

AGRICULTURAL POLLUTION CONTROL PROJECT

DESIGN OF AGRO-FORESTRY PROGRAM

March, 2001

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An important role in fighting pollution from agricultural sources is led by agro-forestry, which as a scientific term was first adopted by ICRAF (International Council for Research in Agro-forestry, founded in 1977, with headquarters in Nairobi-Kenya).

The term agro-forestry was best defined by IUFRO (International Union of Forestry Research Organizations), as being the totality of land use systems, that, integrate trees or other wood-based perennial vegetation with crop and/or livestock production, on the same land surface unit.

Main characteristics of such systems are:

- The will to establish or to maintain agro-forestry systems, as they require protection and maintenance
- The possibility to associate trees and agriculture in space (horizontally or vertically) and time
- Significant, positive economic and ecological interconnections, occurring between the two levels: the trees and the grass cover underneath; more complex than the mono-crops, these associations were often ignored by modern agriculture
- Versatility, mostly for trees (fuel wood, industrial raw material, fruit source, landscape diversity, leisure spots etc.)
- Important social and cultural role in many societies, as they were among the first forms of human settlement development

This relatively new discipline classifies worldwide practiced systems according to the agricultural practices associated with trees and shrubs:

- A. Forestry and pasture systems-** integrated wood and livestock production, comprising: trees and shrubs grown for different purposes, within pastureland areas; windbreaks and fodder vegetation
- B. Agro-forestry and pasture systems-** integrated wood, crop and livestock production, including vegetable gardens, trees, various field crops, animal farms, fodder vegetation which consolidates soil structure etc.
- C. Agro-forestry systems-** integrated wood and agricultural production, comprising: trees and shrubs cultivated within cropped land areas; crops cultivated between tree rows; unproductive land improved by special crop cultivation; windbreaks/ shelterbelts; narrow vegetative barriers etc.
- D. Other systems-** multi-purpose tree plantations

As regarding the situation in Romania and in Calarasi county in particular, one can state that with very few exceptions, there are no current agro-forestry practices. One exception is represented by

RICIC-Fundulea, where following a fruitful co-operation with the local forestry specialists, a shelterbelt was installed, comprising trees (oaks, poplars, cornel trees, acacia trees), fruit trees, fruit shrubs, medicinal plants, grass strips, vegetables etc. Due to the fact that this shelterbelt is still within its first years following installation, no significant conclusion may yet be reached. It is customary among the Calarasi county “ocoale silvice”¹ to cultivate various crops, vegetables, water melons among the individual, 1 to 3 year old saplings of young plantations. In fact, at present in Romania there is no agro-forestry university discipline or specialization, all relevant information being compiled from foreign specialized literature (British, American, French).

For the case of Calarasi county, the project aims to implement agro-forestry practices within areas of 7 communes:

- Alexandru Odobescu
- Ciocanesti
- Cuza Voda
- Gradistea
- Independenta
- Vilcelele
- Vlad Tepes

All these administrative units comprise both terrace and polder (Boianu-Sticleanu) areas, with different soil types and current agricultural practices.

The following criteria were considered for the selection of areas where agro-forestry practices are to be applied:

- Uneven terrain, with small or relatively large depressions
- Areas which may be flooded or land subject to temporary waterlogging, due to variation of Danube river levels
- Eroded or potentially erodable areas
- Low productivity agricultural land
- Canal, stream or reservoir banks
- Inadequate crop growing micro-climate conditions (strong winds, frequent droughts, early frost etc.)
- Special agricultural areas (high value crops, seed production parcels etc.)
- Land affected by chemical, industrial or agricultural pollution
- Scarce fuel wood resources
- Reduced biodiversity
- Constant need for new revenue sources
- Fishing & hunting facilities
- Land use historical background

Among the four systems mentioned above, I consider that for the project area (seven communes located throughout Calarasi county), the following agro-forestry practices can be applied:

1. crops cultivated in-between sapling rows
2. narrow vegetative barriers, in the vicinity of community grazing and pasture land

¹ Ocoale silvice = forestry O&M territorial branch units

3. windbreaks/shelterbelts constituted both of trees and of fruit trees, medicinal plants, vegetables etc.
4. filter strips installed in-between cultivated land parcels or even within a single parcel

By analyzing and discussing the options of implementing these agro-forestry practices, with Mayors of project area communes, the following table was compiled:

Table 1: Tree planting areas on the comunas land

Unit	Commune name							Total
	Alex. Odobescu	Ciocanesti	Cuza Voda	Gradistea	Independenta	Vilcele	Vlad Tepes	
ha	100	105	60	25	77	21	40	428

Recommended tree species to be planted on these land surfaces are as follows:

- for Alex.Odobescu, acacia, bird cherry (*Prunus padus*), honey locust;
- for Ciocanesti, 5 ha with white willow (*Salix alba*) and 100 ha with acacia, bird cherry and honey locust;
- for Cuza Voda, acacia, bird cherry and honey locust;
- for Gradistea, 5 ha with white willow;
- for Independenta, acacia, bird cherry and honey locust;
- for Vilcelele, acacia, bird cherry and honey locust; here, the shelterbelt which will surround the communal grazing field, would include species like privet (*Ligustrum vulgare*), fruit trees, fruit shrubs, medicinal plants;
- for Vlad Tepes, acacia, bird cherry and honey locust; this plantation perimeter will be marked through a hip rose tree (*Rosa Canina*) live barrier, aimed to prevent access of domestic animals;

For the agricultural commercial societies, the following areas are proposed to be planted:

- for Agrozootehnica Mircea Voda, 150 ha with Euro-American poplar, white poplar (*Populus alba*) and white willow;
- for Ceres S.A Ciocanesti, 840 ha with the same species;
- for Agroservcom Gradistea, 100 ha with Euro-American poplar, white poplar and white willow;
- for S.C Prodchim S.R.L Cuza Voda, the existing windbreaks are to be extended on 4 more ha, using species like acacia, honey locust, may tree (*Crataegus*), sloe tree (*Prunus spinosa*), fruit trees & shrubs etc.

For the polder area however, a pedological survey on soil profiles is required, before recommending any tree species (for this, water table level variations and soil carbonate content are very important information).

Table 2: Tree Planting Program in Boianu-Sticleanu Polder

- ha -

Area	PY1	PY2	PY3	PY4	PY5	Total
Mircea Voda	10	15	40	40	45	150
Ciocanesti	10	50	150	250	380	840
Gradistea	10	15	20	25	30	100
Total	30	80	210	315	455	1090

The relatively large total area suggested to be planted with trees (approx. 1,500 ha), would have to be scheduled in time, so that the necessary saplings can be made available along with the machinery required for soil bed preparation, hole digging and husbandry of young plantations.

The following tree planting program (in hectares) is proposed for the terrace area:

Table 3: Tree Planting Program in Terrace Area

Comuna	PY1	PY2	PY3	PY4	PY5	Total
Al Odobescu	5	15	20	25	35	100
Ciocanesti	10	10	15	20	50	105
Cuza Voda	5	10	10	15	20	60
Gradistea	5	5	5	5	5	25
Independenta	7	10	15	20	25	77
Vilcelele	7	7	7	0	0	21
Vlad Tepes	5	10	10	15	0	40
Total	44	67	82	100	135	428
S.C. Total Chim	1	1	1	1	0	4
TOTAL	45	68	83	101	135	432

Although not immediately evident, the effect of these agro-forestry measures can be manifested through a series of benefits:

A. ecological benefits:

- alleviation of negative climate components (strong winds, extreme temperatures, excessive droughts etc.)
- soil erosion resistance, decrease of waterlogging potential, landslide resistance
- water quality conservation, by preventing nitrates' access to streams
- crop protection through evapo-transpiration limitation, breaking cold air masses, pest chain interruption etc.
- making good use of solar radiation by gradual tree species' growing and "floor by floor" vegetation arrangement within each plantation
- soil fertility potential rehabilitation (branches and various debris falling on the ground etc.)
- soil structure improvement (augmentation of micro-organisms which decompose organic matter and consequent root system diversification)

B. Economic benefits:

- increased number of vegetable produce (fuel wood, fruits, flowers etc.)

- incremental agricultural yields, induced by the neighbouring shelterbelts
- reduced plantation maintenance costs

C. Social benefits:

- diversification of human activities, by practicing new jobs (wood processing, harvesting and selecting medicinal plants, harvesting wood berries and seeds, beehive keeping etc.)
- ensuring sufficient wood resources, both for fuel and for rural construction purposes

D. Other benefits:

- improving biodiversity by utilizing a wide range of tree species;
- improving local landscape and scenery;
- creating favourable, wildlife food and cover conditions;

Negative impact:

- land to be occupied by shelterbelts, narrow vegetative barriers, filter strips etc. would subsequently be lost from the agricultural circuit (some profit loss would be recorded, though not possible to be quantified at this stage)
- quality of wood material in trees to be planted in-between crops, cannot be yet ascertained

The negative impact may be countered by ensuring good quality wood and by finding adequate means to compensate for the economic loss generated by the land use transfer.

Reforestation schemes and arrangements:

In the polder area, the following species would be used, arranged in accordance with the following recommended schemes and located in favourable spots (from the geomorphology, soil, surface and underground waters point of view):

1. Euro-American poplar- with a density of 625 saplings per hectare; arrangement scheme- 4 by 4 (distance between two consecutive saplings- 4m; distance between two rows- 4m).

2. White poplar- with a density of 1,670 saplings per hectare; arrangement scheme- 3 by 2 (distance between two consecutive saplings- 3m; distance between two rows- 2m).

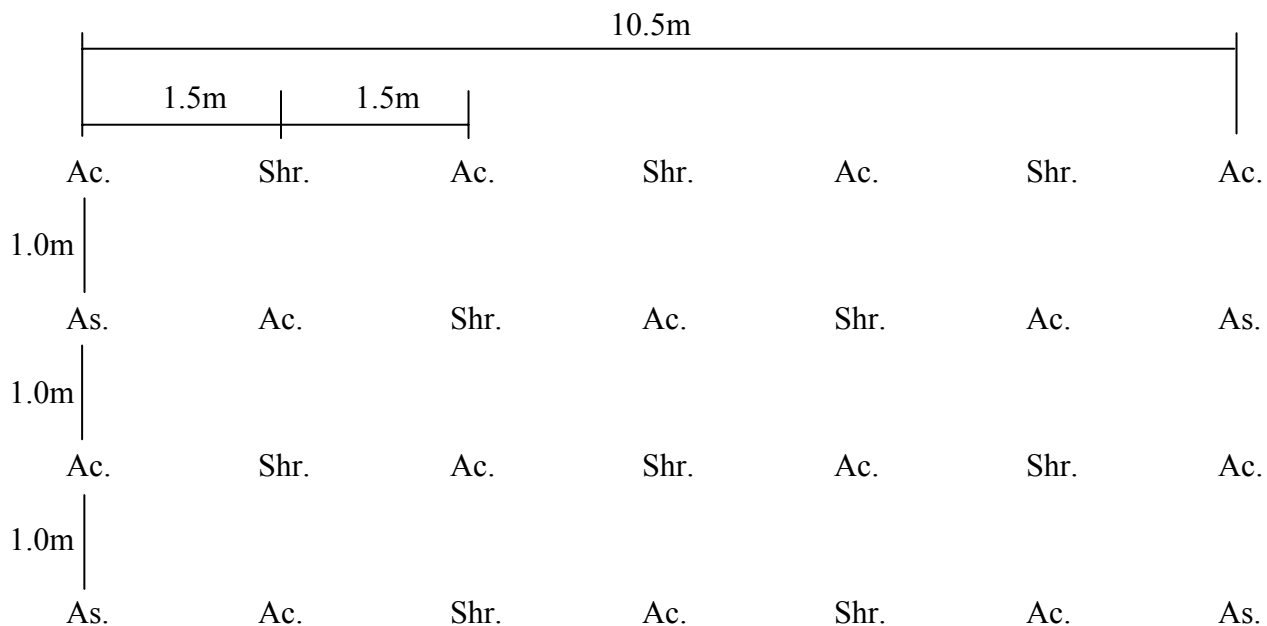
3. White willow- with a density of 1,250 saplings per hectare; arrangement scheme- 4 by 2 (distance between two consecutive saplings- 4m; distance between two rows- 2m).

In the lower, terrace area, acacia plantations would be instituted, in combination with bird cherry (*Prunus padus*) and honey locust (*Gleditsia triacanthos*), according to the following arrangement scheme:

70% acacia + 20% honey locust + 10% bird cherry- with a density of 5,000 saplings per hectare; arrangement scheme 2 by 1; there will be 40% acacia, followed by 10% honey locust, followed by 30% acacia, in turn followed by 10% honey locust and finally 10% bird cherry.

5. The windbreaks (shelterbelts) would consist of :

5a. Main windbreaks, positioned perpendicular to the direction of the dominant wind (in our case, the NW-SE axis). These windbreaks will be 10.5 m wide, consisting of seven rows of saplings, arranged in the 1.50 by 1.00 scheme, with a density of 6,666 saplings per hectare. The arrangement would contain 50% acacia + 14.3% ancillary species* + 35.7% shrub species, distributed as follows:



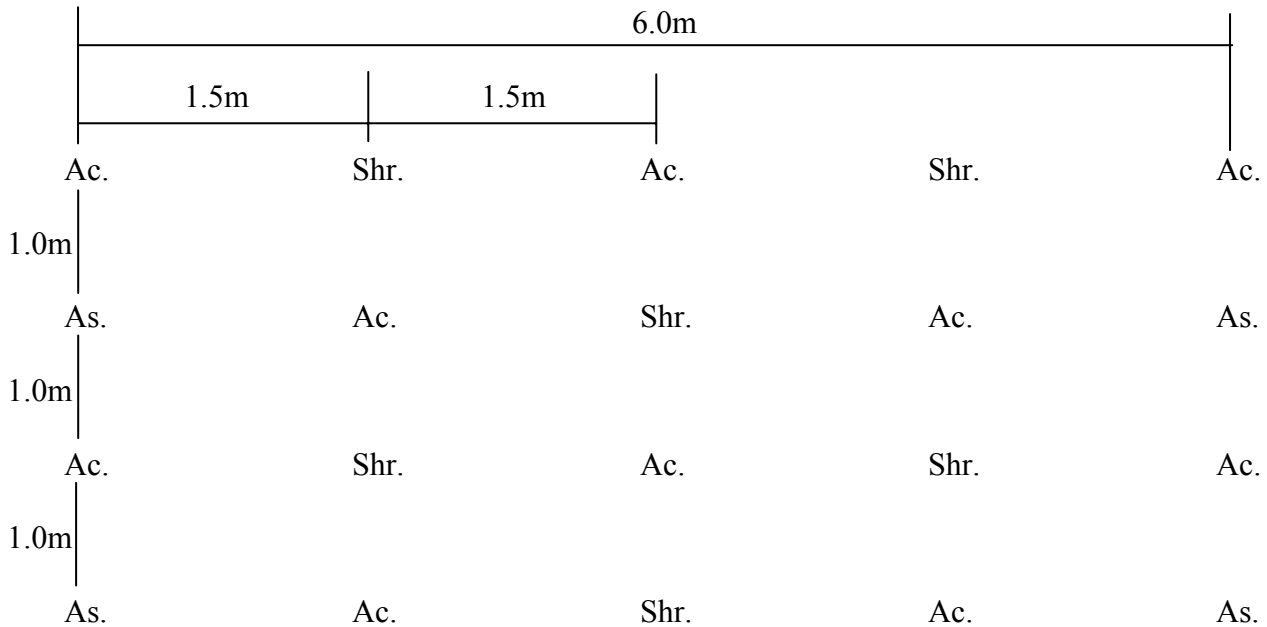
Where: Ac.= acacia; Shr.= shrub species; As.= ancillary species

As shrub species, one can use hawthorn (*Crataegus monogyna*), hip rose (*Rosa canina*), privet (*Ligustrum vulgare*), etc.

* ancillary species- linden tree, common maple (*Acer campestre*), *Acer tataricum* etc.

5b. Secondary windbreaks, of smaller width, to be positioned perpendicular to the main windbreaks; these include three to five rows of the following species, arranged in a 1.50 by 1.00 scheme, as below:

5b1.

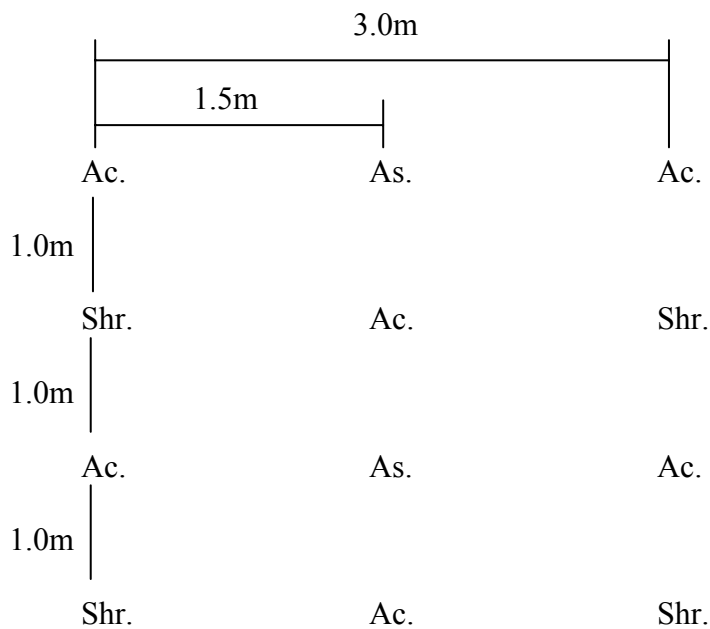


Where: Ac.= acacia; Shr.= shrub species; As.= ancillary species;

The arrangement will comprise 50% acacia + 20% ancillary species + 30% shrub species, having a density of 6,666 saplings per hectare.

5b2. Secondary windbreaks, that include three rows of the following species, arranged in a 1.50 by 1.00 scheme, with a density of 6,666 saplings per hectare:

50% acacia + 16.7% ancillary species + 33.3% shrub species



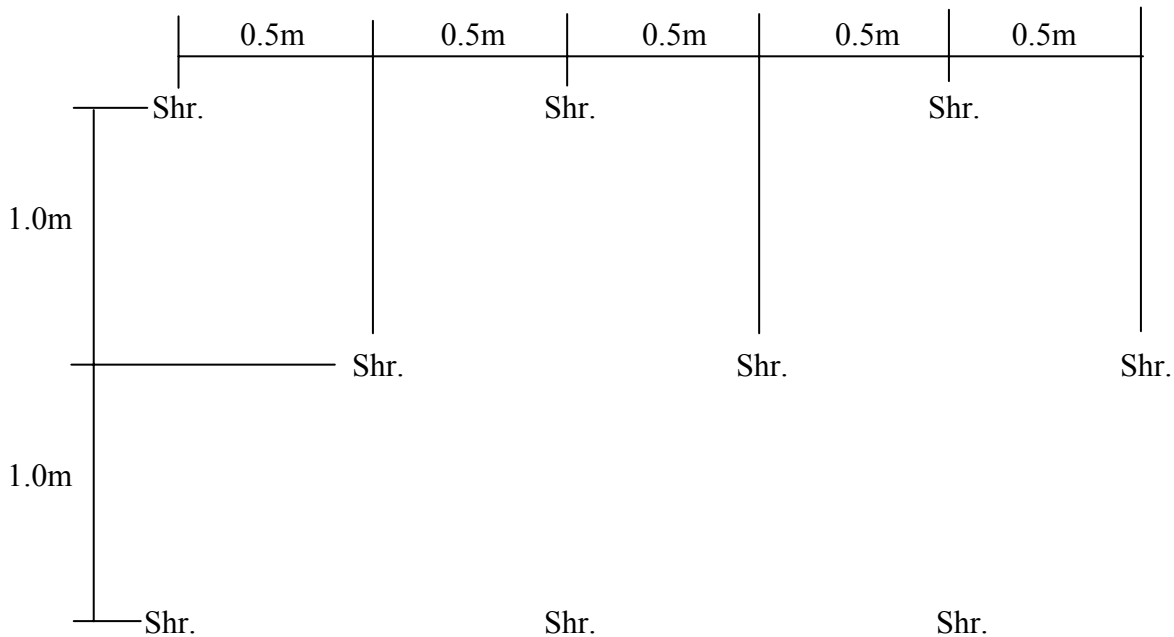
Where: Ac.= acacia; As.= ancillary species; Shr.= shrub species

6. Narrow vegetative barriers:

comprising two or three rows of shrubs or fruit trees, such as: privet (*Ligustrum vulgare*), hip rose (*Rosa canina*), blackthorn (*Prunus spinosa*), apricot tree (*Prunus armeniaca*), peach tree (*Prunus persica*), etc. These barriers can consist of a single species (pure) or can be a mixture of several species of shrubs or trees.

Planting composition may be 100% privet, or 100% hip rose, or 100% blackthorn, arranged in a 1.00 by 1.00 scheme (or even 0.75 by 0.75), as follows:

6a. Pure barriers (1.00 by 1.00 scheme):



6b. Mixed barriers (0.75 by 0.75 scheme):

Shr.1	Shr.2	Shr.1
Shr.2	Shr.1	Shr.2
Shr.1	Shr.2	Shr.1

Where: Shr.1, Shr.2 = shrub species, such as *Crataegus monogyna*, *Rosa canina*, *Ligustrum vulgare*, etc.

Number of saplings per hectare, for the 1.00 by 1.00 scheme = 10,000

Number of saplings per hectare, for the 0.75 by 0.75 scheme = 17,777

Number of saplings per hectare, for the 1.00 by 0.75 scheme = 13,333

7. Riparian buffers:

These will consist of rows of trees, shrubs or grass vegetation, planted along the streamsides, with the purpose of intercepting contaminants from both surface and ground waters before they reach the stream. For this role, hydrophilic vegetation (such as the white willow) as well as deep root species-

for bank stabilization (like sea buckthorn- *Hippophae rhamnoides*; *Elaeagnus angustifolia*; lilac- *Syringa vulgaris*; privet- *Ligustrum vulgare*; cornel tree- *Cornus mascula*, etc.) would be utilized. Willow species can be planted using the 3 by 2 scheme, with a 1,666 saplings per hectare density and the others, utilizing the 1.5 by 1.0 scheme, with 6,666 saplings per ha.

8. Cultivated strips: these are rows of herbaceous vegetation, that are cultivated in-between the main crops, with a similar purpose to that of shelterbelts.

In order to ensure real implementation of agro-forestry practices proposed under this project, I suggest that the following issues should also be considered:

- a. accurate measurement of all areas that are envisaged to foster agro-forestry practices
- b. out-carrying of pedological soil profile surveys, especially within the polder area, where conditions vary a lot on relatively small land surfaces
- c. ensuring adequate supply of necessary inputs (saplings, grass seeds of proper quality, etc.), by involving the corresponding MAFF (Ministry of Agriculture, Food and Forests) agencies
- d. provision of training, by forestry specialists and by qualified agronomists, prior to any agro-forestry practice installation
- e. permanent monitoring of the project objectives, during the entire five year period, by qualified personnel (forestry specialists and experienced agronomists)
- f. setting up and implementing adequate management of the proposed agro-forestry practices, soon after their commissioning, consisting of:
 - the system of forestry husbandry operations, to be performed taking into account the age of each plantation
 - the adequate pest control measures (if required)
 - the most effective security measures deemed necessary, in order to avoid damage by fire or by stealing
 - an efficient system of harvesting and selling the various produce obtained (wood mass, fruits, flowers, green mass, etc.)
 - the establishment of a viable system, able to measure and quantify the favourable effects induced by the project agro-forestry practices upon crops, soils in the area, local climate, surface and ground waters, etc.

It is worth emphasizing that in selecting candidate tree species for the project terrace area, several shrub species were eliminated, as these represent intermediate hosts for agricultural crop pests, in spite of possessing good forestry properties:

1. *Dracila Berberis Vulgaris* – serves as intermediate host for the wheat blast/blight (*Puccinia graminis*)
2. Stag thistle (*Rhamnus cathartica*) leaves are favourable spots for the wheat and oats blast
3. Cornel tree /bloody twig (*Cornus mascula*) is a host for the green tree louse
4. *Evonymus verucosa* fosters the sugar beet louse
5. Hawthorn/hedgethorn (*Crataegus monogyna*) serves as intermediate host for several fruit tree pests

Taking into account the forestry sector potential to supply the necessary saplings, as well as the capacity of Local Councils and commercial societies to undertake agro-forestry works, the total area proposed for reforestation was scheduled for the interval 2001-2005, starting with 75 ha in 2001 and culminating with 590 ha in 2005 (see table no.4), of which 1,090 ha in the polder and 432 ha in the terrace.

Agro-forestry measures to be implemented in this period are detailed in table no.4, as follows:

1. Crops cultivated in-between tree plantations, on 1,469 ha, of which 1,090 ha in the polder and 432 ha in the terrace area
2. windbreaks/shelterbelts on 18 ha in the terrace area
3. hedgerows on 15 ha in the terrace area
4. narrow vegetative barriers on 30 ha in the polder area
5. filter strips on 15 ha in the polder area
6. riparian buffers on 20 ha in the terrace area

Table 4: Agro-Forestry practices scheduled for implementation during 2001-2005

- ha -

Practice	Year					Total
	2001	2002	2003	2004	2005	
Tree planting	59	140	284	406	580	1469
Windbreaks/shelterbelts	15	1	1	1	-	18
Hedgerows	1	2	3	4	5	15
- Narrow vegetative barriers*	2	4	6	8	10	30
- Filter strips*	1	2	3	4	5	15
Riparian buffers	-	5	5	5	5	20
TOTAL	75	148	293	416	590	1522

* included in total Tree planting

Table no.5 shows specific investment values for each scheduled year and the totals.

One can easily notice from this table that the most expensive to install are the windbreaks, followed closely by the acacia plantations.

Table 5: Investment costs per hectare brokedown on tree species for the proposed Agro-Forestry Practices

- thousand ROL -

Species/Practice	Year					Total
	2001	2002	2003	2004	2005	
Euro-American poplar	4,900	2,900	1,100	1,100	1,000	11,000
White poplar	11,200	3,300	1,100	1,100	1,000	17,700
White willow	9,400	3,200	1,100	1,100	1,000	15,900
Acacia	10,400	6,000	2,000	-	-	18,400
Windbreaks/shelterbelts	19,200	7,300	-	-	-	26,500
Hedgerows	9,000	4,000	-	-	-	13,000
Riparian buffers	10,400	6,000	2,000	-	-	18,400

In view of the afore presented plantation schemes and taking into consideration the requirement of each species, the total number of saplings needed was calculated to be of 3,073,162 for the whole project duration (2001-2005), as seen in table no.6.

Table 6: Schedule of saplings' requirement for the 2001-2005 interval
- thousand pcs. -

Species	Year					Total
	2001	2002	2003	2004	2005	
Acacia	122.333	220.333	272.833	335.833	455	1,406.332
Euro-American poplar	18.75	31.25	100	162.5	231.25	543.75
White poplar	-	41.75	66.8	75.15	125.5	308.95
White willow	12.5	6.25	12.5	12.5	12.5	56.25
Honey locust	34.0	62.0	77.0	95.0	130.0	398.0
Bird cherry (Prunus Padus)	17.0	31.0	35.5	47.5	65.0	196.0
Ancillary species	1.0	13.5	13.5	13.5	12.5	54.0
Shrubs	2.38	15.0	15.0	15.0	12.5	59.88
Hip rose (Rosa Canina)	10.0	10.0	10.0	10.0	10.0	50.0
TOTAL	211.963	431.083	603.133	766.983	1,054.25	3,073.162

Table no.7 details the required investment funds, relevant to the installation of project agro-forestry practices, the total being an estimated 762,309 US\$. (The exchange rate used 1US\$ = 25,500 ROL)

Table 7: Investment funds required for the implementation of proposed Agro-Forestry practices during 2001-2005
- thousand ROL -

Starting year	Year					Total
	2001	2002	2003	2004	2005	
2001	613,800	330,300	112,000	44,000	40,000	1,140,100
2002	0	1,288,000	652,800	222,000	88,000	2,250,800
2003	0	0	2,198,000	1,127,300	395,000	3,720,300
2004	0	0	0	2,931,200	2,141,800	5,073,000
2005	0	0	0	0	4,151,000	4,151,000
Total	613,800	1,618,300	2,962,800	4,324,500	6,815,800	16,335,200
VAT (19%)	116,622	307,477	562,932	821,655	1,295,002	3,103,688
Grand Total	730,422	1,925,777	3,525,732	5,146,155	8,110,802	19,438,888

These costs do not include training expenses relevant to the personnel that will transport, handle, plant and husband the newly installed saplings, nor the cost of supervising these activities, by qualified agronomists and forestry specialists.

ANNEXES

**Necessary funds for the Planting Program in
ALEXANDRU ODOBESCU communa**

Planting scheme: 70% acacia + 20% honey locust + 10% bird cherry = 100 ha

Planting commencing year	Necessary funds in					thousand ROL
	2001	2002	2003	2004	2005	Total
2001	52,000	30,000	10,000	0	0	92,000
2002	0	156,000	90,000	30,000	0	276,000
2003	0	0	208,000	120,000	40,000	368,000
2004	0	0	0	260,000	150,000	410,000
2005	0	0	0	0	364,000	364,000
Total	52,000	186,000	308,000	410,000	554,000	1,510,000

**Necessary funds for the Planting Program in
CIOCANESTI communa**

Planting scheme: 70% acacia + 20% honey locust + 10% bird cherry = 100 ha

thousand ROL

Planting commencing year	Necessary funds in					Total
	2001	2002	2003	2004	2005	
2001	52,000	30,000	10,000	0	0	92,000
2002	0	104,000	60,000	20,000	0	184,000
2003	0	0	156,000	90,000	30,000	276,000
2004	0	0	0	208,000	120,000	328,000
2005	0	0	0	0	520,000	520,000
Total	52,000	134,000	226,000	318,000	670,000	1,400,000

Planting scheme: White willow (Salix Alba) = 5 ha

thousand ROL

Planting commencing year	Necessary funds in					Total
	2001	2002	2003	2004	2005	
2001	47,000	16,000	5,500	5,500	5,000	79,000
Total	47,000	16,000	5,500	5,500	5,000	79,000

**Necessary funds for the Planting Program in
CUZA VODA communa**

Planting scheme: 70% acacia + 20% honey locust + 10% bird cherry = 60 ha

Planting commencing year	Necessary funds in					Total
	2001	2002	2003	2004	2005	
2001	52,000	30,000	10,000	0	0	92,000
2002	0	104,000	60,000	20,000	0	184,000
2003	0	0	104,000	60,000	20,000	184,000
2004	0	0	0	156,000	90,000	246,000
2005	0	0	0	0	208,000	208,000
Total	52,000	134,000	174,000	236,000	318,000	914,000

thousand ROL

**Necessary funds for the Planting Program in
GRADISTEA communa**

Planting scheme:

Starting Year 2001 - White Willow (Salix Alba) = 5 ha

Starting Year 2002 - 2005 = 70% acacia + 20% honey locust + 10% bird cherry = 20 ha

Planting commencing year	Necessary funds in					thousand ROL
	2001	2002	2003	2004	2005	Total
2001	47,000	16,000	5,500	5,500	5,000	79,000
2002	0	52,000	30,000	10,000	0	92,000
2003	0	0	52,000	30,000	10,000	92,000
2004	0	0	0	52,000	30,000	82,000
2005	0	0	0	0	52,000	52,000
Total	47,000	68,000	87,500	97,500	97,000	397,000

**Necessary funds for the Planting Program in
INDEPENDENTA communa**

Planting scheme: 70% acacia + 20% honey locust + 10% bird cherry = 77 ha

Planting commencing year	Necessary funds in					thousand ROL
	2001	2002	2003	2004	2005	Total
2001	72,800	42,000	14,000	0	0	128,800
2002	0	104,000	60,000	20,000	0	184,000
2003	0	0	156,000	90,000	30,000	276,000
2004	0	0	0	208,000	720,000	928,000
2005	0	0	0	0	260,000	260,000
Total	72,800	146,000	230,000	318,000	1,010,000	1,776,800

**Necessary funds for the Planting Program in
VALCELELE communa**

Planting scheme: 70% acacia + 20% honey locust + 10% bird cherry = 21 ha

thousand ROL

Planting commencing year	Necessary funds in					Total
	2001	2002	2003	2004	2005	
2001	72,800	42,000	14,000	0	0	128,800
2002	0	72,800	42,000	14,000	0	128,800
2003	0	0	72,800	42,000	14,000	128,800
2004	0	0	0	0	0	0
2005	0	0	0	0	0	0
Total	72,800	114,800	128,800	56,000	14,000	386,400

**Necessary funds for the Planting Program in
VLAD TEPEȘ communa**

Planting scheme: 70% acacia + 20% honey locust + 10% bird cherry = 40 ha

Planting commencing year	Necessary funds in					thousand ROL
	2001	2002	2003	2004	2005	Total
2001	52,000	30,000	10,000	0	0	92,000
2002	0	104,000	60,000	20,000	0	184,000
2003	0	0	104,000	60,000	20,000	184,000
2004	0	0	0	156,000	90,000	246,000
2005	0	0	0	0	0	0
Total	52,000	134,000	174,000	236,000	110,000	706,000

**Necessary funds for the Planting Program in
TOTAL CHIM Commercial Society, communa Cuza Voda**

Planting scheme: 50% acacia + 14.3% ancillary + 35.7% shrubs = 4 ha

thousand ROL

Planting commencing year	Necessary funds in					Total
	2001	2002	2003	2004	2005	
2001	19,200	7,300	0	0	0	26,500
2002	0	19,200	7,300	0	0	26,500
2003	0	0	19,200	7,300	0	26,500
2004	0	0	0	19,200	7,300	26,500
2005	0	0	0	0	0	0
Total	19,200	26,500	26,500	26,500	7,300	106,000

**Necessary funds for the Planting Program in
BOIANU - STICLEANU Polder**

White Willow (Salix Alba) - 35 ha

thousand ROL

Year	Necessary funds in					Total
	2001	2002	2003	2004	2005	
2001	0	0	0	0	0	0
2002	0	47,000	16,000	5,500	5,500	74,000
2003	0	0	94,000	32,000	11,000	137,000
2004	0	0	0	94,000	32,000	126,000
2005	0	0	0	0	94,000	94,000
Total	0	47,000	110,000	131,500	142,500	431,000

Euro-American poplar - 870 ha

Year	Necessary funds in					Total
	2001	2002	2003	2004	2005	
2001	147,000	87,000	33,000	33,000	30,000	330,000
2002	0	245,000	145,000	55,000	55,000	500,000
2003	0	0	784,000	464,000	176,000	1,424,000
2004	0	0	0	1,274,000	754,000	2,028,000
2005	0	0	0	0	1,813,000	1,813,000
Total	147,000	332,000	962,000	1,826,000	2,828,000	6,095,000

White poplar - 185 ha

Year	Necessary funds in					Total
	2001	2002	2003	2004	2005	
2001	0	0	0	0	0	0
2002	0	280,000	82,500	27,500	27,500	417,500
2003	0	0	448,000	132,000	44,000	624,000
2004	0	0	0	504,000	148,500	652,500
2005	0	0	0	0	840,000	840,000
Total	0	280,000	530,500	663,500	1,060,000	2,534,000

Total

Year	Necessary funds in					Total
	2001	2002	2003	2004	2005	
2001	147,000	87,000	33,000	33,000	30,000	330,000
2002	0	572,000	243,500	88,000	88,000	991,500
2003	0	0	1,326,000	628,000	231,000	2,185,000
2004	0	0	0	1,872,000	934,500	2,806,500
2005	0	0	0	0	2,747,000	2,747,000
Total	147,000	659,000	1,602,500	2,621,000	4,030,500	9,060,000

Necessary funds for the Planting Program

Total

thousand ROL
VAT included

Area	Necessary funds in					Total
	2001	2002	2003	2004	2005	
Terrace	555,492	1,141,567	1,618,757	2,027,165	3,314,507	8,657,488
Polder	174,930	784,210	1,906,975	3,118,990	4,796,295	10,781,400
Total	730,422	1,925,777	3,525,732	5,146,155	8,110,802	19,438,888

Of which:

thousand ROL
VAT included

Saplings (20% of Total)

Area	Necessary funds in					Total
	2001	2002	2003	2004	2005	
Terrace	111,098	228,313	323,751	405,433	662,901	1,731,498
Polder	34,986	156,842	381,395	623,798	959,259	2,156,280
Total	146,084	385,155	705,146	1,029,231	1,622,160	3,887,778

thousand ROL

Planting (80% of Total)

VAT included

Area	Necessary funds in					Total
	2001	2002	2003	2004	2005	
Terrace	444,394	913,254	1,295,006	1,621,732	2,651,606	6,925,990
Polder	139,944	627,368	1,525,580	2,495,192	3,837,036	8,625,120
Total	584,338	1,540,622	2,820,586	4,116,924	6,488,642	15,551,110

Necessary funds for the Planting Program - in US\$

Exchange rate: 25,500 ROL/US\$

Saplings (20% of Total) US\$ (VAT included)

Area	Necessary funds in					Total
	2001	2002	2003	2004	2005	
Terrace	4,357	8,953	12,696	15,899	25,996	67,902
Polder	1,372	6,151	14,957	24,463	37,618	84,560
Total	5,729	15,104	27,653	40,362	63,614	152,462

Planting US\$ (VAT included)

Area	Necessary funds in					Total
	2001	2002	2003	2004	2005	
Terrace	17,427	35,814	50,785	63,597	103,985	271,607
Polder	5,488	24,603	59,827	97,851	150,472	338,240
Total	22,915	60,417	110,611	161,448	254,457	609,847