



The Economic and Social Value of Floodplain Agroforestry to Rural Development

Corinne Valdivia
Andy Raedeke
Sandra Hodge
John Green
Larry Godsey

Department of Agricultural Economics Working Paper No. AEW P 2000-4

February 25, 2002

The Department of Agricultural Economics is a part of the Social Sciences Unit of the
College of Agriculture, Food and Natural Resources at the University of Missouri-Columbia
200 Mumford Hall, Columbia, MO 65211 USA

Phone: 573-882-3545 • Fax: 573-882-3958 • <http://www.ssu.missouri.edu/agecon>

AEWP 2000-4

***The Economic and Social Value of Flood plain Agroforestry to Rural Development:
A Baseline Economic and Social Profile of Producers in Northeast and Southeast of Missouri,
The Fox-Wyaconda Watershed and Scott County.***

Corinne Valdivia¹, Andy Raedeke, Sandra Hodge, John Green and Larry Godsey

Agricultural Economics Working Papers generally have not been reviewed by anyone other than the authors. They are part of the process of obtaining from readers comments and suggestions for the author to use in subsequent revisions of the paper and to inform colleagues of work in progress. Working papers should not be quoted or cited as a reference without approval of the author(s).

This work was funded under cooperative agreement CR 826704-01-0 with US EPA. The results presented are sole responsibility of the PIs/ or MU and may not represent the policies or positions of EPA.

¹ Corinne Valdivia is in the Department of Agricultural Economics, Andrew Raedeke and John Green are Research Assistant Professor and Ph Graduate Student in the Department of Rural Sociology. Social Sciences Unit CAFNR, MU
Sndra Hodge is in the Center for Agroforestry, University of Missouri-Columbia
Contact Person: Corinne Valdivia. ValdiviaC@missouri.edu. 573 882 4020
Mailing address: 200 Mumford Hall Columbia MO 65211.

***The Economic and Social Value of Flood plain Agroforestry to Rural Development:
A Baseline Economic and Social Profile of Producers in Northeast and Southeast of Missouri,
The Fox-Wyaconda Watershed and Scott County.***

Corinne Valdivia, Andy Raedeke, Sandra Hodge, John Green and Larry Godsey

I. Introduction

Environmental and economic forces have been affecting rural areas in past years. In Missouri the flood of 1993 is an example. In order to determine the value of agroforestry interventions for rural development, a necessary step is to understand the social and economic characteristics of existing production systems. Positive economic returns are a necessary but not the only condition for adoption, as many other factors weigh in the decision of individuals to adopt, or not, a new practice. Along with an economic evaluation, a social evaluation is essential to understand the logic of current decisions, and the weight of economics on the potential adoption of new practices.

This study presents the initial findings of two research activities that took place in 1998 and 1999. The first is a series of qualitative interviews conducted to understand the role of stakeholders with potential influence in decisions to adopt agroforestry practices. This included land owners, farmers, farm operators, extension agents and agencies involved with agriculture, and processors. Information from these qualitative interviews (Raedeke et al.) was followed by a formal survey, to elicit information on the social, economic and production characteristics of farmers in the Fox-Wyaconda Watershed and Scott County, and their knowledge and attitudes towards agroforestry practices. It should be noted that 1998 was a difficult year, as prices for major crops dropped, as well as the yields (Missouri Farm Facts 1999).

To understand major characteristics of producers, an analysis of the baseline survey is conducted. Important producer characteristics are described by site, and analysis is undertaken of similar characteristics, by involvement in agriculture and household production system. Interest for agroforestry practices in relation to the production system and degree of involvement in agriculture is presented in the last section.

The research methods and research settings are presented in the next two sections. The producer profiles based on the survey data for 1998 follow, which includes demographic characteristics, land use patterns, and economic characteristics, in general and for each site. Differences between those involved full time and part time in agricultural activities are analyzed in the fifth section. Summary findings of the interest farmers expressed in the agroforestry practices presented during the formal survey are presented next by production system and

involvement.

II. Methods.

The study of agroforestry adoption requires an understanding of current land management practices and commercial production activities, in order to determine the viability, economic, social and environmental, of new activities such as agroforestry practices. An approach that looks at these practices within the realm of rural livelihood strategies is necessary because families remain and pursue farming for many reasons, not only economic ones. Using a rural livelihood perspective allows us to understand how and what is the role of rural and urban interactions. It permits to incorporate into decisions, other types of objectives that go beyond the economic. Farming may be one more activity of many, or it may be the sole activity pursued.

The study of agroforestry and land use practices was based on the collection of primary data through two stages. The first was a series of qualitative interviews carried out to understand what are the main characteristics of households and their farming operations, as well as their experience with trees. These open ended interviews guided by a set of questions, were instrumental in developing a formal survey and refining the questions asked. A snowball sampling technique was used to identify the informants. This portion of the study was carried out between November of 1998 and January of 1999. Fifty three key informants were interviewed at two selected study sites.

A formal questionnaire was developed, using a household production framework to understand the interactions between farming and non farming activities. Two sites were selected and a sampling frame was developed with assistance from the Soil and Water Conservation District and the Natural Resource Conservation Service. A random sample of farm operators was selected from the sample frames constructed for each site. Person to person interviews were conducted with local interviewers hired and trained by the project. There were 199 households interviewed in Fox Wyaconda Watershed, and 162 in Scott County. Response rates were 61 and 52% respectively of each sample frame.

III. The setting.

Two study sites near the Mississippi river were chosen. The first is the Fox Wyaconda Watershed, which is on the west side of the Mississippi on the North East of Missouri. It spans three counties, Lewis, Clark and Scotland, and an area of 430,453 acres. The region originally was a combination of forests and prairie. The combination of both contributed to agriculture and forestry activities being developed side by side. The second study site also located west of the Mississippi river is in South East Missouri in Scott County. The extension is 273,062 acres, and is divided in two distinct area. The Mississippi River delta comprises 82 percent of the county. The other area consists of a combination of crop land pasture and woodlands. It took many years to clear the land for farming in this area. The Mississippi River flood plain is intensively farmed

today, and has one of the most valuable lands in the state.

IV. Profiles of Producers in the Fox-Wyaconda Watershed and Scott County in 1998.

Homogeneous or diverse?

In order to address a first hypothesis, that production systems and land use patterns in the Fox-Wyaconda Watershed and Scott County are determined by land resource quality and access, net income from crop-livestock activities, off-farm employment opportunities, demographic characteristics such as age and members living on the farm, and perceptions of environmental problems, a first profile is developed based on average(mean) values for both sites. These profiles are a first description of the farmers at both sites. High degree of dispersion around these average figures indicates that it may be appropriate to further group producers into other categories. This will be done to understand the differences at each site, between those interested in introducing agroforestry practices, and those that are not according to the results obtained from the initial survey (Hodge et al, agroforestry conference presentation). Characteristics will also be described using self defining criteria, such as perception of being a full time farmer, as opposed to part time, hired operator or other. A second criteria for analysing the data will be by production system. Three are clearly identified as a cropping operation, a crop-livestock operation, or a livestock operation. An other category is also identified.

Household characteristics and farming involvement

In order to describe the characteristics of these households, demographic, economic and social variables are analyzed. The demographic characteristics of the households sampled at both sites are presented in table 1. The average age of the total sample is around 53 years of age for the head of household, with the Fox Wyaconda population in average 4 years older than those in Scott County. Most households are composed of an adult couple, ranging from 84% in FWW, and 89% in SC, showing the latter at a slightly younger stage in the life cycle. The percent of households with children living at home is 37% in FWW, while it is 59% in SC. Both populations have similar years of schooling, 13. At both sites the spouse is employed out of the household for approximately 24 hours a week, with 84% of the spouses working off the farm in FWW and 92% in SC.

In terms of being involved with agriculture, results when asked the years of involved in farming since 18 years of age, FWW farmers have been in average involved 4 more years, which relates to household heads being also four years older in average. Greater differences exist in the number of years that the oldest portion of land has been in the hands of the family, which is over fifty years in FWW while it is 43 years in SC. In average farmers at both sites have been involved with agriculture all their lives. Owned land in average is 75 acres greater in FWW than in SC. The overall average is 335 acres. For those that rent land in Scott County (99) the average amount rented in 899. In FWW 86 respondents indicated renting land, and their average was 667 acres (Table 2).

In general these averages have a high degree of dispersion, indicating that the mean for each site does not describe most farmers in each region. Cash leases are similar for both sites, while share agreements are more often employed in SC, where land values are higher. In June of 1999 the average land values in the North East was \$881, while it was \$1,550 in the Bootheel (Plain and White). The same report indicates that pastureland values and timberland values per acre are below the state average. More farmers, 54%, defined themselves as full time farmers in the SC area, as compared to FWW, where less than fifty percent defined themselves as full time farmer, a sign that cropping may be a more profitable enterprise (check if reflected on average returns and yields).

Table 1: Household Characteristics of the Fox-Wyaconda Watershed and Scott County in Production Year 1998-1999

Category	Fox-Wyaconda Watershed	Scott County	Total Sample
Total Sample Size	199	165	364
Household Head Age (years)	55 (25%)	51 (24%)	53 (25%)
Marital Status Married	84%	89%	87%
Percent of Households with Children at Home	37%	59%	47%
Education (years)	12.8 (12%)	12.7 (19%)	13 (18%)
Off-Farm Employment:			
a. Spouse hours per week	24 (83%), N= 167	22(91%) N= 149	24(88%),N= 316
b. Spouses working off farm	84%	92%	87%
c. Respondents working off farm	45%	43%	44%

Coefficient of Variation in Parenthesis. N indicates the number of respondents that worked off the farm.

Source: Agroforestry Baseline Survey of 1999.

Land Use Patterns

Land use patterns varied between the FWW and SC in the sense that the latter group farms in average twice the land than SC, and it rents three times more the amount they own. Table 3 shows the distribution of total land by type of use at both sites. Proportionally more land is in hay land, CRP and woodlands with and without livestock in the Fox-Wyaconda watershed. The amount of highly erodible land more than seven times higher than in Scott county. This highlights the facts that trees an important part of the landscape in this area, and that concerns with the environment may also be proportionally higher.

Table 2: Experience, Land Tenure and Involvement in Agriculture in Scott County and Fox-Wyaconda.

Category	Fox-Wyaconda Watershed	Scott County	Total Sample
Years in farming	31 (48%)	27 (46%)	29 (49%)
Oldest portion of land owned by the family (years)	51 (76%)	43 (75%)	48 (76%)
Land Owned (acres)	369 (117%)	294 (195%)	335 (149%)
Land Rented in 1998 (acres)	667 (125%) N=86	899 (111%) N=99	791 (118%) N=185
Percent Involved in Cash Lease Agreements	55/85 65% 28% *	50/98 51% 31% *	105/183 57% 29%*
Percent Involved in Share Lease Agreements	60/85 71% 30%*	83/97 39% 50%*	143/182 79% 39% *
Involvement in Agriculture in %			
Full-time farmer	45	55	50
Part-time farmer	40	35	38
Farm operator	4	1	3
Other	11	9	9

Percent in parenthesis are the coefficients of variation.
 N indicates the number of respondents for the category.
 * Percent of the total sample in the corresponding column.
 Source: Agroforestry Baseline Survey of 1999.

Land use ownership, and management differ between both sites. The averages reported for crops planted was considered by all but 27 farmers typical of what they would do every year. These farmers indicated that they would typically farm less than what they did in 1998 (Table 4). On the other hand only 10 of the farmers interviewed in 1998 in SC considered this not a typical year, as they would normally plant a greater number of acres. The five most important crops, and the average area planted in 1998 are presented in Table 4. More corn and soybeans are planted in

the South East, as well as wheat and sorghum. CRP was also more common in the FWW than in SC.

Table 3: Total Land Use in the Southeast and Northeast Missouri in 1998 (acres).

Category	Fox-Wyaconda Watershed	Scott County	Total Sample
	Acres	Acres	Acres
Acres Owned 1998	73,062	47,922	120,984
Acres in Row Crops			
Acres in hay land and pasture non wooded	22,360	6,080	28,441
Acres in CRP	8,310	719	9,029
Acres of woodlands with livestock	7,233	896	8,128
Acres of woodland where livestock are excluded	3,771	1,139	4,910
Acres in managed timber	796	728	1,524
Acres of unmanaged timber	4,345	1,800	6,145
Acres in trees that could be harvested	2,028	1,440	3,467
Frontage miles with trees	557	217	774
Frontage miles along streams and creek or drainage without trees	368	257	625
Acres classified as highly erodible	53,827	6,787	60,614
Acres with low or inconsistent yields	3,592	415	4,007

Source: Agroforestry Baseline Survey of 1999.

Table 4: Land Use Patterns in the Fox-Wyaconda Watershed and Scott County in 1998-1999 (acres)

Category	Fox-Wyaconda Watershed		Scott County		Total Sample
	Acres (CV)	N	Acres (CV)	N	Acres (CV)
Acres Owned 1998	369 (117%)	198	294 (195%)	163	335 (149%)
Acres Managed: owned and rented	659 (125%)	198	840 (138%)	163	741 (133%)
Was 1998 a typical farming year: (yes)	86%		93%		89%
Acres in CRP	42 (242%) 134	198 62	4 (382%) 36	164 18	25 (316%)
Acres in corn	249 (123%)	127	420 (116%)	94	322 (125%)
Acres in soybeans	316 (134%)	130	410 (116%)	100	357 (126%)
Acres in SB double	102 (110%)	11	265 (103%)	99	248 (107%)
Acres in wheat	83 (99%)	51	264 (103%)	104	204 (118%)
Acres in milo grain sorghum	252 (198%)	5	145 (86%)	22	165 (105%)
Area farmed in row crops	397 (173%)	198	915(144%)	164	632 (167%)

Coefficients of variation are shown in parenthesis.

N is the size of the sample used for the calculation.

Source: Agroforestry Baseline Survey of 1999.

Returns as reported in 1998

In order to look at the economic potential of agroforestry interventions, it is necessary to understand the returns to each of the enterprises carried out by farmers and that would complement or compete with existing activities. Table 5 shows the returns to the major crop activities for 1998. Some farmers experienced negative returns, losses. Average of reported gains and losses are reflected in the averages. The average share of income from farming is around 50 percent. Scott county has a greater proportion, based on averages for the past three

years. It should be noted that prices for row crops were very low the year of the study. The Freedom to Farm Act has brought back to farming the price risk dimension that should be kept in mind in evaluating alternatives that may be facing more elastic markets.

Table 5: Average returns per acre for the most important crops, and gross agricultural sales in Fox Wyaconda Watershed and Scott County in 1998 (dollars per acre)

Average Returns Per Acre, Sales and Farming Income Share (\$)	Fox-Wyaconda Watershed		Scott County	
	N	\$	N	\$
Corn	73	78 (78)	71	80 (101)
Soybeans	74	86 (63)	73	68 (94)
SB Double Cropping	8	93 (75)	73	66 (93)
Wheat	24	44 (131)	78	39 (89)
Sorghum	1	-	20	48 (70)
CRP	58	76 (126)	15	62 (28)
Gross Agricultural Sales	136	93,243 (182)	125	193,100 (160)
Gross Sales from Livestock	132	14,546 (200)	87	31,047 (397)
Farming Share of Household Income, Average of Last Three Years	188	48% (78)	155	55% (73)

N is the sample size used to calculate the average values presented.

The numbers in parenthesis are the coefficients of variation.

Source: Agroforestry Baseline Survey of 1999.

V. Differences Between Full Time and Part Time Farmers.

There is a great diversity of family farms in Missouri as reflected by the results of the survey. Using as a criteria for distinguishing farming operations based on how the interviewed household members views his/her operation, four groups are identified. This are full time farmer. Part time farmer, farm manager hired to run a farming operation, and other. This last category includes a diverse type of people that include retired persons, hobby farmers, and people living in a rural setting. Table 2 showed that full time and part time farmers comprised the majority of the sample. In Scott county 55% of the sample were full time farmers, while there were 45% in FWW. Part time farmers comprised 40% of the households in FWW, while these

were 40% in Scott county.

Table 6: Sources of income according to involvement in agriculture.

Category	Fox-Wyaconda Watershed	Scott County	Total Sample
Total Sample Size	199	165	364
Operator has a non farm job by involvement in agriculture:			
Full time farmer	16%	18%	17%
Part time farmer	71%	79%	74%
Farm manager	50%	100%	60%
Other	67%	43%	60%
Mean	45%	43%	44%
Spouse average weekly hours of the farm by Involvement:			
Full time farmer	23hrs	23hrs	23hrs
Part time farmer	27hrs	26hrs	27hrs
Farm manager	7hrs	33hrs	13hrs
Other	28hrs	22hrs	25hrs
Mean	24hrs	24hrs	24hrs
Income share from farming by level of involvement in agriculture:			
Full time farmer			
Part time farmer	78% (31)	83 % (30)	81% (31)
Farm manager	28%	21%	25%
Other	19%	45%	24%
Average (total)	10%	14%	12%
	48% (78)	55% (73)	51% (76)

Values in parenthesis are the coefficients of variation.

Source: Agroforestry Baseline Survey of 1999.

Even those that are full time farmers work outside the home. In FWW 16% of the full time farmers worked off the farms, 18% in the case of SC. Of the part time farmers as expected 71% of the operators worked off the farm, a higher proportion in SC, 79% (Table 6). Spouses contributed labor to the family farm, in close to similar proportions, with spouses working slightly more on the farm, when the operator perceived him/herself to be a part time farmer. The income share from farming varied as expected depending on involvement. Full time farmers income share from agriculture was 78% in FWW and 83% in SC. The income share for part time farmers was only 28 and 21% for FWW and SC respectively. Variation around the mean on

income from agriculture for those involved full time was 30%, while the average for the whole sample was around 76%. The grouping by involvement did reduce the variation around the mean, meaning that the groups were more homogeneous regarding this variable.

The economic characteristics of these groups are presented in table 7. It should be noted that Scott County has proportionally more operations with a high amount of sales. While in the FWW 90% of the sample qualify as small farms (Gross sales of less than \$250,000), only 74% qualified as such in SC. Gross value of agricultural products sold in SC is 67% larger than in the FWW. For part time farmers the differences are larger, with sales being 2.6 times larger in SC. Livestock activities are also larger in SC. FWW farmers contribute more unpaid family labor to the farming operation. More row crops are grown in SC while more cattle is raised in FWW (Table 7). There are also some differences in the age of the operator, with farmers in SC being younger than those in the northeast.

Table 7: Economic Characteristics according to involvement with agriculture.

Location and Involvement	Gross Value of Agricultural Products Sold	Gross sales of livestock in 1998	Percent of Income from Farming	Hours per week of unpaid family labor in 1998	Hours of Hired labor	Average Row Crop Area(all sample)	Percent involved in livestock	Age
Fox-Wyaconda								
Full time	183356	22624	78%	13	1433	723	67/132 51%	53
Part time	13730	6846	28%	29	545	92	50/132 38%	56
Total	93243	7400	45%	17	1215	397	132/198 67%	55
Scott County								
Full time	305790	47637	83 %	9	3722	1512	43/87 49%	49
Part time	50010	18040	21%	9	734	198	35/87 40%	51
Total	193100	31047	43%	9	2978	915	87/164 53%	51

Source: Agroforestry Baseline Survey of 1999.

Asset distribution is almost similar with the differences being two, the proportion of livestock assets is higher in FWW, while the proportion of machinery for row crops is higher in SC in the case of full time farmers. Scott County had a lower proportion of assets owned debt

free.

In conclusion in terms of perceived involvement in farming there are differences in the proportion of income being generated from agriculture in relation to other activities pursued by the households. The size of the operations are larger in SC based on sales, in the full time farming and part time farming categories. The major activity in the SC area is row cropping, while in FWW livestock have relatively more importance, but in general terms absolute gross sales from agriculture were lower.

Table 8: Percent distribution of assets among different factors according to involvement in agriculture.

Location and Involvement	Livestock Assets	Livestock Machinery	Machinery Row Crops	Farm Buildings	Farm real estate	Non-farm Real Estate	Owned Debt Free
Fox-Wyaconda							
Full time	10	4	21	8	48	9	63
Part time	6	3	6	7	52	24	66
Total	7	4	12	7	50	19	66
Scott County							
Full time	3	3	33	8	42	10	53
Part time	5	2	8	6	47	31	62
Total	4	2	23	7	45	19	59

Source: Agroforestry Baseline Survey of 1999.

VI. Production Systems.

Using a production systems approach a “typology” based on two criteria was developed: current involvement with agriculture, and type of production system (livestock only, crops only, crop livestock, other). The distribution of the population by production system is presented in table with differences in participation in the “other” category, which is not relevant to our study.

Other involvement with agriculture (column 5 Table 9) included retired people, land owners, exiting farming, hobby farmer, farm labourers living on the land, and suburbanites. Other in the classification of production systems included people surveyed that were living on the land but were not farming. The whole sample of other category had 9 landowners, 4 living on the land, 4 hobby farmers, and a farm worker.

Chi-Square tests show a significant relationship between production system

category and degree of involvement in agriculture. Unfortunately, several cells have less than five entries, therefore the results of significance are questioned. When we collapse the farm manager and other involvement in agriculture into a single categories of other, the Chi-Square test is valid for Fox Wyaconda Watershed. There are two cells with less than 5 expected count (16.7%). In the case of Scott there are three cells with less than 5, which is 25.0% which is above the 20% threshold, which means that the results for Scott should be taken with care. In terms of significance of the cells created, it indicates that there are some combinations of Production systems categories and level of involvement in agriculture that are not relevant or significant.

Table 9: Population Distribution by involvement in agriculture and production system:

Survey Location Production System	Current involvement with agriculture				
	Full-time farmer (#)	Part-time farmer (#)	Farm manager (#)	Other (#)	Total %
Fox-Wyaconda Watershed (N=198)					
Crop-Livestock	54	2.72e+09	25018	3	43
Crop	26			2	27
Livestock	8			3	14
Other	1			13	16
Total	89			21	100
Scott County (N=164)					
Crop-livestock	39	16	1012	1	34
Crop	48	19		2	43
Livestock	3	17		6	16
Other	0	5		6	7
Total	90	57		15	100

number of farmers in the category.

Source: Agroforestry Baseline Survey of 1999.

The crop only and crop-livestock systems are relevant for full and part time farmers in the FWW. The livestock only activity is more important in part time farming than in full time farming in this site. In the case of Scott county, again production system crop-livestock and only crops are more important, both in full time and part time farming. Livestock only is only relevant in part time farming. The percent distribution is shown in in table 10

In full time farming crop only and crop-livestock systems are more important. As expected crop operations are more so in SC, and crop-livestock in FWW reflecting the total

amount of land and its uses. These production systems may be useful not only in identifying different crop and livestock interactions, but also the potential interest for agroforestry practices.

Table 10: Percent distribution of respondents based on degree of involvement in agriculture and type of production system.

Survey Location Production System	Current involvement with agriculture			
	Full-time farmer (%)	Part-time farmer (%)	Other (#)	Total %
Fox-Wyaconda Watershed (N=198)				
Crop-Livestock	60.6 (27.7)	33.7 (13.6)	17.2	43
Crop	29.2 (13.1)	25.0 (10.1)	24.1	27
Livestock	8.9	20.0 (8)	10.3	14
Other		21.2 (8.5)	48.2	16
Total	N=89 (44.9)	N=80 (40.4)	N=29	N=198
Scott County (N=164)				
Crop-livestock	43.3 (23.7)	28.0 (9.7)	5.8	34
Crop	53.3 (29.3)	33.3 (11.5)	11.7	43
Livestock	3.3	29.8 (10.3)	35.2	16
Other	0	8.7	41.1	7
Total	N=90 (54.8)	N=57 (34.7)	N=15	N=164

N indicates the sample size in the category. The bolded figures represent the percentage of the total population of the sample at each site in the category.

Source: Agroforestry Baseline Survey 1999.

In terms of relevance with respect to population size in each category, table 10 shows the distribution of the population by type of involvement. For example 60.6% of the population in full time farming in FWW are engaged in mixed, crop-livestock systems. The total of households in this category are 89. The mixed system in full time involvement with agriculture represents 27.7% of the total population of the sample in the FWW. The bold figures indicate percentages from the total sample at each site. In order of involvement crop-livestock system in full time farming is followed by part time farming, and then crops only is full time farming. In the case of Scott county, crop only in full time farming engages 29.26 of the households, followed by crop-livestock full time, and then crop only part time, livestock only part time and mixed part time.

VII. Agroforestry: Perceptions Attitudes and Interest.

Agroforestry is a farming practice that incorporates woody perennials in a farming operation with either the production of crops, and/or livestock. with the purpose to maximize ecological, economic, and agronomic benefits by integrating these activities in ways that are mutually beneficial (Raedeke et al.).

Common agroforestry practices in temperate zones include alley cropping, silvopastoral systems, windbreaks, riparian buffers, and forest farming. Alley cropping consists of inter planting row crops between rows of trees. Silvopastoral practices include trees with pastures. Riparian buffers consist of planting woody and herbaceous plants along streams. Windbreaks consist of planting rows of trees along crop fields, pastures, and buildings. Forest farming is the cultivation of crops under the shade of managed forests. All of these practices are intended to provide unique environmental, agronomic, economic, and social benefits. All these practices require intensive management. (Raedeke et al.).

These practices were described to the farmers interviewed, pictures were shown, and questions of knowledge, interest and reasons why the practice may be a problem were asked. In Scott County and, to a lesser extent, in the Fox-Wyaconda Watershed, farmers perceived trees as being antagonistic to farming. For generations the prevalent attitude in the area, especially in SC has been to clear the land for farming.

Characteristics of Producers Based on Interest in Agroforestry

Are there differences in interest in agroforestry practices based on involvement levels in agriculture and on production systems?

The working hypothesis guiding the analysis of the data is that “Stakeholders who are interested in agroforestry will differ from uninterested stakeholders in the following areas: demographic characteristics; farm structure/economic organization; relationships to institutions critical to agroforestry technology transfer; knowledge of agroforestry; attitudes about agroforestry and the environment; stage in the life cycle; and perceptions of the environmental problems on their land (Research Proposal EPA).”

Table 11: Percent of respondents moderately and very interested in Alley Cropping

Survey Location Production System	Current involvement with agriculture			
	Full-time farmer (%)	Part-time farmer (%)	Other (%)	Total %
Fox-Wyaconda Watershed				
Crop-Livestock	4	12	0	6
Crop	0	5	0	2
Livestock	14	13	0	12
Other	0	12	0	0
Total	3/89=3.3%	8/80=10%	0%	5.5%
Scott County				
Crop-livestock	11	20	0	13
Crop	5	14	0	7
Livestock	33	5	33	15
Other	0	0	0	0
Total	7/90=7.7%	6/57=10.5%	2/11=18%	9.1%

The number in each cell represents the percent in a group interested in the practice. For example 4 in FWW Crop-Livestock/Full time means 4% in this group are interested in alley cropping.

There is very little interest in alley cropping at both study sites Only 5.5% of the population in FWW and 9% in SC showed some interest in this practice. Those in part time farming were more interested than the full time farmers, at both sites. Windbreaks on the other hand (Table 12) had a higher proportion of farmers interested, across the different levels of involvement with farming. Mostly crop-livestock and livestock producers were interested, though 38% of row crop farmers in SC mentioned interest in windbreaks.

Riparian buffers were interesting to 15% of the producers in FWW, and 11 % in SC. There were no major differences between groups by production systems no involvement in farming as the bottom rows and the last column of table 13 show. The higher absolute interest was with the part time farmers in the FWW, where both crop and crop-livestock producers were interested.

Table 12: Percent of respondents moderately and very interested in windbreaks

Survey Location Production System	Current involvement with agriculture			
	Full-time farmer (%)	Part-time farmer (%)	Other (%)	Total %
Fox-Wyaconda Watershed				
Crop-Livestock	39	42	40	40
Crop	25	25	14	24
Livestock	14	50	33	38
Other	0	12	46	26
Total	40/89=44.9%	26/80=32.5%	10/29=34.5%	31.8%
Scott County				
Crop-livestock	38	56	0	43
Crop	29	57	66	38
Livestock	33	41	67	46
Other	0	20	30	25
Total	27/90=30%	25/57=43.9%	10/17=58.8%	36.6%

The number in each cell represents the percent in a group interested in the practice. For example 39 in FWW Crop-Livestock/Full time means 39% in this group are interested in windbreaks. Source: Agroforestry Baseline Survey 1999.

Silvopasture (Table 14) is of little interest to producers, at levels similar to Riparian Buffers, although higher than alley cropping. In total only 16 farmers in FWW and 18 in SC were interested in silvopasture practices. In SC most of the interested were in the livestock production system. Forest farming (Table 15) is interesting as those expressing interest in the operation are mostly in part time or other activities in SC. Overall the proportion of interested people is similar, what is not is the proportion according to involvement and production system in the case of SC. Almost half of those involved with other activities in SC were interested in this practice.

Table 13: Percent of respondents that were moderately and very interested in Riparian Buffers

Survey Location Production System	Current involvement with agriculture			
	Full-time farmer (%)	Part-time farmer (%)	Other (%)	Total %

Fox-Wyaconda Watershed				
Crop-Livestock	10	27	4	16
Crop	13	20	29	17
Livestock	29	13	0	15
Other	0	12	7	10
Total	10/89=11.2%	15/80=18.8%	5/29=17.2%	15.2%
Scott County				
Crop-livestock	8	13	0	9
Crop	15	14	33	16
Livestock	33	12	17	15
Other	0	0	0	0
Total	10/90=11.1%	6/57=10.5%	2/17=11.8%	11%

The number in each cell represents the percent of the group interested in the practice. 10 in FWW Crop-Livestock/Full time means 10% in this group are interested in Riparian Buffers.

Source: Agroforestry Baseline Survey 1999.

Table 14: Percent of respondents moderately and very interested in Silvopasture

Survey Location Production System	Current involvement with agriculture			
	Full-time farmer (%)	Part-time farmer (%)	Other (%)	Total %
Fox-Wyaconda Watershed				
Crop-Livestock	14	8	0	11
Crop	0	0	0	0
Livestock	29	13	0	15
Other	0	18	0	10
Total	9/89=10.1%	7/80=8.8%	0%	9.8%
Scott County				
Crop-livestock	11	19	0	13
Crop	7	7	0	7
Livestock	33	24	33	27
Other	0	0	0	0
Total	8/90=8.9%	8/57=14%	11.8%	11%

The number in each cell represents the percent in a group interested in the practice. For example 14 in FWW Crop-Livestock/Full time means 14% in this group are interested in silvopasture.

Source: Agroforestry Baseline Survey 1999.

Table 15: Percent of respondents moderately and very interested in Forest Farming

Survey Location Production System	Current involvement with agriculture			
	Full-time farmer (%)	Part-time farmer (%)	Other (%)	Total %
Fox-Wyaconda Watershed				
Crop-Livestock	20	30	0	22
Crop	8	15	0	10
Livestock	14	13	0	12
Other	0	24	8	16
Total	13/89=14.6%	17/80=21.3%	1/29=3.4%	15.7%
Scott County				
Crop-livestock	14	25	0	17
Crop	7	36	66	17
Livestock	33	12	50	23
Other	0	20	30	25
Total	9/90=10%	21/57=36.8%	7/15=46.7%	17.1%

The number in each cell represents the percent in a group interested in the practice. For example in FWW Crop-Livestock/Full 20% are interested in forest farming.

Source: Agroforestry Baseline Survey 1999.

Table 16: Percent of respondents moderately and very interested in Flood Protection

Survey Location Production System	Current involvement with agriculture			
	Full-time farmer (%)	Part-time farmer (%)	Other (%)	Total %
Fox-Wyaconda Watershed				
Crop-Livestock	2	8	20	5
Crop	4	5	0	4
Livestock	17	6	0	8
Other	0	6	0	3
Total	3/89=3.4%	5/80=6.3%	1/293.=4%	4%
Scott County				
Crop-livestock	8	6	0	7
Crop	24	14	0	21
Livestock	33	0	0	12
Other	0	0	0	0
Total	14/90=15.6%	3/57=5.3%	0%	11.6%

The number in each cell represents the percent in a group interested in the practice. For example 2 in FWW Crop-Livestock/Full time means 2% in this group are interested in flood protection.

Source: Agroforestry Baseline Survey 1999.

Flood protection, is only interesting to full time farmers in Scott County, as table 16 shows. The interest was expressed mostly in the crop and the livestock production systems.

Overall the percent of producers interested in these agroforestry practices is low, but in the adoption of new practices, especially intensive ones, we should expect only a few of early adopters. It is with this group of farmers that possible advisory panels for the design of specific agroforestry practices should be discussed.

Flood protection and forest farming were more interesting to the farmers in SC while riparian buffers were for FWW. It was surprising to see silvopasture command more interest in Scott County, when most of the hay land is in the FWW. Alley cropping was not popular, but again Scott County farmers showed more interest. It will be necessary to understand the perceived need to diversify to make a living in rural areas. With the Freedom to Farm Act the incentives to farm in traditional ways are disappearing, and behavior change needs to occur in order for rural livelihood strategies to improve well being.

VIII. Conclusions From a First Evaluation of the Baseline.

A first evaluation of the results survey considered three dimensions. The first was to determine the differences in land scape that exist between the two project sites. As mentioned before both sites were chosen for their proximity to the Mississippi River. The second was to identify the types of producers involved in farming and their degree of similarity or homogeneity according to involvements with farming. The third dimension was to understand differences in land use and management identifying distinct production systems. Finally using the cross section between production system and involvement in farming to determine if there were differences in interest and knowledge of agroforestry practices, and the types that would be more interesting.

Survey results show clearly that there are differences in the total land resource available by potential or actual use. There is more emphasis on row crop production and less erodible land in Scott County, the southeast. On the other hand the northeast has more woodlands, managed and unmanaged, and also a greater proportion of land that is highly erodible. The area for livestock production and the acres on CRP were significantly higher in the northeast. These differences lend themselves to possible differences in the interest in agroforestry practices, as well as the mechanism to support their establishment.

In terms of land use management and activities undertaken at each project site, it was clear that the southeast is more involved in row crops But there is variation in the level and number of row crops each farmer is engaged in. Overall corn and soybeans were the most important crops in number of people farming. Wheat was the second or third depending on the site. Though there is variation in the number and composition of the row crops, there is not much between these commodity crops and other products. This activity is very important in the southeast, and is reflected also in the high value of this land. There were significant differences in the amounts of sales between both sites, the southeast averaging twice the amount of gross farm sales, and there were more small farms in the northeast.

Involvement in agriculture differed between the northeast and southeast. There are

differences between full time and part time farmers, especially in terms of the contribution to household income, but also on the contribution of family labor to the farm. Those in the northeast rented less land, used more family labor, had lower gross sales from agriculture, and consequently less share of income from agriculture when farming full time. Conversely farmers in the southeast relied more on commodity crops, had twice the level of gross sales, and a lower proportion of small farms in the sample. This group was wealthier, relying on farm income more, and greater proportion of assets in row crop machinery.

Forty-five percent of the farmers in FWW and 55 in SC were full time farmers. A higher proportion of those in the northeast were in crop livestock and crop only farming systems, In SC a greater proportion were in crop only systems, with crop-livestock second. Mostly those in part time farming had a greater proportion of only livestock production (as compared to full time). It was interesting though to note that agroforestry practices that would consider alley cropping were of almost no interest, probably because of having worked to clear the land from trees especially in the south. Windbreaks was the most known and that farmers expressed interest in. It was also interesting to note that forest farming was viewed with interest by “others”, those that either are retired, or are hobby farmers. Overall the proportion interested in agroforestry is low, but there is enough interest to consider these farmers potential early adopters of these practices.

The next step with this research is to look at diversification strategies, and how agroforestry fares with farmers perceived not to be only “traditional farmers”, looking at growth by expansion of current practices, but at those that are “innovators” that look at other opportunities to pursue rural livelihoods.

IX. References.

Economic Research Service. (nd). ERS Farm Typology for a Diverse Ag Sector. USDA. ERS. Washington DC.

Garret, H. E. (Director) A Floodplain Analysis of Agroforestry's Physical, Biological , Ecological, Economic and Social Benefits. Research proposal submitted to the Environmental Protection Agency. Center for Agroforestry, Columbia MO.

Hodge, S., A. Raedeke, C. Valdivia and J. Green. 1999. Agroforestry adoption in Missouri: Preliminary socioeconomic survey data from two project sites. Presentation at the 6th North American Agroforestry Conference at HotSprings Arkansas, June 12-16..

Jamtgaard, K. 1989. Targeting Production Systems in the Small Ruminant CRSP: A Typology Using Cluster Analysis. Chapter 11 in McCorkle, C. (ed) The Social Sciences in International Agricultural Research. Lynne Rienner Publishers, Boulder, Colorado.

Plain R. and J. White. 1999. Missouri Farm and Land Values. Farm management Newsletter, University Cooperative Outreach and Extension. Columbia, MO.

Missouri Land Owner Agroforestry Pilot Project. Fox Wyaconda Watershed and Scott County Survey Results 1998-9. Mimeograph. Center for Agroforestry, MU. Columbia, MO.

Raedeke, A., J. Green, S. Hodge, and C. Valdivia. 1999. "Farmers' Perceptions of Agriculture, Trees, and Agroforestry". 62nd Annual Meeting of the Rural Sociology, Society, Chicago, August 4-8.

Shucksmith, M. 1993. Farm Household Behaviour and the Transition to Post-Productivism. *Journal of Agricultural Economics* 3(44):466-478.

USDA 1998. A Time to Act A report of the USDA National Commission on Small Farms. January. Washington DC.

Valdivia, C. and C. Jetté. 1997. Peasant Household Strategies Technologies and Diversification in Andean Fragile Lands. AEWP-1997-6. Department of Agricultural Economics, University of Missouri-Columbia, Columbia.

Valdivia, C., E. Dunn and C. Jetté. 1996. Diversification as a Risk Management Strategy in an Andean Agropastoral Community. *AJAE* (December): 1329-1334.