

Figure 47 - Methodological steps for the study of LULC dynamics in Machadinho d'Oeste and Vale do Anari.

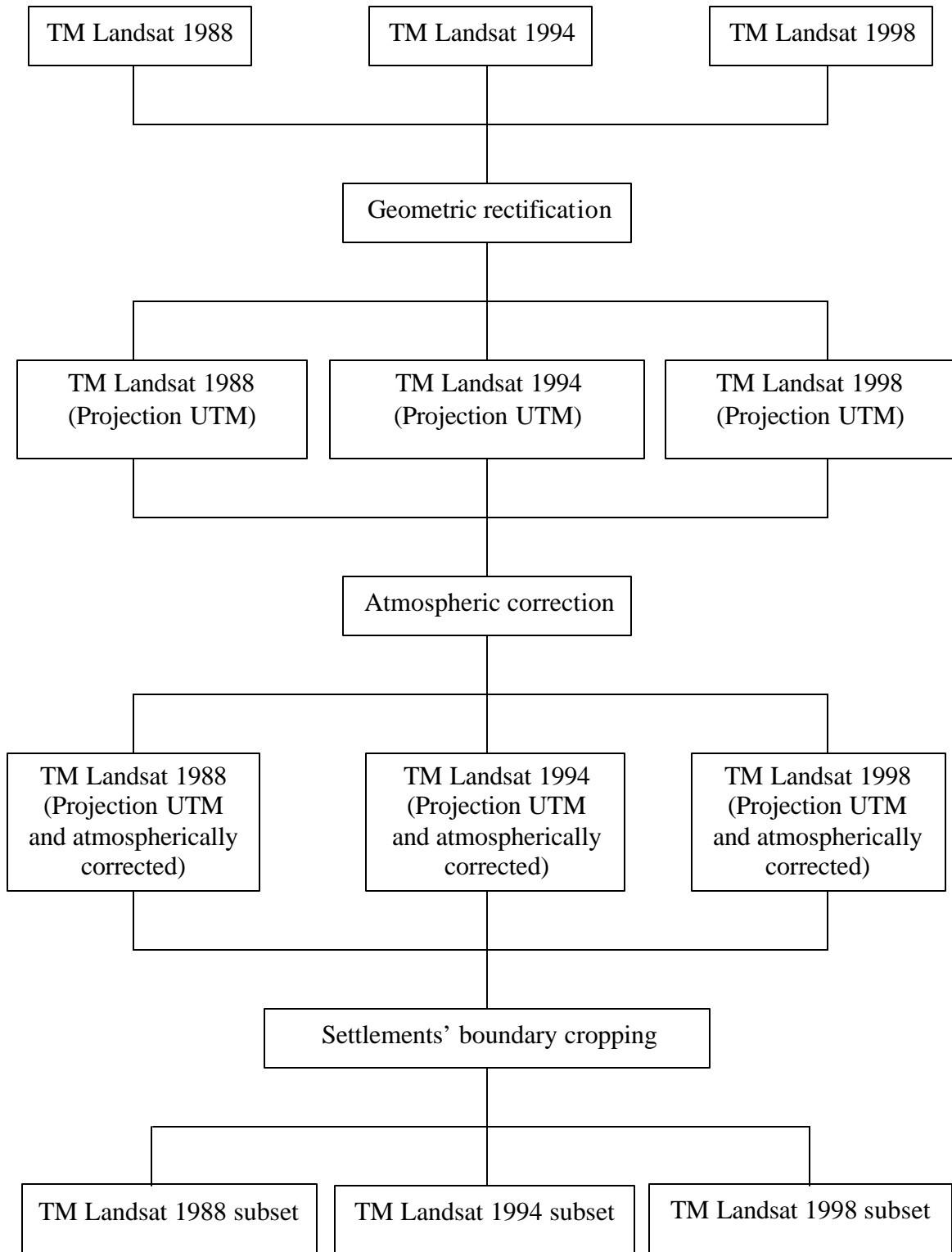


Figure 48 - Pre-classification techniques used for the study of LULC dynamics in Machadinho d'Oeste and Vale do Anari.

Table 12 - LULC classification system for Machadinho d'Oeste and Vale do Anari.

LEVEL 1	LEVEL 2	LEVEL 3
1. Mature Forest	1.1. Open Forest	1.1.1. Open Forest w/Palms
		1.1.2. Open Forest w/Bamboo
		1.1.3. Open Forest w/Lianas
	1.2. Floodplain Forest	1.2.1. <i>Varzea</i>
		1.2.2. Gallery
2. Secondary Succession	2.1. Advanced Secondary Succession	
	2.2. Initial Secondary Succession	
3. Pasture	3.1. Degraded Pasture	3.1.1. Degraded Pasture with Palms
		3.1.2. Degraded Pasture with Stumps
		3.1.3. Degraded Pasture with <i>Vismia sp</i>
	3.2. Cultivated Pasture	3.2.1. Cultivated Pasture with Palms
4. Agriculture	4.1. Agroforestry	4.1.1. Coffee/ <i>Cecropia</i>
		4.1.2. Coffee/Rubber
		4.1.3. Cacao/Rubber
		4.1.4. Coffee/Cupuaçu/Cacao/ <i>Guarana</i>
		4.1.5. Coffee/Rubber/ <i>Guarana</i>
		4.1.6. Coffee/ <i>Cecropia</i> /Other tree sp.
		4.1.7. Coffee/Rubber/Banana/Cacao
		4.1.8. Coffee/Other tree species
	4.2. Perennial	4.2.1. Coffee
		4.2.2. Cacao
		4.2.3. Rubber
		4.3.4. Banana
	4.3. Annual	4.3.1. Corn
		4.3.2. Rice
4.3.3. Beans		
4.3.4. Manioc		
5. Bareland	5.1. Agricultural Exposed Soil	
	5.2. Exposed Rock	
6. Built-up Land (Infrastructure)	6.1. Road	
	6.2. Urbanized Areas	
7. Water	7.1. Running Water	
	7.2. Lakes	

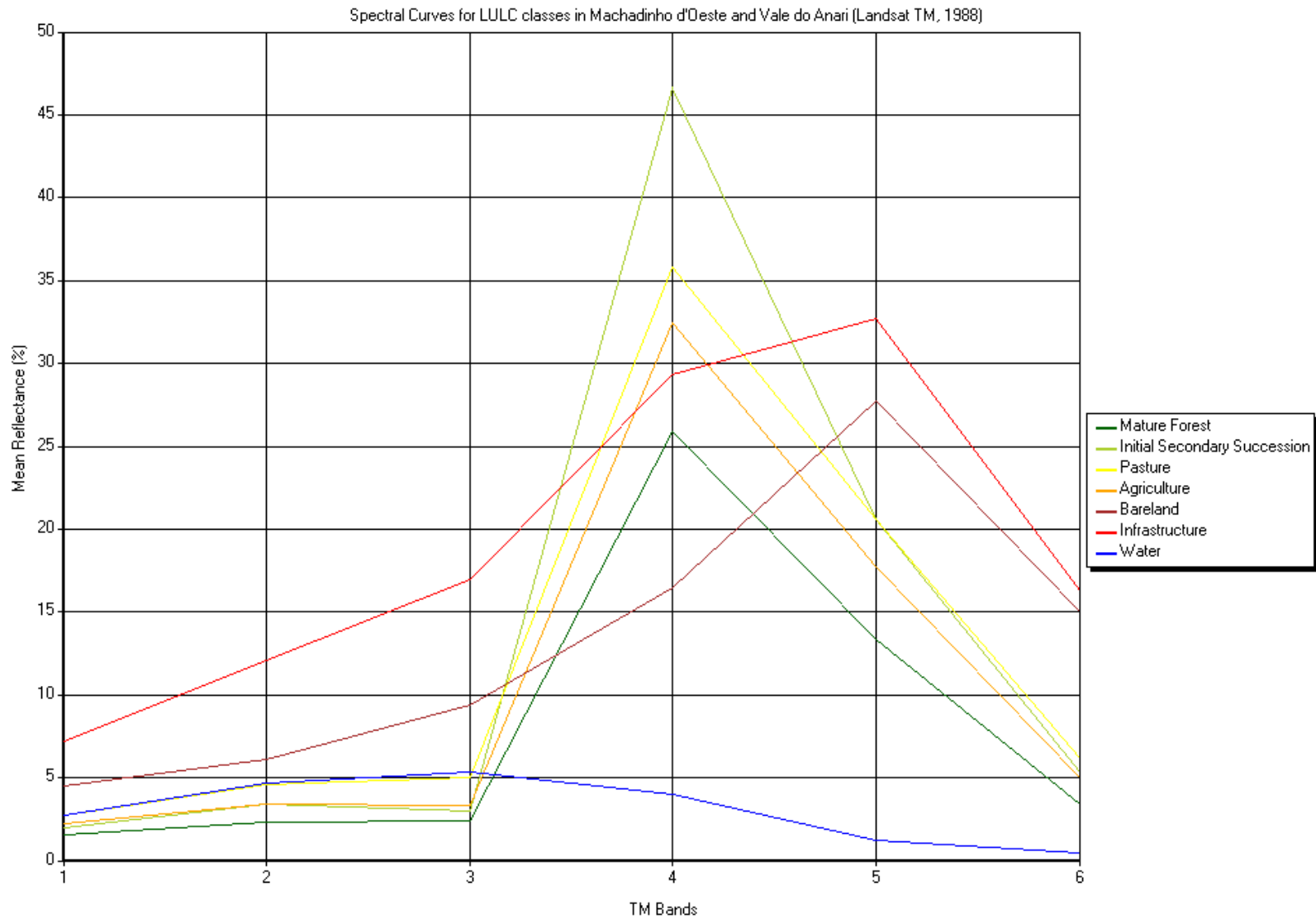


Figure 49 - Spectral curves for LULC classes in Machadinho d'Oeste and Vale do Anari (Landsat TM 1988).

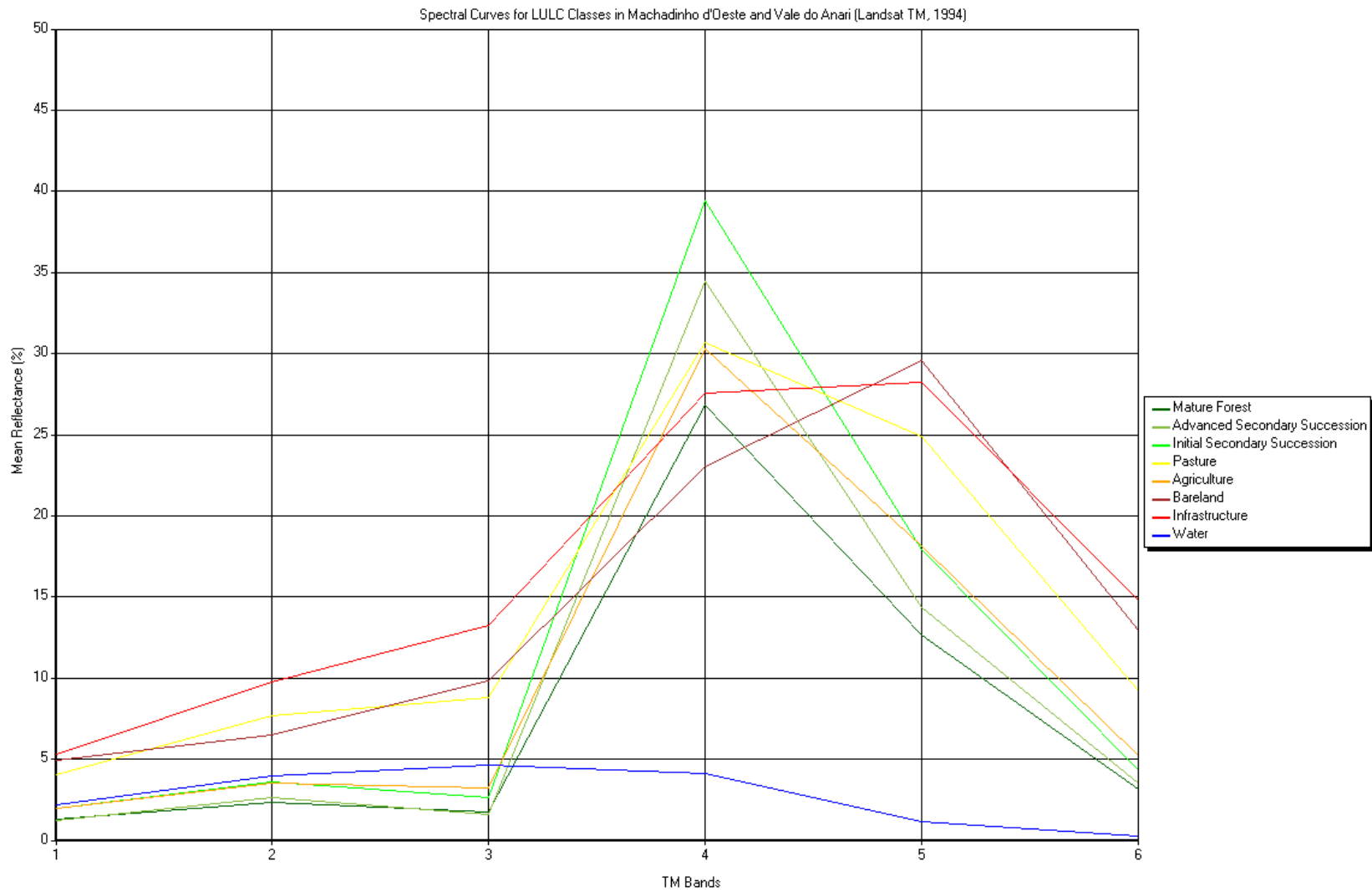


Figure 50 - Spectral curves for LULC classes in Machadinho d'Oeste and Vale do Anari (Landsat TM 1994).

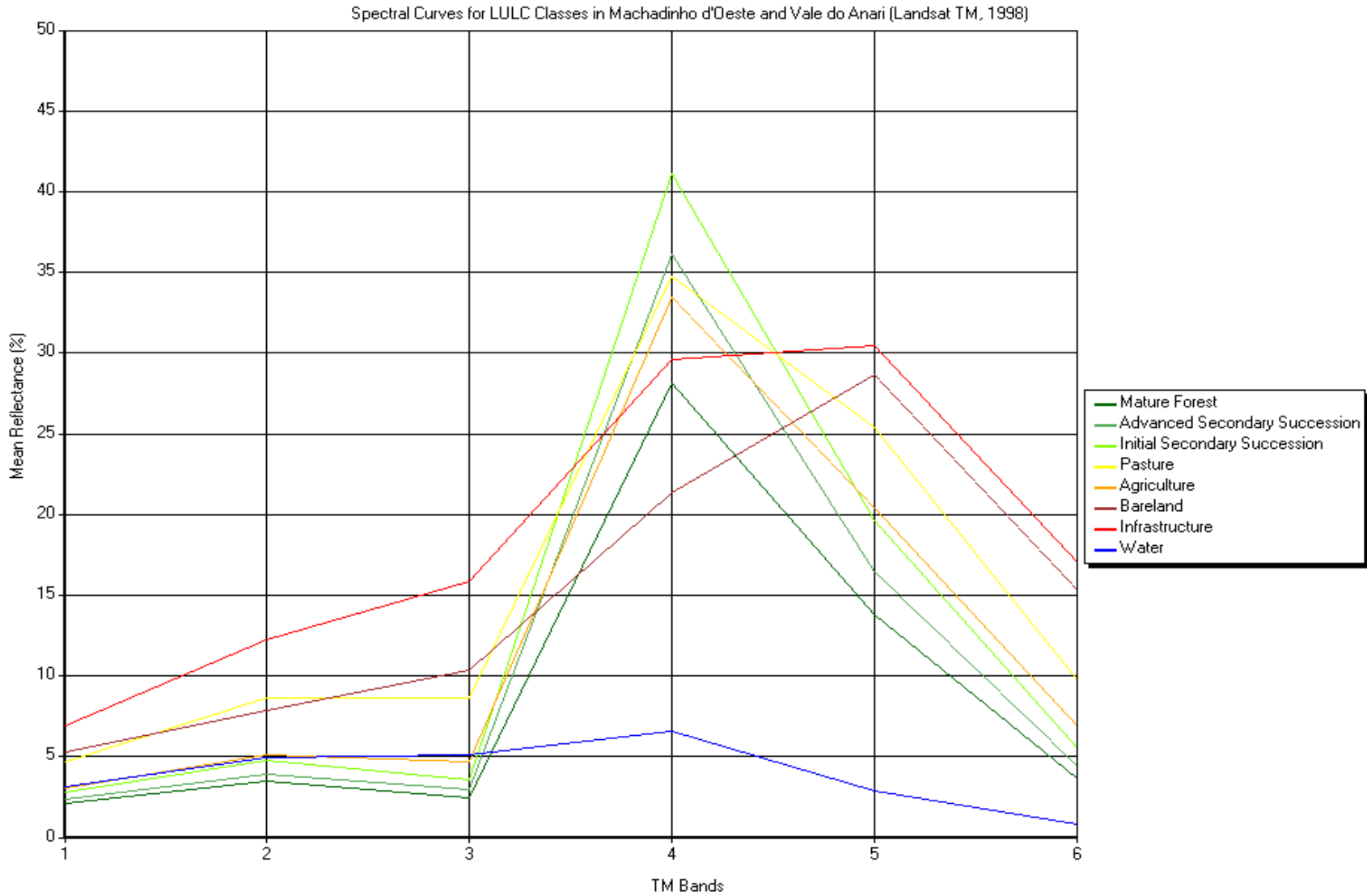


Figure 51 - Spectral curves for LULC classes in Machadinho d'Oeste and Vale do Anari (Landsat TM 1998).

Table 13 - Accuracy assessment for LULC classifications in Machadinho d'Oeste and Vale do Anari.

	1988		1994		1998	
	User's Accuracy	Producer's Accuracy	User's Accuracy	Producer's Accuracy	User's Accuracy	Producer's Accuracy
Forest	89.4	86.3	80.2	95.8	81.9	97.3
Advanced SS	--	--	48.1	46.7	54.0	57.2
Initial SS	68.4	83.3	65.9	85.9	71.3	89.4
Pasture	87.7	72.0	90.5	66.4	95.3	70.5
Agriculture	80.5	66.7	85.1	77.8	86.5	82.3
Bareland	79.7	94.6	75.1	90.3	77.9	94.0
Infrastructure	82.4	100.0	81.0	83.6	81.0	85.0
Water	71.4	87.0	81.7	100.0	86.4	100.0
Overall Accuracy	79.5		76.8		81.1	
Kappa Coefficient	74.7		70.1		75.6	

Table 14 – Land Use/Land Cover in Machadinho d’Oeste and Vale do Anari in 1988, 1994, and 1998.

Land-Use/ Land-Cover	MACHADINHO D’OESTE						VALE DO ANARI					
	Area in 1988 (km ²)	% in 1988	Area in 1994 (km ²)	% in 1994	Area in 1998 (km ²)	% in 1998	Area in 1988 (km ²)	% in 1988	Area in 1994 (km ²)	% in 1994	Area in 1998 (km ²)	% in 1998
Forest	1879.3	88.4	1620.1	75.8	1402.7	65.7	951.1	86.8	748.5	68.5	632.7	50.8
Advanced SS	0.0	0.0	27.8	1.3	63.5	3.0	0.0	0.0	14.7	1.3	55.3	4.4
Initial SS	34.4	1.6	151.8	7.1	224.5	10.5	16.1	1.5	71.9	6.6	154.6	12.4
Pasture	121.0	5.7	169.0	7.9	208.8	9.8	71.7	6.5	137.3	12.6	230.2	18.5
Agriculture	20.8	1.0	83.9	3.9	152.1	7.1	35.6	3.2	64.7	5.9	129.1	10.3
Bareland	37.4	1.8	44.0	2.1	44.8	2.1	10.2	0.9	43.5	4.0	31.4	2.5
Infrastructure	26.0	1.2	26.9	1.3	28.1	1.3	9.4	0.9	11.1	1.0	11.2	0.9
Water	7.9	0.4	12.8	0.6	11.9	0.6	1.2	0.1	1.4	0.1	2.0	0.2
Total	2127.0	100.0	2136.4	100.0	2136.4	100.0	1095.5	100.0	1093.2	100.0	1246.5	100.0

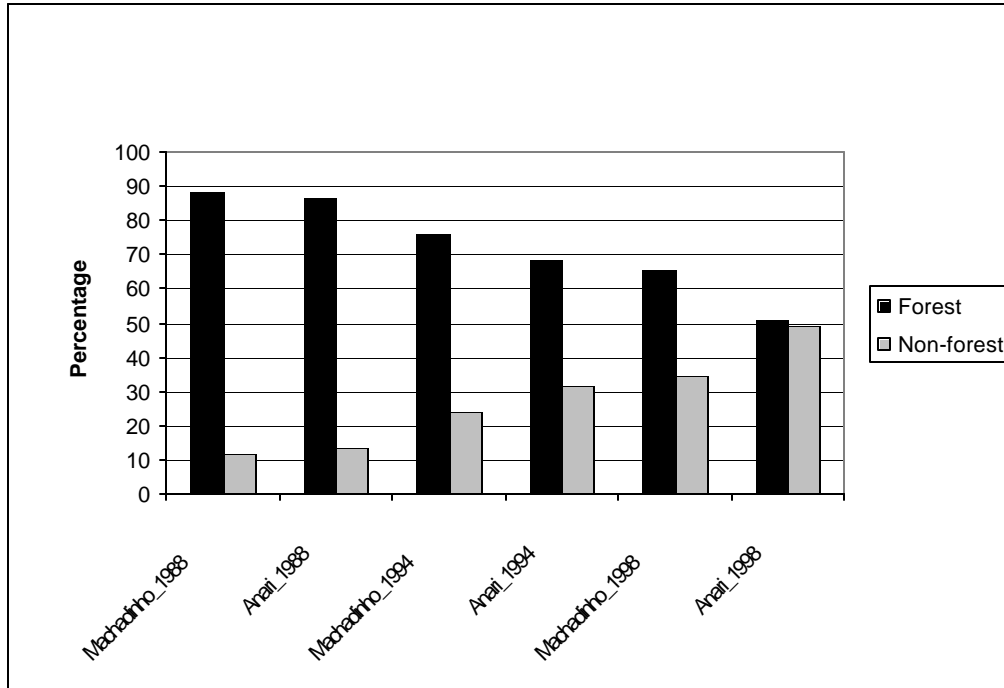


Figure 52 - Percentage of forest and non-forest in Machadinho d'Oeste and Vale do Anari in 1988, 1994, and 1998.

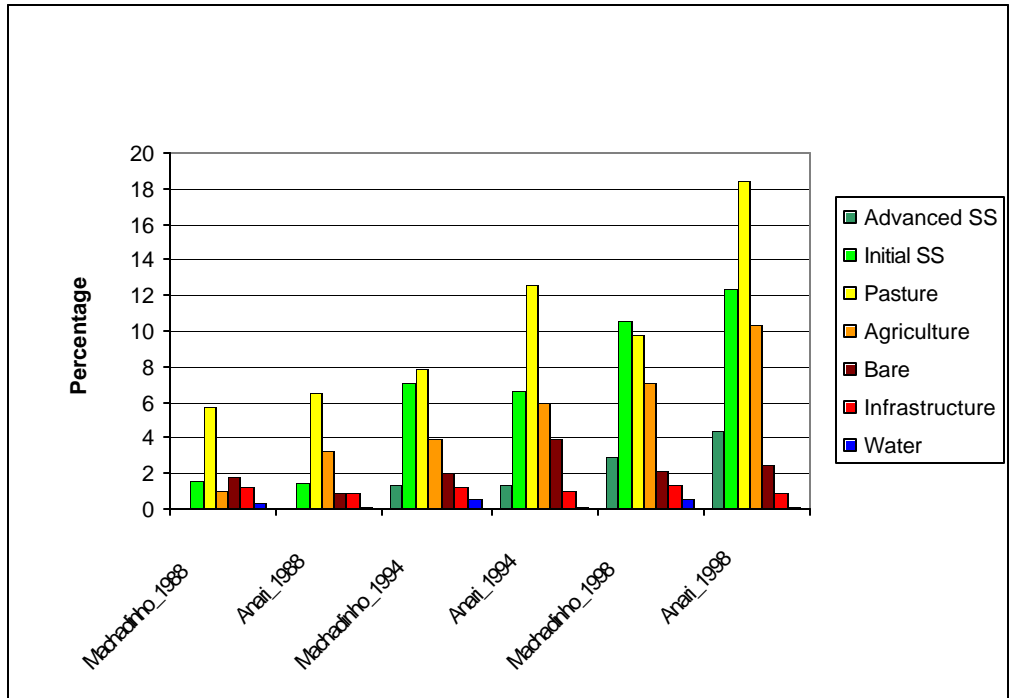


Figure 53 - Percentage of non-forest classes in Machadinho d'Oeste and Vale do Anari in 1988, 1994, and 1998.

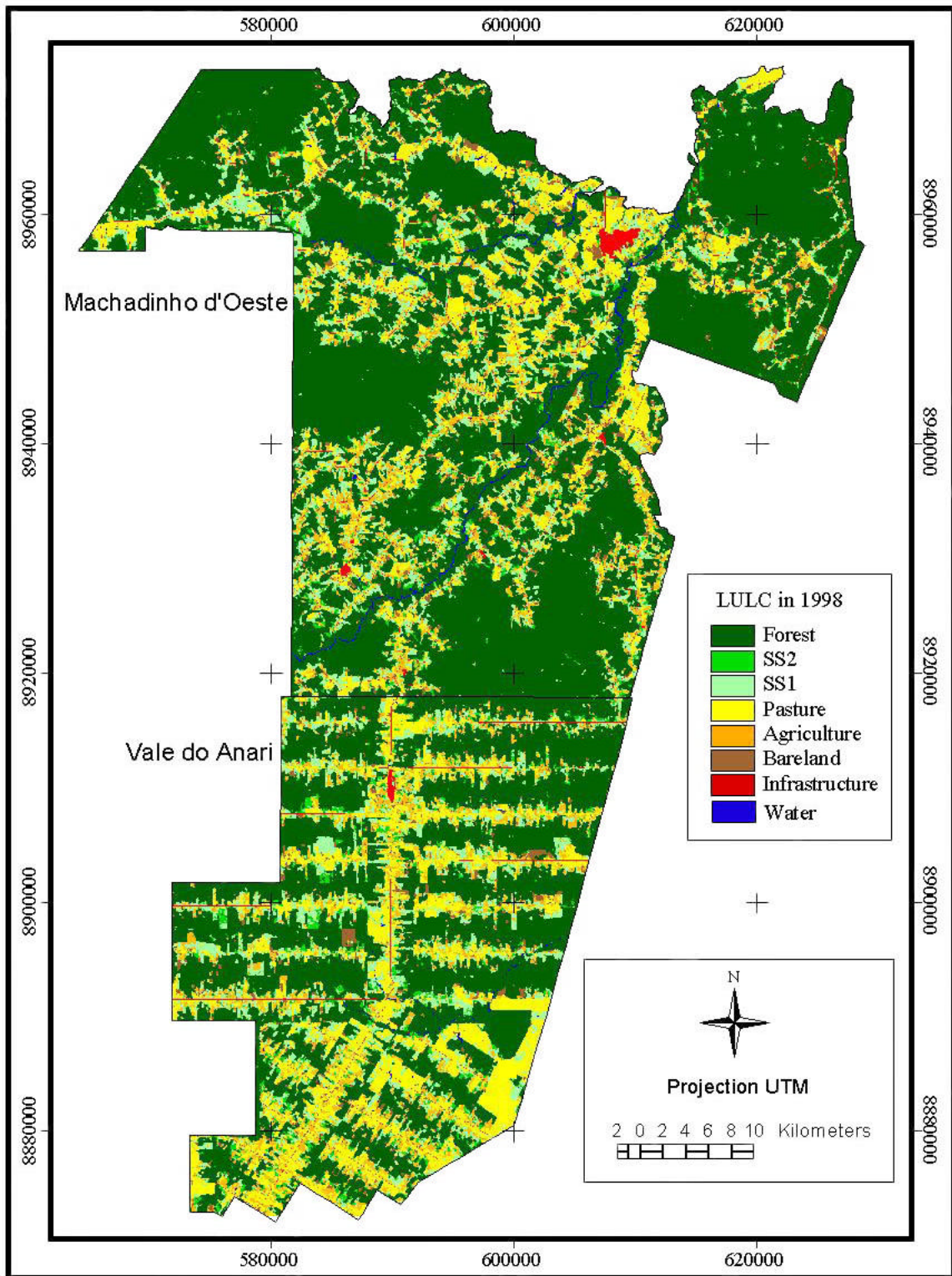


Figure 54 - Machadinho d'Oeste and Vale do Anari – Land Use/Land Cover in 1998.

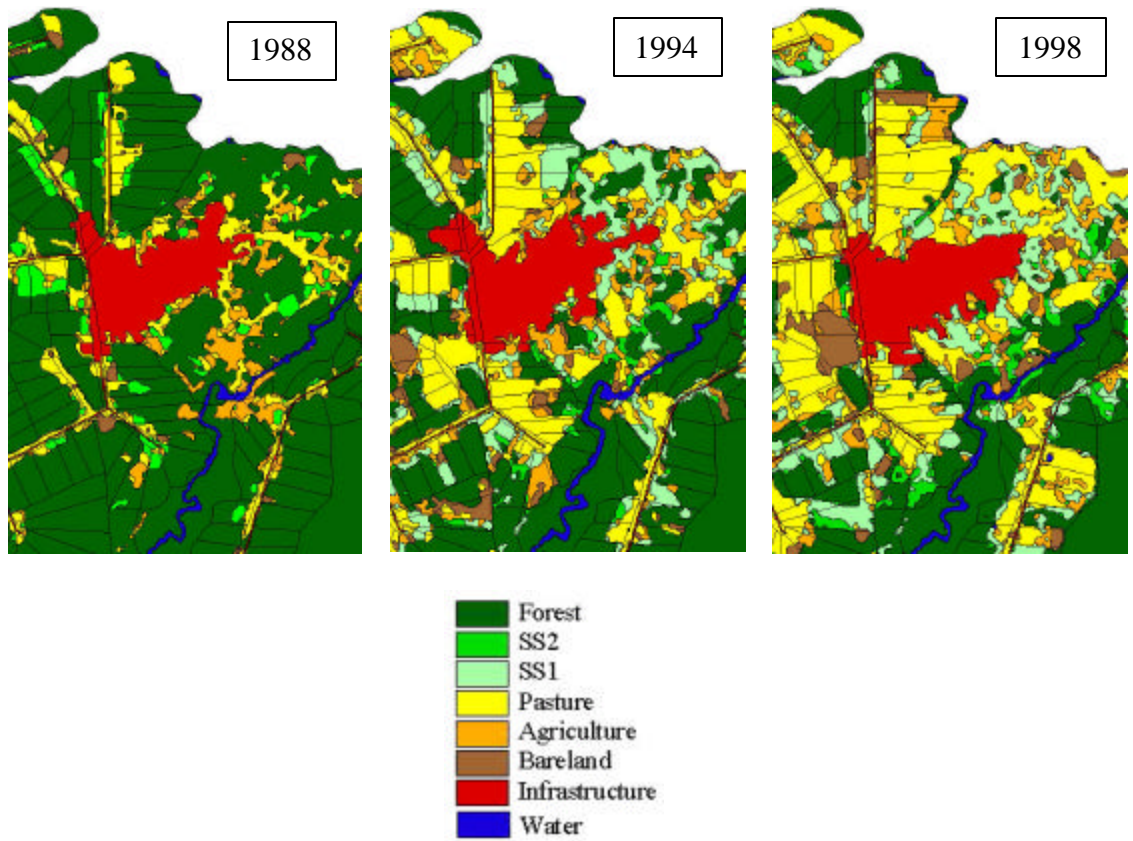


Figure 55 - Pasture conversion in peri-urban areas of Machadinho d'Oeste.

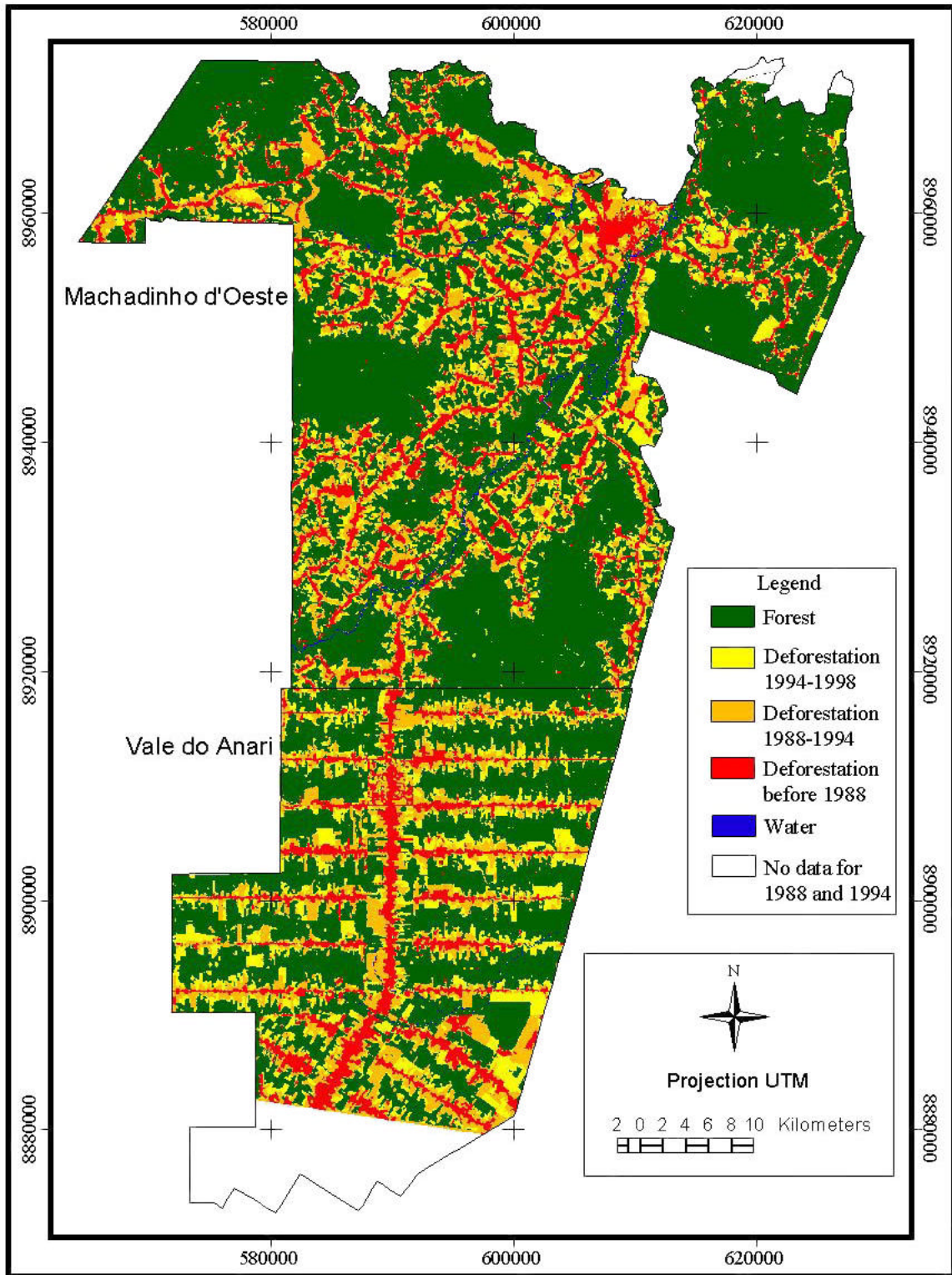


Figure 56 - Machadinho d'Oeste and Vale do Anari – Deforestation until 1998.

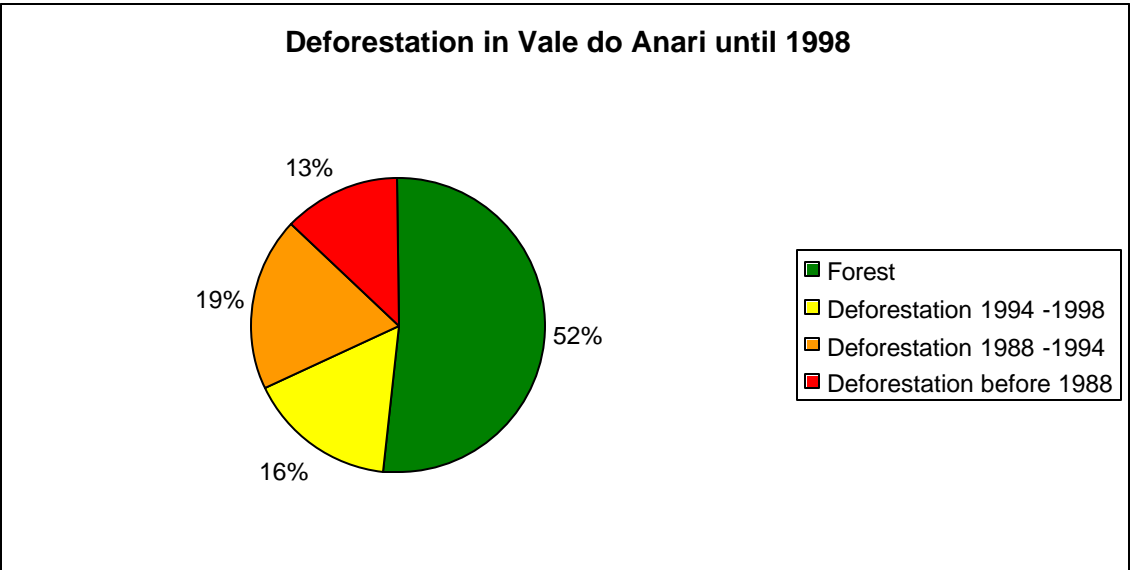
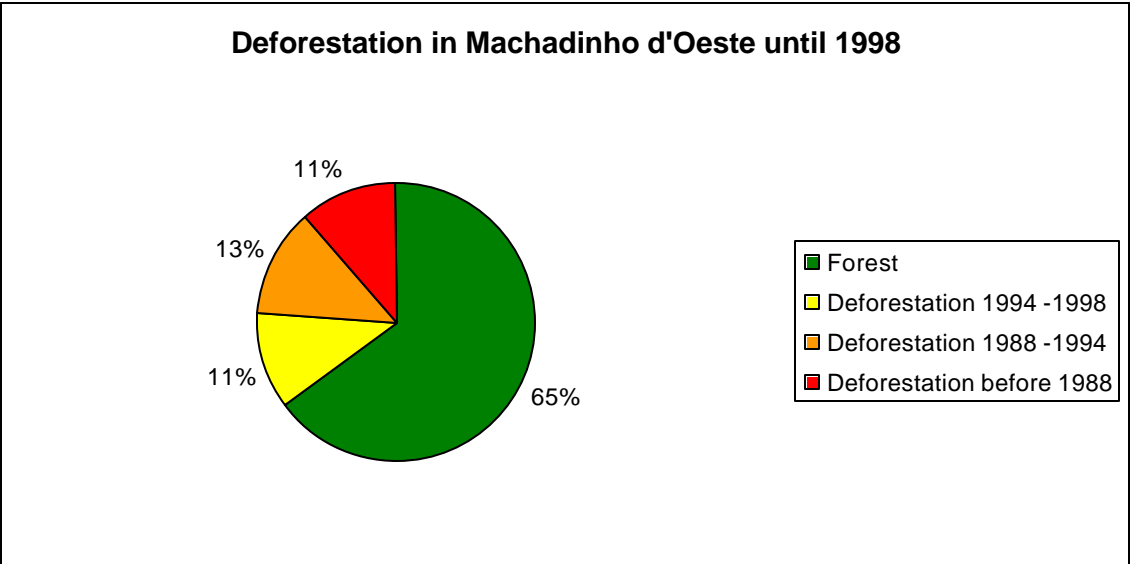


Figure 57 - Percentages of classes of deforestation and forest in Machadinho d'Oeste and Vale do Anari until 1998.

Table 15 - Definition of transition classes for production and secondary succession in Machadinho d'Oeste and Vale do Anari.

TRANSITION CLASS	CLASSES IN 1988 – 1994 - 1998
Forest since 1988	F - F - F
SS since 1988	SS - SS - SS
Long Fallow Cycle	F - SS - SS or F
	SS - SS - Prod
	Prod - SS - SS or F
Short Fallow Cycle	F - SS - Prod
	SS - Prod - SS
	Prod - SS - Prod
Recent Abandonment (SS in 1998 only)	F - F - SS
	F - Prod - SS
	Prod - Prod - SS
Production since 1988	Prod - Prod - Prod
Production since 1994	F - Prod - Prod
	SS - Prod - Prod
Recent Clearing (Production in 1998 only)	F - F - Prod
Others	Infrastructure and water

F = Forest; SS = Secondary Succession; Prod = Production

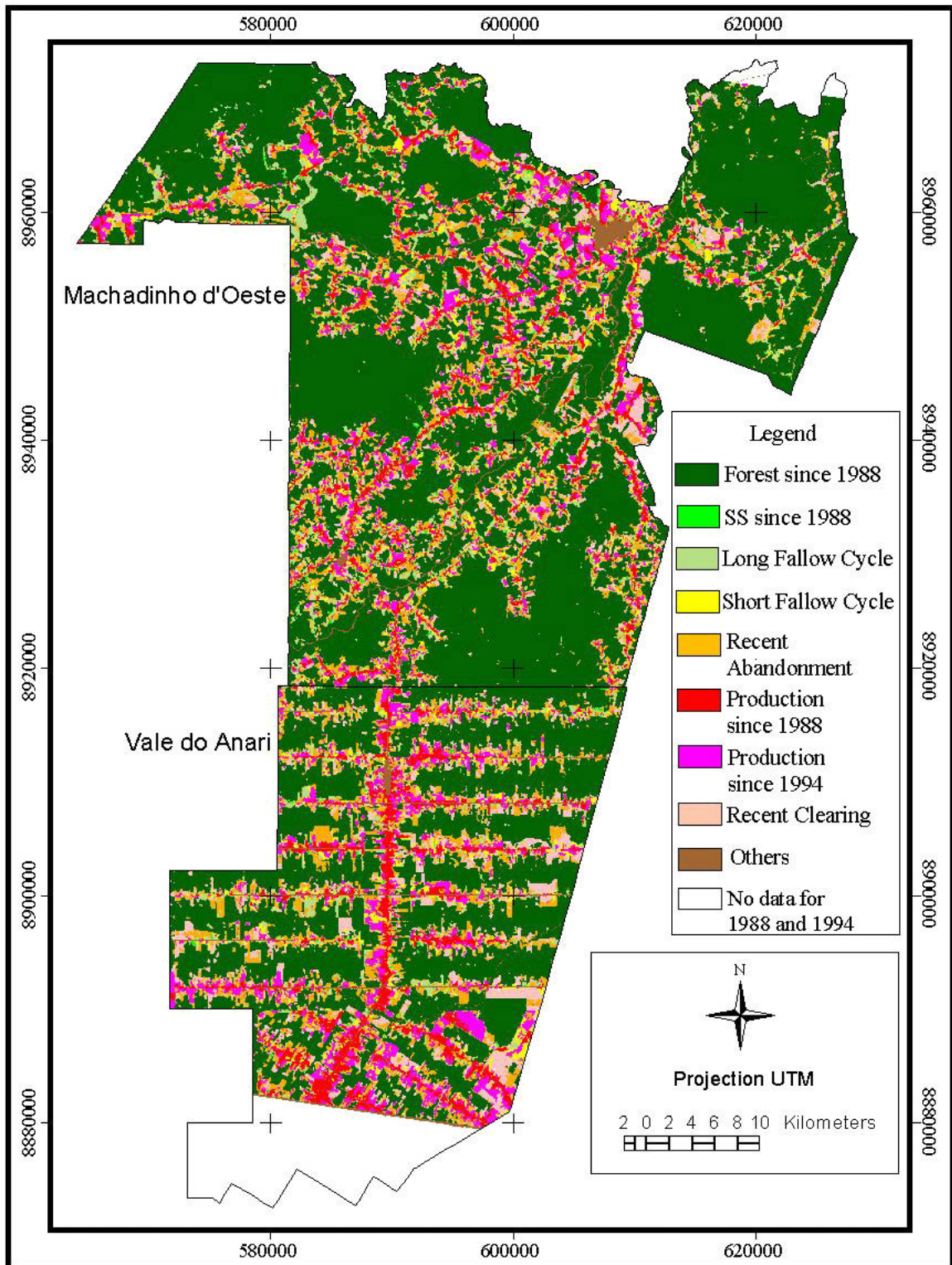


Figure 58 - Machadinho d'Oeste and Vale do Anari – Production and secondary succession until 1998.

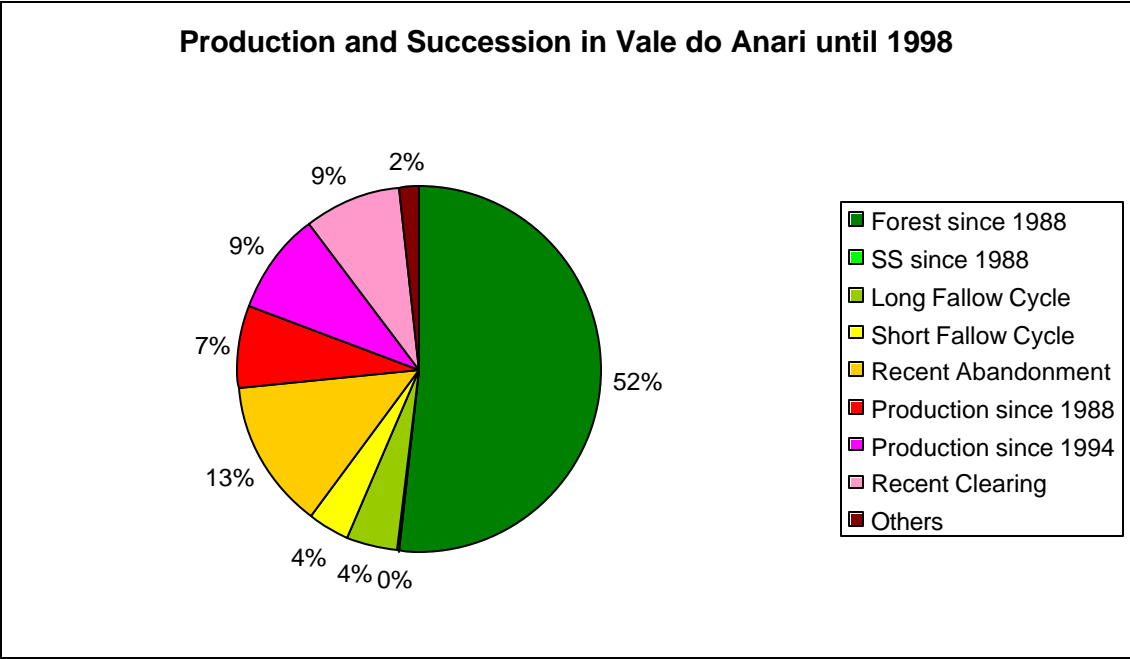
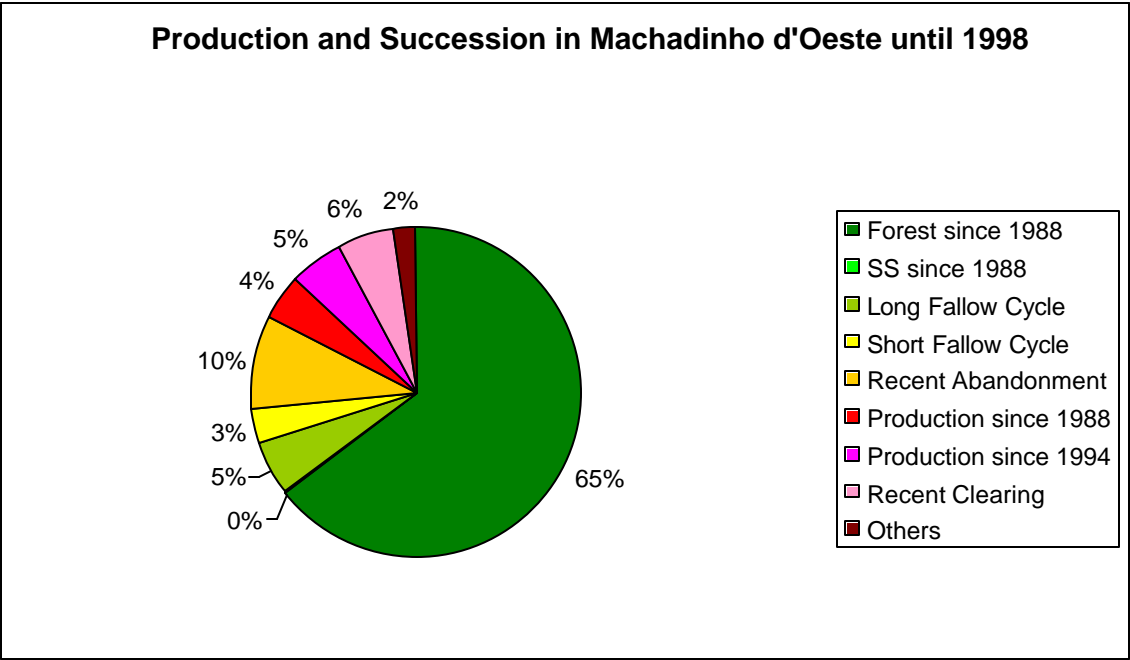


Figure 59 - Percentages of classes of production and secondary succession in Machadinho d'Oeste and Vale do Anari until 1998.

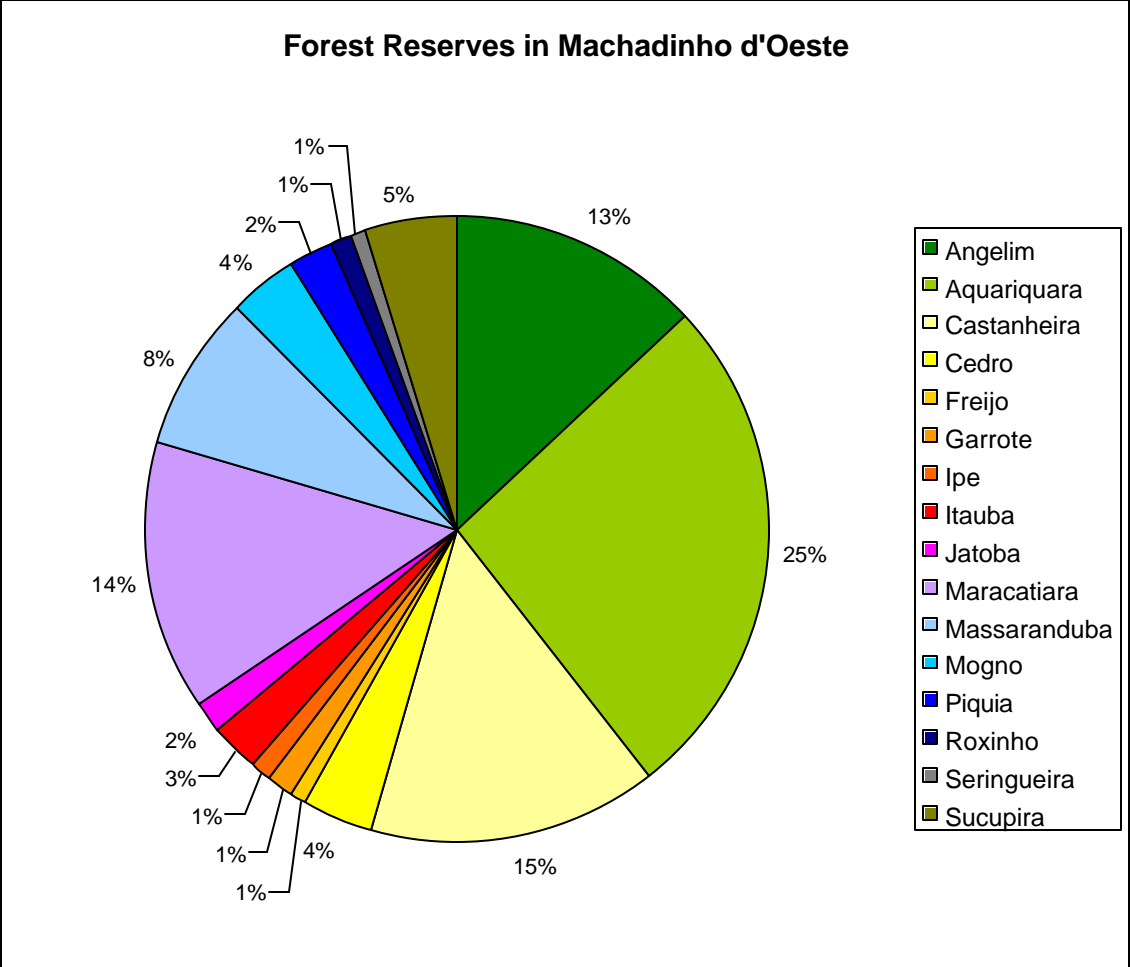


Figure 60 - Percentages of each forest reserve in relation to the total area of reserves in Machadinho d'Oeste.

Table 16 - Forest reserves in Machadinho d'Oeste.

RESERVES	AREA (ha)	POPULATION
Angelim	8923.2	10
Aquariquara	18100.0	181
Castanheira	10200.0	27
Cedro	2566.7	--
Freijó	600.4	4
Garrote	802.5	9
Ipê	815.5	28
Itaúba	1758.1	13
Jatobá	1135.2	3
Maracatiara	9503.1	66
Massaranduba	5566.2	18
Mogno	2450.1	13
Piquiá	1448.9	16
Roxinho	882.2	9
Seringueira	537.5	4
Sucupira	3188.0	--
Total	68477.6	401

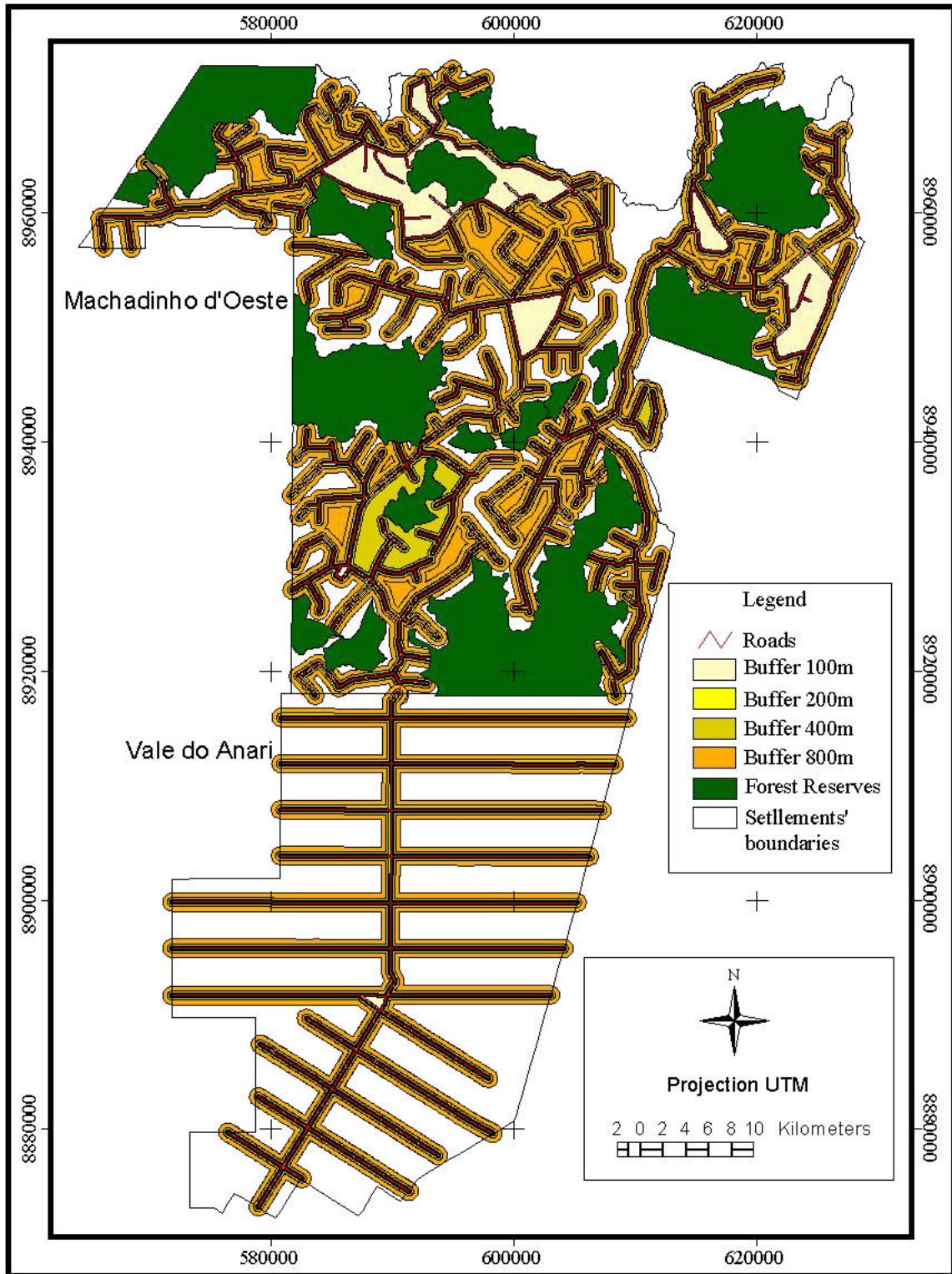


Figure 61 - Machadinho d'Oeste and Vale do Anari – Buffers around roads.

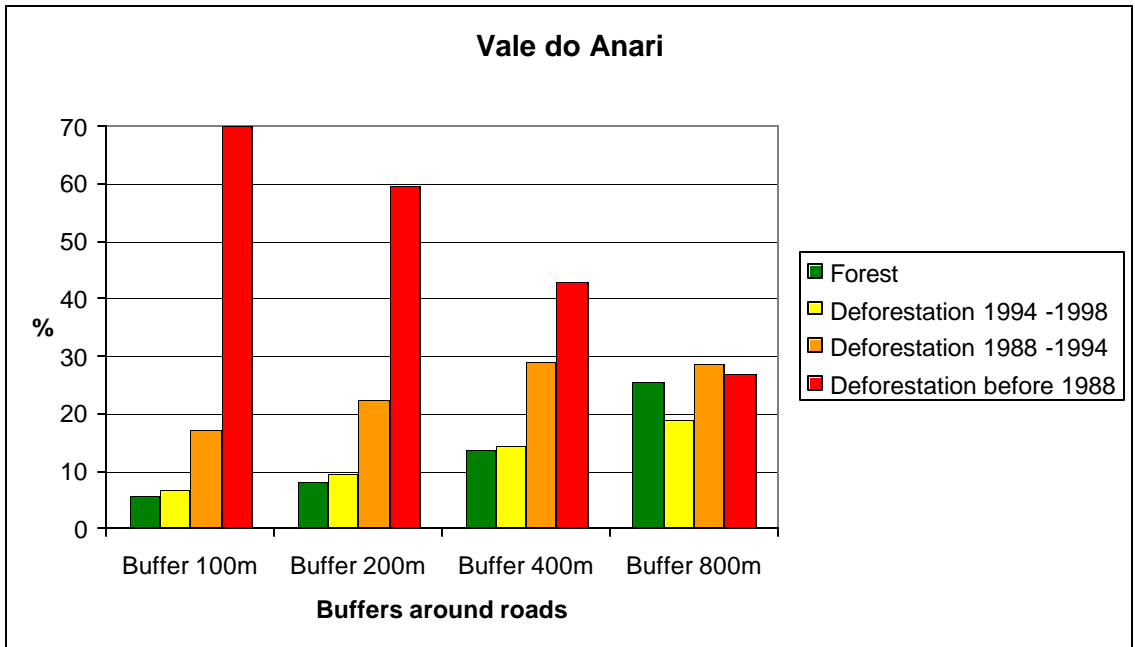
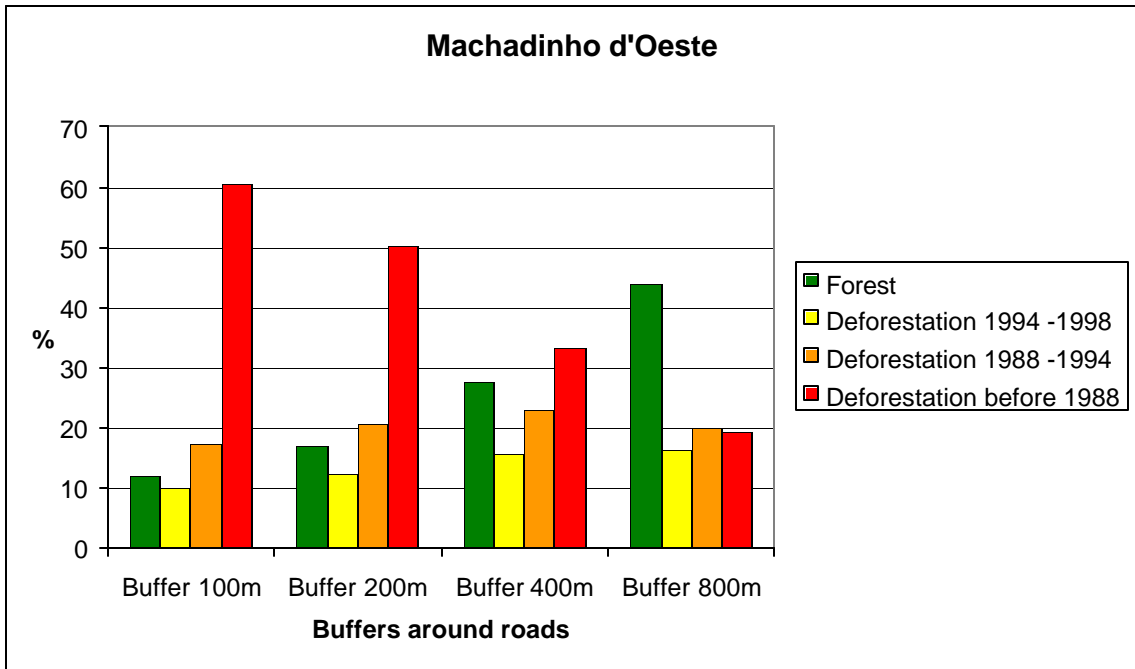


Figure 62 - The route of deforestation around roads in Machadinho d'Oeste and Vale do Anari until 1998.

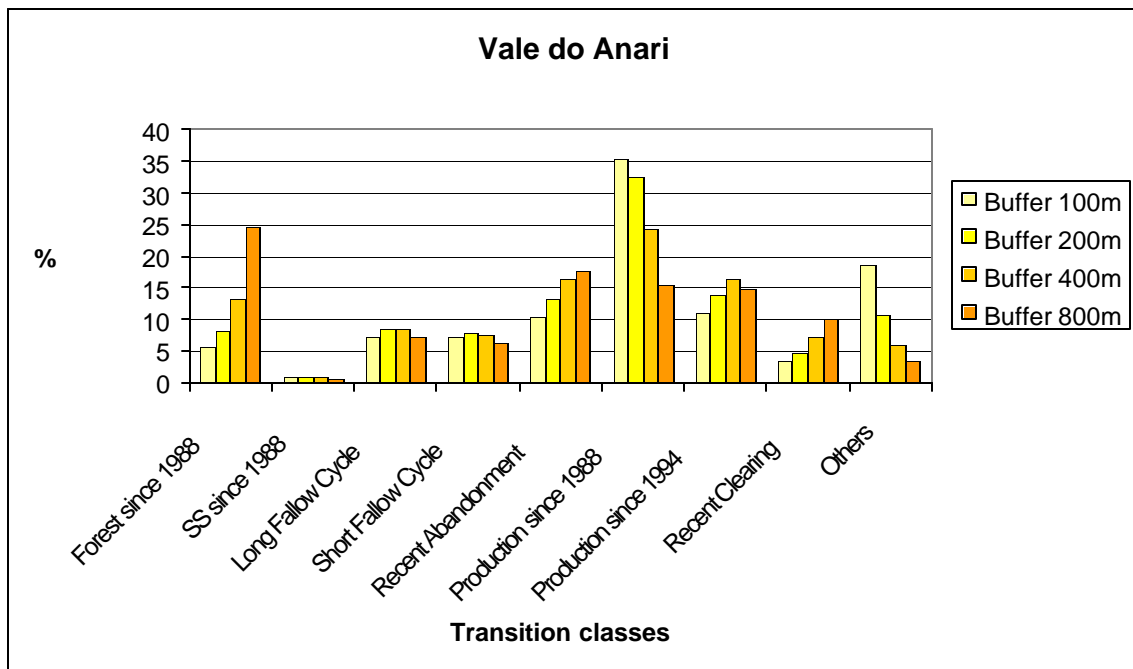
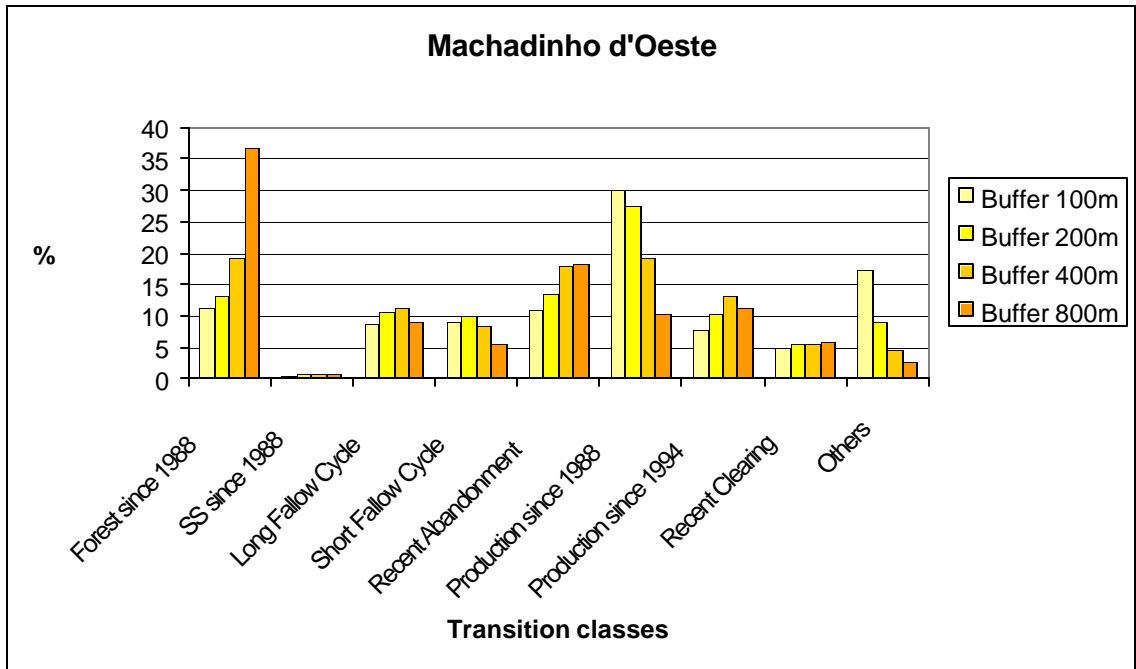


Figure 63 - Production and secondary succession around roads in Machadinho d'Oeste and Vale do Anari until 1998.

Table 17 - LULC statistics for properties of Machadinho d'Oeste in 1988.

	MEAN AREA (ha)	MEAN PERCENT	STANDARD DEVIATION (ha)	STANDARD DEVIATION (%)	VARIANCE
Forest	38.5	87.9	13.5	35.2	183.3
SS1	0.9	2.0	1.8	200.0	3.1
Pasture	2.8	6.5	3.3	116.3	10.8
Agriculture	0.5	1.1	1.1	232.4	1.2
Bareland	1.0	2.2	2.1	218.5	4.5
Infrastructure	0.1	0.1	0.4	684.5	0.1
Water	0.1	0.2	0.6	811.0	0.3
Total	43.8	100.0			

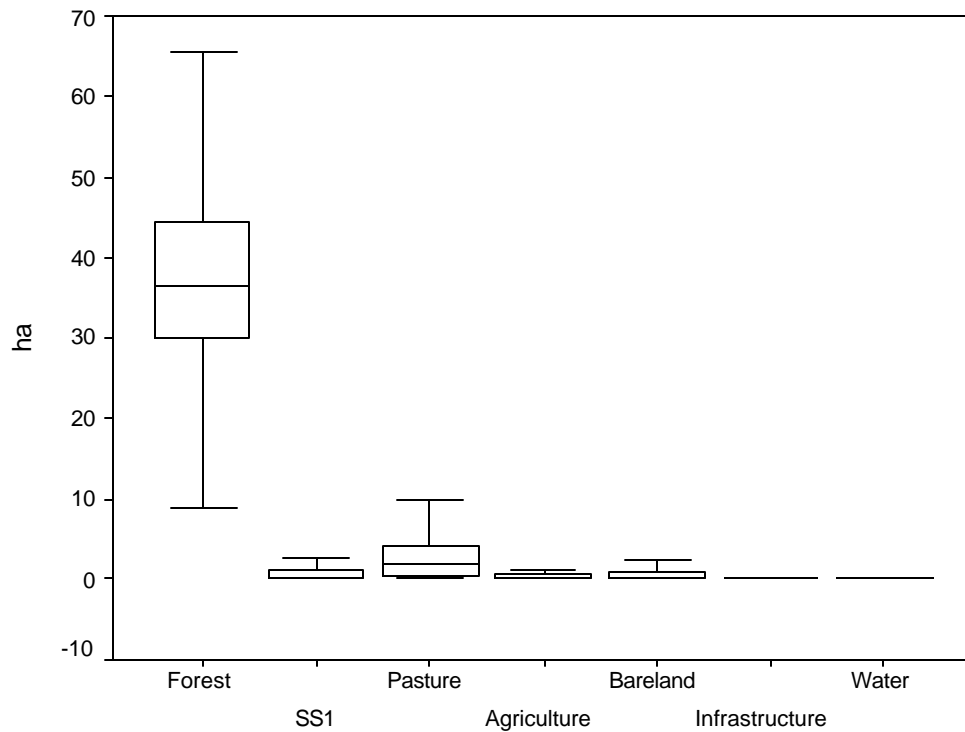


Figure 64 - LULC boxplots for properties of Machadinho d'Oeste in 1988.

Table 18 - LULC statistics for properties of Machadinho d'Oeste in 1994.

	MEAN AREA (ha)	MEAN PERCENT	STANDARD DEVIATION (ha)	STANDARD DEVIATION (%)	VARIANCE
Forest	30.4	69.5	14.7	48.4	217.4
SS2	0.8	1.7	1.4	183.1	1.9
SS1	4.3	9.8	5.1	120.2	26.5
Pasture	4.5	10.4	6.9	151.2	47.0
Agriculture	2.3	5.2	3.0	130.4	9.0
Bareland	1.3	3.0	2.6	196.0	6.7
Infrastructure	0.1	0.2	0.6	832.8	0.3
Water	0.1	0.2	0.7	785.5	0.5
Total	43.8	100.0			

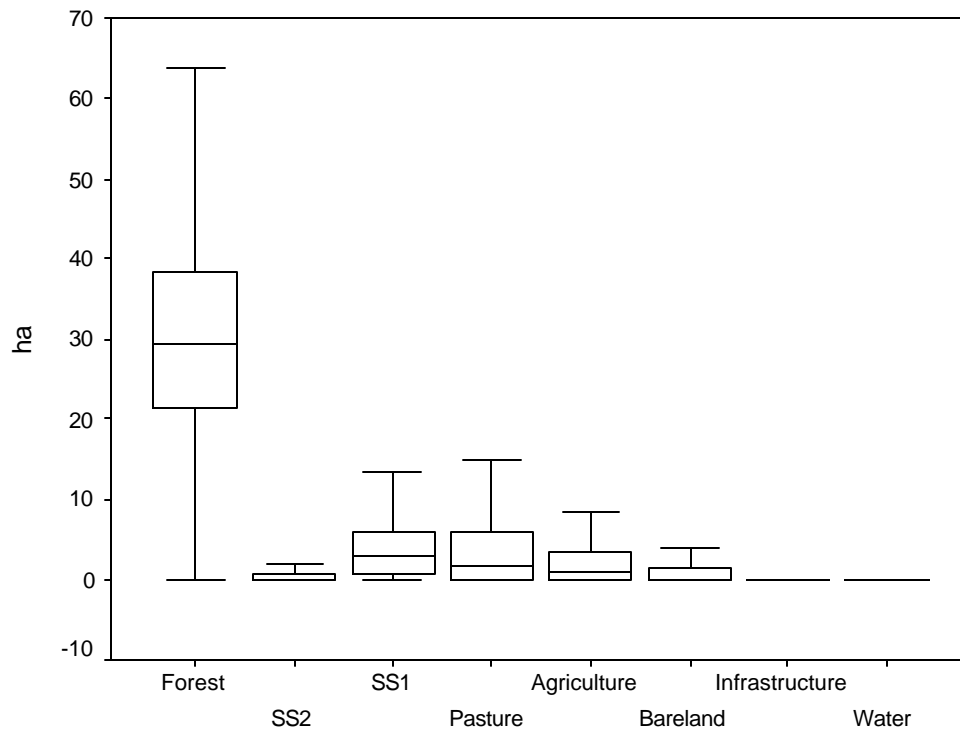


Figure 65 - LULC boxplots for properties of Machadinho d'Oeste in 1994.

Table 19 - LULC statistics for properties of Machadinho d'Oeste in 1998.

	MEAN AREA (ha)	MEAN PERCENT	STANDARD DEVIATION (ha)	STANDARD DEVIATION (%)	VARIANCE
Forest	23.5	53.8	15.2	64.5	230.2
SS2	1.8	4.0	2.5	139.8	6.0
SS1	6.7	15.3	6.8	102.0	46.6
Pasture	5.9	13.4	8.8	150.0	77.7
Agriculture	4.4	10.0	5.2	117.5	26.6
Bareland	1.3	3.1	3.1	229.4	9.4
Infrastructure	0.1	0.2	1.0	1451.8	1.0
Water	0.1	0.3	0.7	622.2	0.5
Total	43.8	100.0			

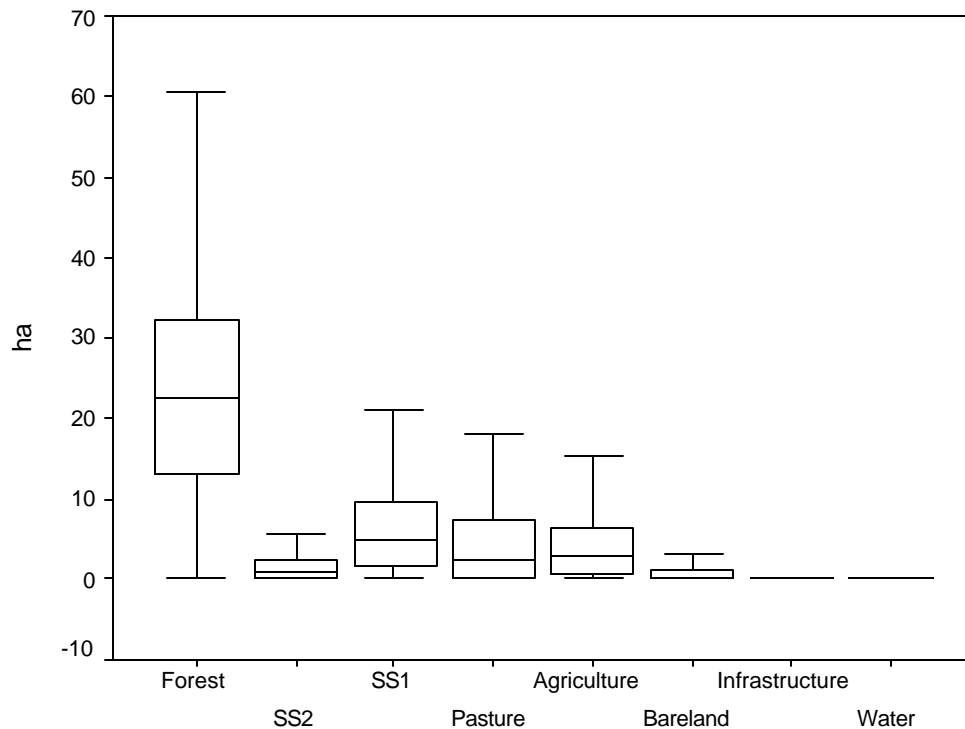


Figure 66 - LULC boxplots for properties of Machadinho d'Oeste in 1998.

Table 20 - LULC statistics for properties of Vale do Anari in 1988.

	MEAN AREA (ha)	MEAN PERCENT	STANDARD DEVIATION (ha)	STANDARD DEVIATION (%)	VARIANCE
Forest	44.5	89.0	7.3	16.5	53.9
SS1	0.7	1.3	1.5	224.8	2.1
Pasture	2.8	5.6	4.0	141.7	15.9
Agriculture	1.4	2.7	2.1	153.5	4.4
Bareland	0.4	0.8	1.2	299.3	1.5
Infrastructure	0.2	0.4	0.5	245.0	0.2
Water	0.1	0.1	0.3	539.1	0.1
Total	50.0	100.0			

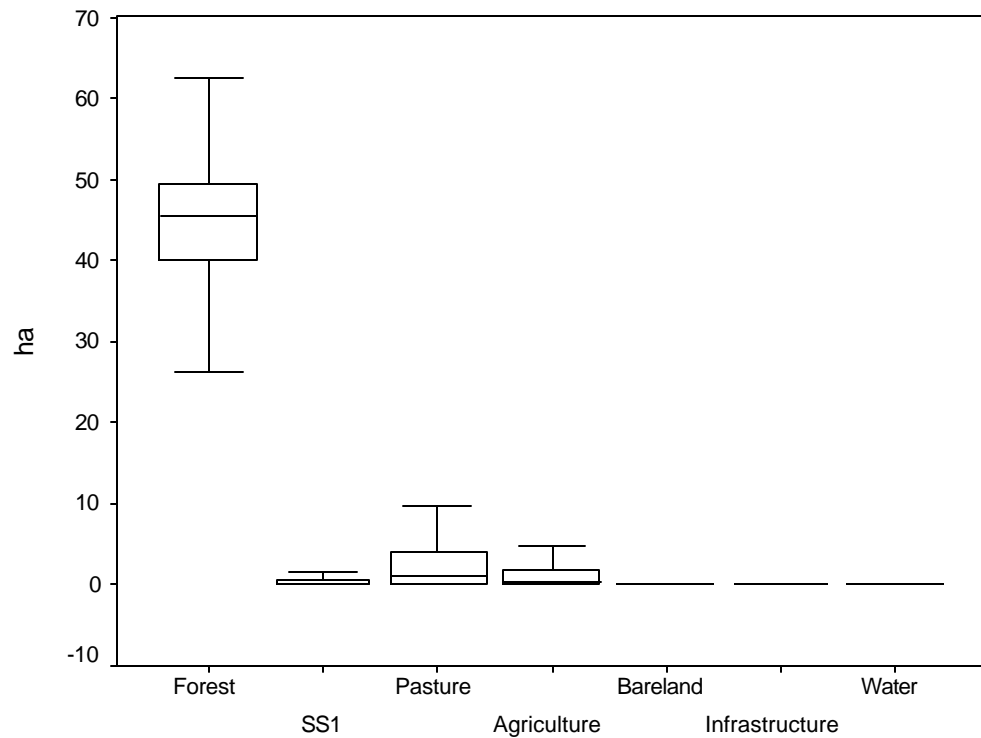


Figure 67 - LULC boxplots for properties of Vale do Anari in 1988.

Table 21 - LULC statistics for properties of Vale do Anari in 1994.

	MEAN AREA (ha)	MEAN PERCENT	STANDARD DEVIATION (ha)	STANDARD DEVIATION (%)	VARIANCE
Forest	35.9	71.7	11.4	31.8	130.6
SS2	0.6	1.3	1.1	174.4	1.3
SS1	3.2	6.3	4.1	128.5	16.5
Pasture	5.4	10.8	7.0	130.3	49.3
Agriculture	2.8	5.5	3.5	127.6	12.5
Bareland	1.9	3.8	3.6	189.0	12.9
Infrastructure	0.2	0.4	0.5	244.7	0.2
Water	0.1	0.2	0.5	538.1	0.2
Total	50.0	100.0			

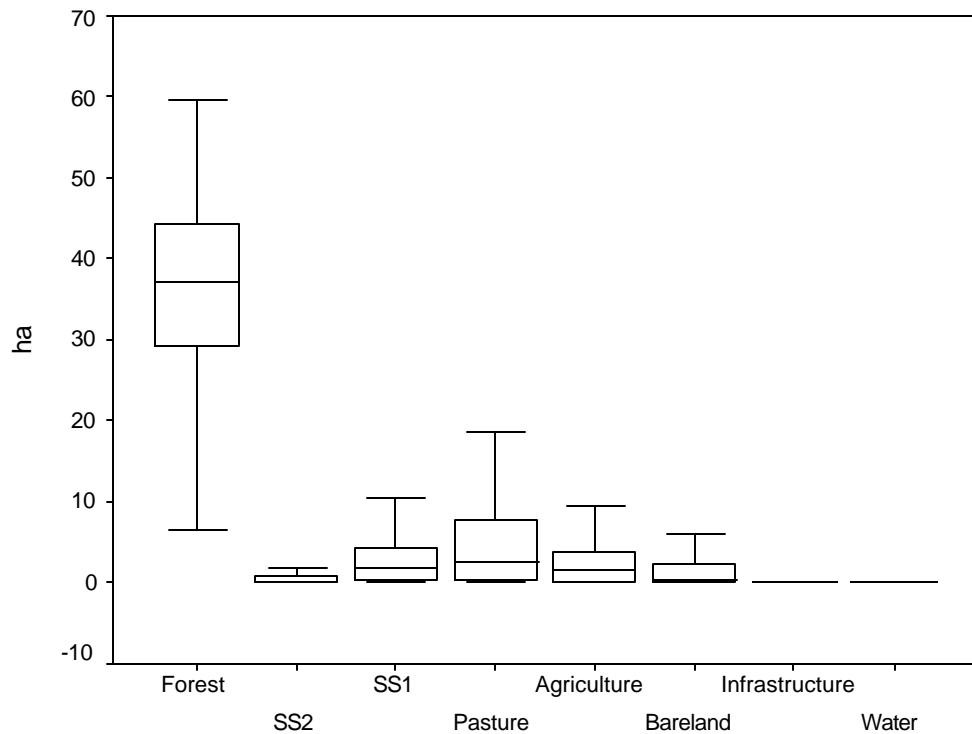


Figure 68 - LULC boxplots for properties of Vale do Anari in 1994.

Table 22 - LULC statistics for properties of Vale do Anari in 1998.

	MEAN AREA (ha)	MEAN PERCENT	STANDARD DEVIATION (ha)	STANDARD DEVIATION (%)	VARIANCE
Forest	27.1	53.6	12.6	46.6	159.5
SS2	2.3	4.5	3.1	136.6	9.6
SS1	6.3	12.5	6.1	95.7	36.8
Pasture	8.1	16.0	9.4	116.1	87.8
Agriculture	5.2	10.3	5.0	96.5	25.4
Bareland	1.3	2.5	2.8	214.0	7.6
Infrastructure	0.2	0.3	0.5	279.2	0.2
Water	0.1	0.2	0.4	459.0	0.1
Total	50.0	100.0			

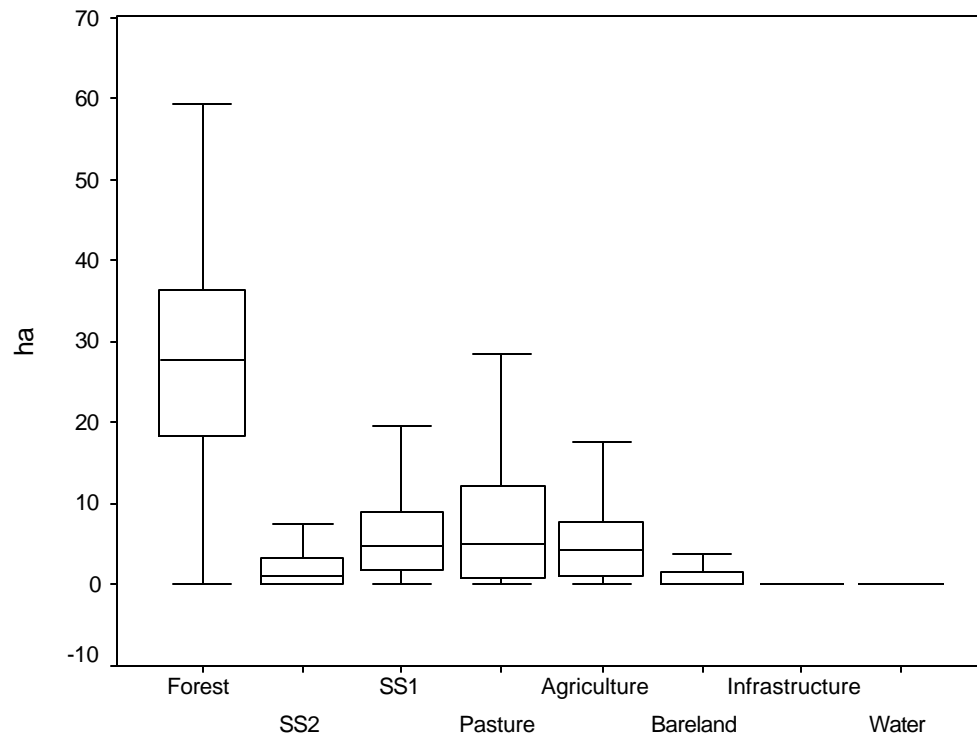


Figure 69 - LULC boxplots for properties of Vale do Anari in 1998.

Table 23 - Rates of deforestation in Machadinho d'Oeste and Vale do Anari until 1998.

Deforestation	MACHADINHO D'OESTE		VALE DO ANARI	
	% per year	ha/year	% per year	ha/year
Before 1988	2.4	1.1	1.6	0.8
1988 - 1994	3.1	1.3	2.9	1.4
1994 - 1998	3.9	1.7	4.5	2.2

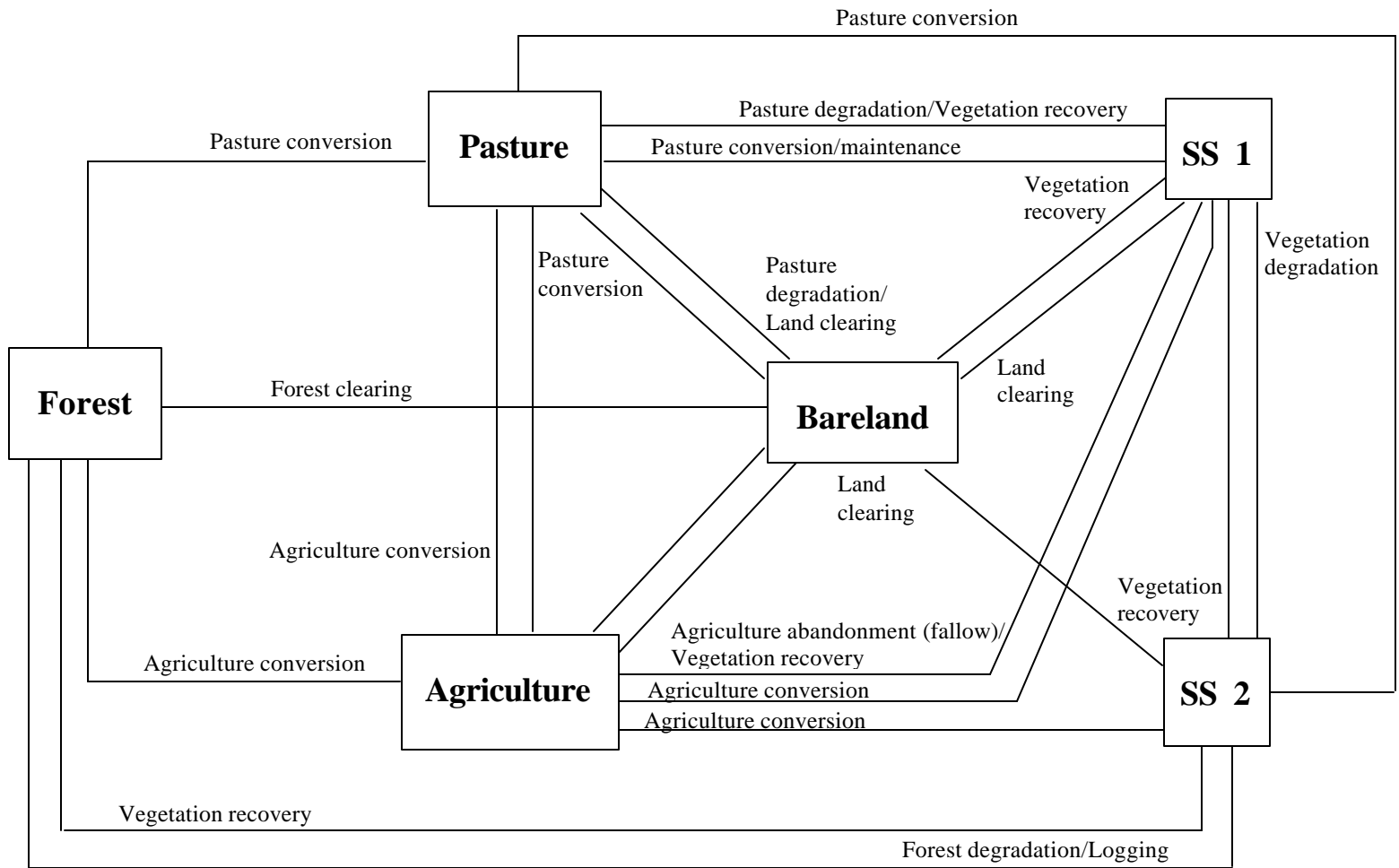


Figure 70 - Trajectories of Land Use/Land Cover in Machadinho d'Oeste and Vale do Anari until 1998.

Table 24 - Pearson correlation between forest cover and selected LULC classes in farm lots of Machadinho d'Oeste and Vale do Anari.

	MACHADINHO D'OESTE				VALE DO ANARI			
	SS1	Pasture	Agriculture	Bare	SS1	Pasture	Agriculture	Bare
1988	-0.039*	-0.182**	-0.077**	-0.126**	-0.179**	-0.618**	-0.390**	-0.274**
1994	-0.225**	-0.425**	-0.271**	-0.172**	-0.384**	-0.700**	-0.499**	-0.394**
1998	-0.239**	-0.434**	-0.280**	-0.160**	-0.388**	-0.626**	-0.367**	-0.131**

** Correlation is significant at the 0.01 level (2-tailed)

* Correlation is significant at the 0.05 level (2-tailed)