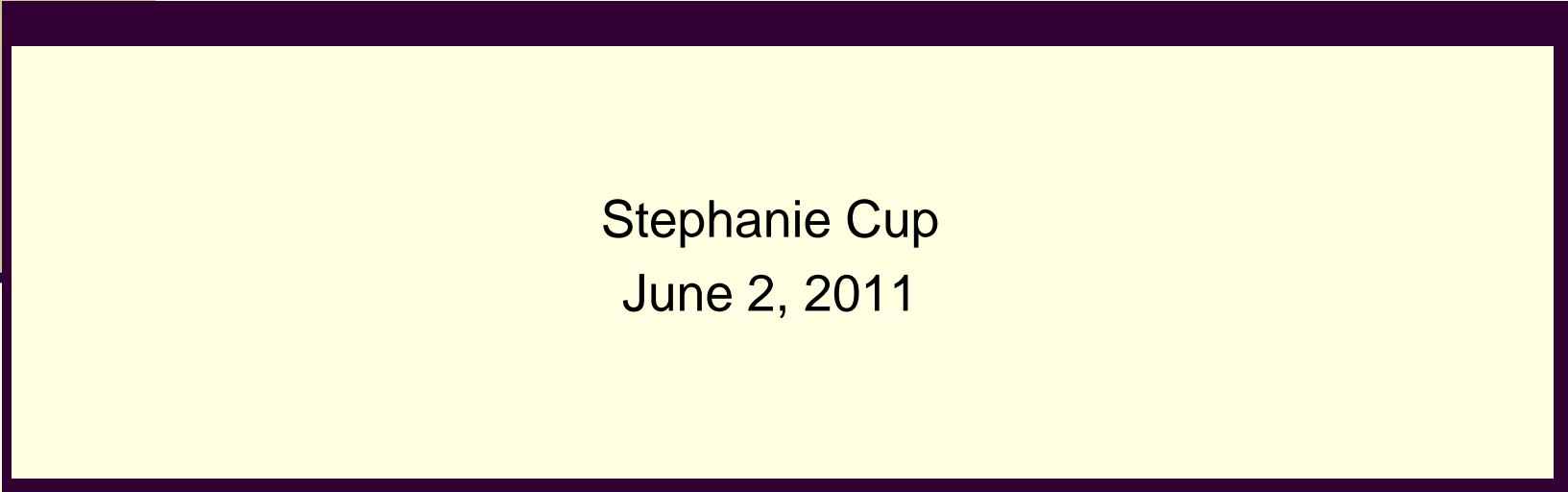


SUITABILITY OF AGROFORESTRY  
PRACTICES: A COMPARATIVE  
ANALYSIS OF LOCATION AND  
DESIGN CRITERIA



Stephanie Cup  
June 2, 2011

# Exploring existing knowledge

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- Undergraduate class
- Questions, gaps and distortions

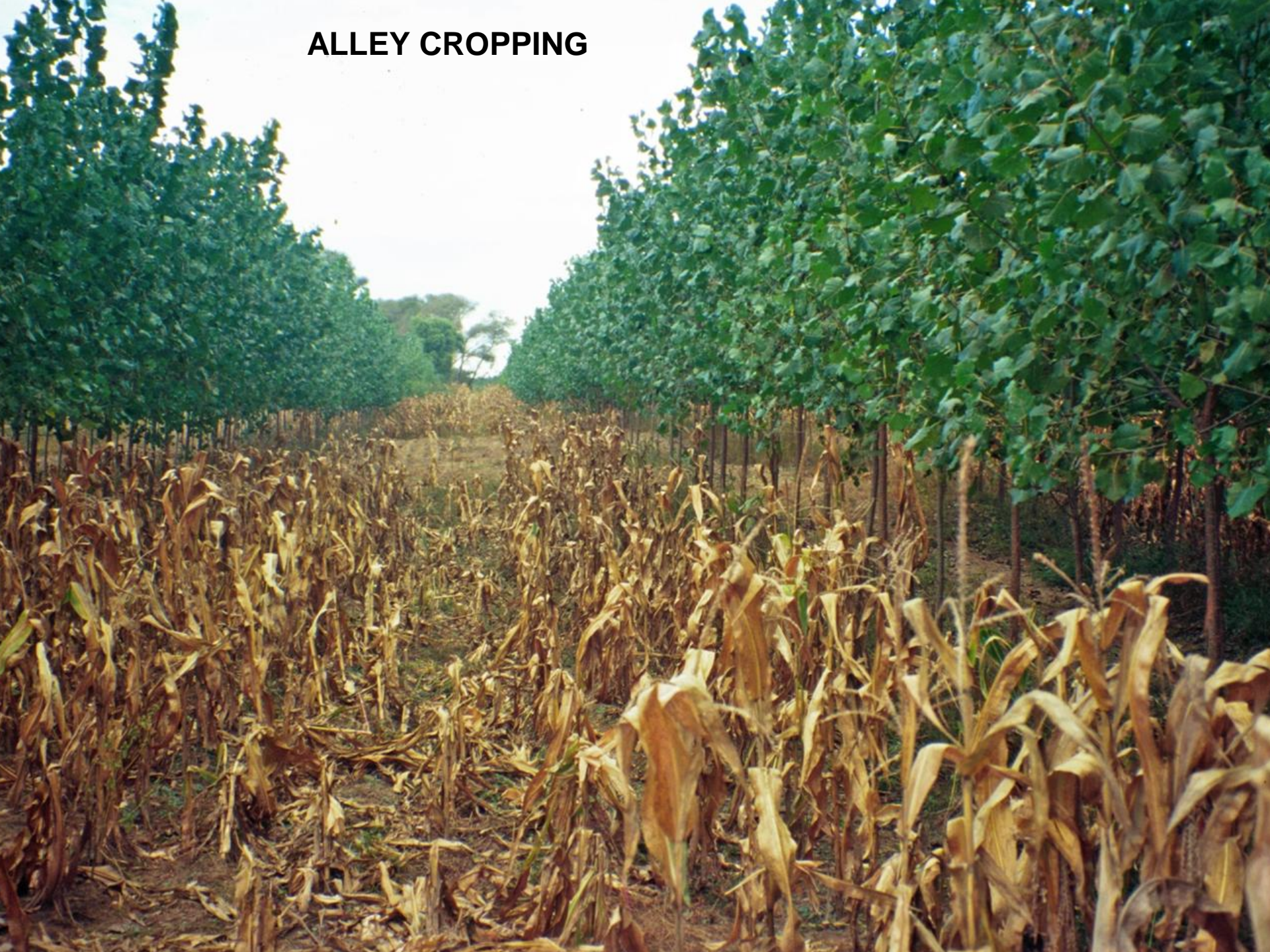


# Background

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- Five Practices
  - Alley Cropping
  - Silvopasture
  - Forest Farming
  - Riparian Buffers
  - Windbreaks

# ALLEY CROPPING



# SILVOPASTURE



# FOREST FARMING



# RIPARIAN BUFFER



# WINDBREAKS



# Research Design

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- Research question:
  - What location and design criteria influence the use of alley cropping, riparian buffer, and windbreak practices in agroforestry areas?

# Research Design

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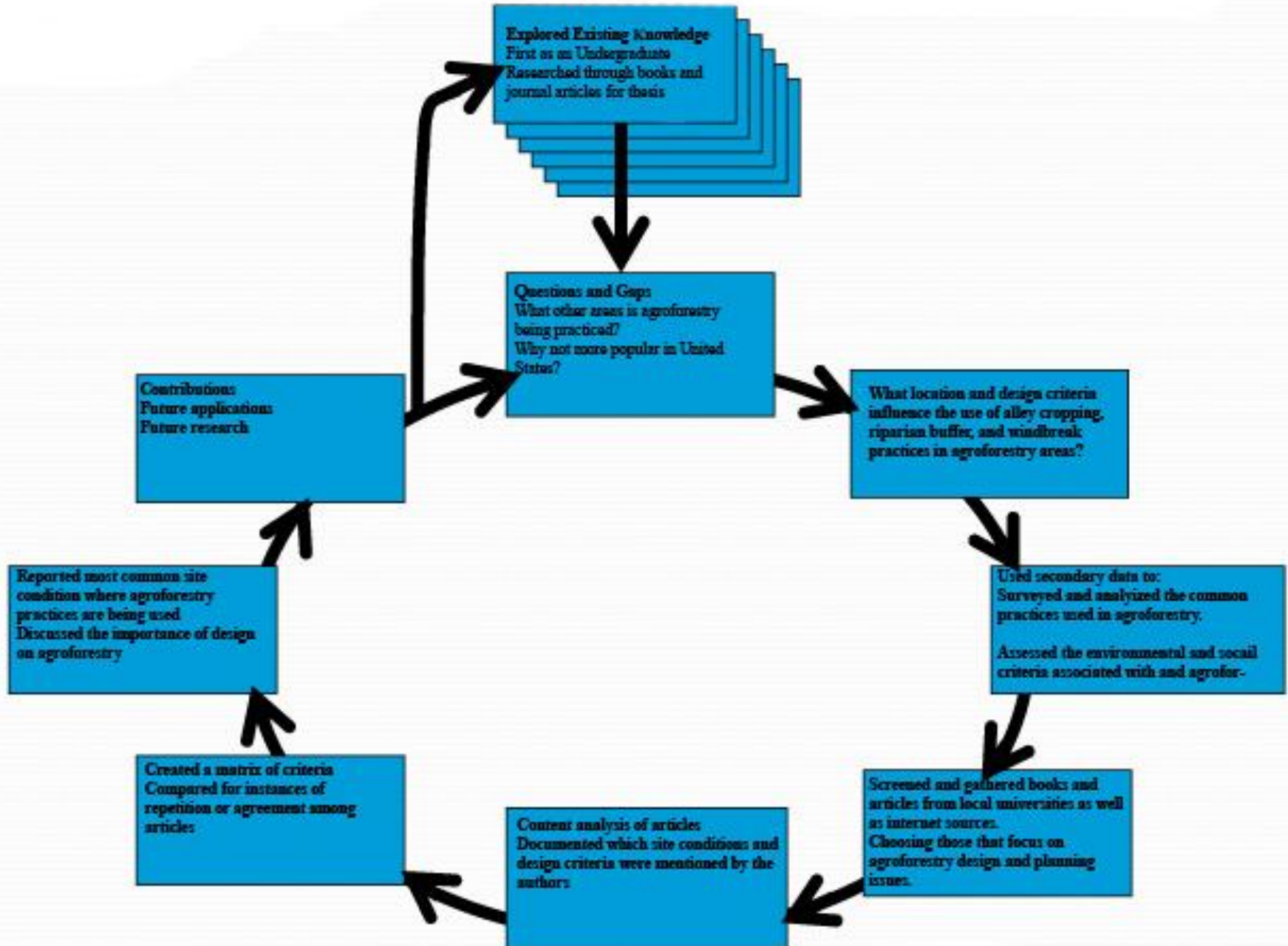
- **Included Only Three of Five Practices**
  - **Alley Cropping**
  - Silvopasture
  - Forest Farming
  - **Riparian Buffers**
  - **Windbreaks**

# Research Design

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- Characteristics examined
  - surveyed and analyzed the practices
  - assessed the environmental and social criteria

# THE RESEARCH PROCESS



# Research

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- Specific body of material studied
  - Journal articles and academic papers
  - Based on a consensus of experts judgment

# Articles used in this research

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1. Schultz, R.C., Colletti, J.P, Isenhardt, T.M., Simpkins, W.W, Mize, C.W, and Thompson, M.L. (1995).
2. Gillespie, A.R., Jose, S., Mengel, D.B., Hoover, W.L., Pope, P.E., Seifert, J.R., Biehle, D.J., Stall, T., and Benjamin, T.J. (2000)
3. Zhu, J., Jiang, F., Matsuzaki, T. (2002)
4. Bentrup, G. and Kellerman, T. (2004).
5. Brandle, J.R., Hodges, L., Zhou, X.H. (2004).
6. Schultz, R.C., Isenhardt, T.M., Simpkins, W.W., and Colletti, J.P. (2004).
7. Garret, H.E., Kurtz, W.B., Slusher, J.P. (2007).
8. Sudmeyer, R.A., Speijers, J. (2007).
9. Brandle, J.R. (2008).
10. Dosskey, M.G. (2008).
11. Kiparski, G.R. von, Gillespie, A.R. (2008).
12. Wright, B., Boes, T.K., Brandle, J. (2008).
13. Brodt, S., Klonsky, K., Jackson, L., Brush, S.B., Smukler, S (2009).
14. Noorduijn, S.L., Smettem, K.R.J., Vogwill, R., Ghadouani. (2009).
15. Rivest, D., Cogliastro, A., Vanasse, A., Olivier, A. (2009).
16. Tomer, M.D., Dosskey, M.G., Burkart, M.R., James, D.E., Helmers, M.J., Eisenhaur, D.E. (2009).
17. Rivest, D., Olivier, A., Gordon, A.M. (2010)

# Observation and data gathering

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- Gathered articles
- Narrowed articles
- Surveyed and analyzed each article and documented factors
- In the findings section: Summarized the articles
- Discussed criteria that were found in the articles
- Compared the criteria for each practice for instances of repetition or agreement

# Data Analysis for Alley Cropping

	Author	Source	Location	Criteria
1	A.R. Gillespie, S. Jose, S.B. Mengel, W.L. Hoover, P.E Pope, J.R. Seifert, D.J. Biehle, T. Stall, and T.J. Benjamin	Agroforestry Systems (2000) 48: 25-40	Indiana, USA	A. High water holding capacity. B. Deep soil. C. North-south orientation.
2	H.E. Garret, W.B. Kurtz, and John P. Slusher	University of Missouri Extension (2007)	n/a	D. Well-drained soils. E. Soils with a neutral pH. B. Deep soils.
3	G.R. von Kiparski, A.R. Gillespie	Toward Agroforestry Design: An Ecological Approach. Springer (2008)	Indiana, USA	C. North-south orientation. B. Deep soil.
4	S.L. Noorduijn, K.R.J. Smettem, R. Vogwill, and A. Ghadouani	Hydrology and Earth System Sciences (2009) 13:2095-2104	Western Australia	F. Deep water table. A. Soils with neutral pH.
5	David Rivest, Alain Cogliastro, Anne Vanasse, and Alain Oliver	Agriculture, Ecosystems and Environment (2009) 131: 51-60	Quebec, Canada	C. North-south orientation. G. Soil with moderate to imperfect drainage. H. Alleys that can be placed perpendicular to a slope. A. High water holding capacity.
6	David Rivest, Alain Olivier, and Andrew M. Gordon	Agriculture and Agri-Food Canada (2010) Government of Canada	Quebec, Canada	I. Loamy sand-sandy loam soil. G. Moderate drainage. J. A Land equivalent ratio (LER) greater than one.

# Data Analysis for Riparian Buffers

	Author	Source	Location	Criteria
1	R.C. Schultz, J.P Colletti, T.M. Isenhart, W.W Simpkins, C.W Mize, and M.L. Thompson	Agroforestry Systems (1995) 29:201-226	Iowa, USA	<p><b>A.</b> Large areas of 20 m wide are optimal.</p> <p><b>B.</b> Steep, actively eroding banks.</p> <p><b>C.</b> Adjacent land use of cultivated fields or bare soil and pasture/rangeland.</p>
2	G. Bentrup and T. Kellerman	Journal of Soil and Water Conservation (2004) 59: 209-215	Kansas, USA	<p><b>D.</b> Gaps between habitat patches.</p>
3	R.C. Schultz, T.M. Isenhart, W.W. Simpkins, and J.P. Colletti	Agroforestry Systems (2004) 61: 35-50	n/a	<p><b>C.</b> Adjacent land use of cultivated fields or bare soil and pasture/rangeland.</p> <p><b>E.</b> Vertical stream banks.</p> <p><b>F.</b> Gentle slopes greater than or equal to 3:1.</p> <p><b>G.</b> Meandering streams.</p>
4	Michael G. Dosskey	American Water Resources Association(2008 )	Chesapeake Bay watershed	<p><b>H.</b> Shallow groundwater.</p>
5	Mark D. Tomer, Michael G. Dosskey, Michael R. Burkart, David E. James, Matthew J. Helmers, and Dean E. Eisenhour	Agroforestry Systems (2009) 75: 17-25	Missouri, USA	<p><b>I.</b> Along first order streams.</p> <p><b>J.</b> Flat areas with large upslope contributing areas.</p> <p><b>B.</b> Steep, actively eroding banks.</p> <p><b>K.</b> Areas of hydric soil.</p>

# Data Analysis For Windbreaks

	Author	Source	Location	Criteria
1	Zhu Jio-jun, Jiang Feng-qi, and Matsuzaki Takeshi	<i>Journal of Forestry Research</i> (2002) 13:83-90	Japan	<p><b>A.</b> Areas that need protection from high winds.</p> <p><b>B.</b> Areas of highly erodible soils.</p>
2	J.R. Brandle, L. Hodges, and X.H. Zhou	<i>Agroforestry Systems</i> (2004) 61: 65-78	North America	<p><b>A.</b> Areas that need protection from high winds.</p> <p><b>C.</b> Oriented perpendicular to the most prevailing or most troublesome wind directions</p> <p><b>D.</b> Areas with extreme temperature fluctuations.</p> <p>Areas of highly erodible soil.</p> <p><b>E.</b> Areas that require protection from snow.</p> <p><b>F.</b> Areas where there is minimal natural forest cover.</p>
3	Robert A. Sudmeyer and Jane Speijers	<i>Agroforestry Systems</i> (2007) 71: 201-214	Western Australia	<p><b>G.</b> A north to south orientation.</p> <p><b>A.</b> Areas that need protection from high winds.</p> <p><b>D.</b> Areas with extreme temperature fluctuations.</p>
4	James R. Brandle	University of Nebraska Extension (2008)	n/a	<p><b>A.</b> Areas that need protection from high winds.</p> <p><b>E.</b> Areas that require protection from snow.</p> <p><b>C.</b> Oriented perpendicular to the most prevailing or most troublesome wind directions.</p> <p>Areas of soil erosion.</p> <p><b>F.</b> Areas where there is minimal natural forest cover.</p> <p><b>D.</b> Areas with extreme temperature fluctuations.</p>
5	Bruce Wright, Teresa K. Boes, and James R. Brandle	University of Nebraska Extension (2008)	n/a	<p><b>A.</b> Areas that need protection from high winds.</p> <p><b>E.</b> Areas that require protection from snow.</p> <p><b>C.</b> Oriented perpendicular to the most prevailing or most troublesome wind directions.</p> <p><b>D.</b> Areas with extreme temperature fluctuations.</p> <p><b>F.</b> Areas where there is minimal natural forest cover.</p> <p><b>H.</b> Private areas.</p> <p><b>B.</b> Areas of highly erodible soils.</p> <p><b>I.</b> Areas where noise reduction is needed.</p> <p><b>J.</b> Areas with unpleasant odors.</p>
6	Sonja Brodt, Karen Klonsky, Louise Jackson, Stephen B. Brush, and	<i>Agroforestry Systems</i> (2009) 76:195-205	California, USA	<p><b>F.</b> Areas where there is minimal natural forest cover.</p> <p><b>B.</b> Areas of highly erodible soils..</p>

# Conclusions

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- Alley cropping, riparian buffers, and windbreaks all share two components: the crop and the tree
- Differ by their design. Interaction or juxtaposition of trees and crops determines the type of agroforestry practice
- Design has not been highly acknowledged in existing research

# Contributions

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- Answered research question. But still lacks specific details on design
- Useful to professional practitioners and member of the academic community

# Future Research and Application

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- Incorporated into geographic information systems
- Template for conducting research on forest farming and silvopasture
- Conduct an analysis with social criteria
- Overall, the principals of landscape design is not well documented in agroforestry research and warrants further study by landscape architects as well as land use planners