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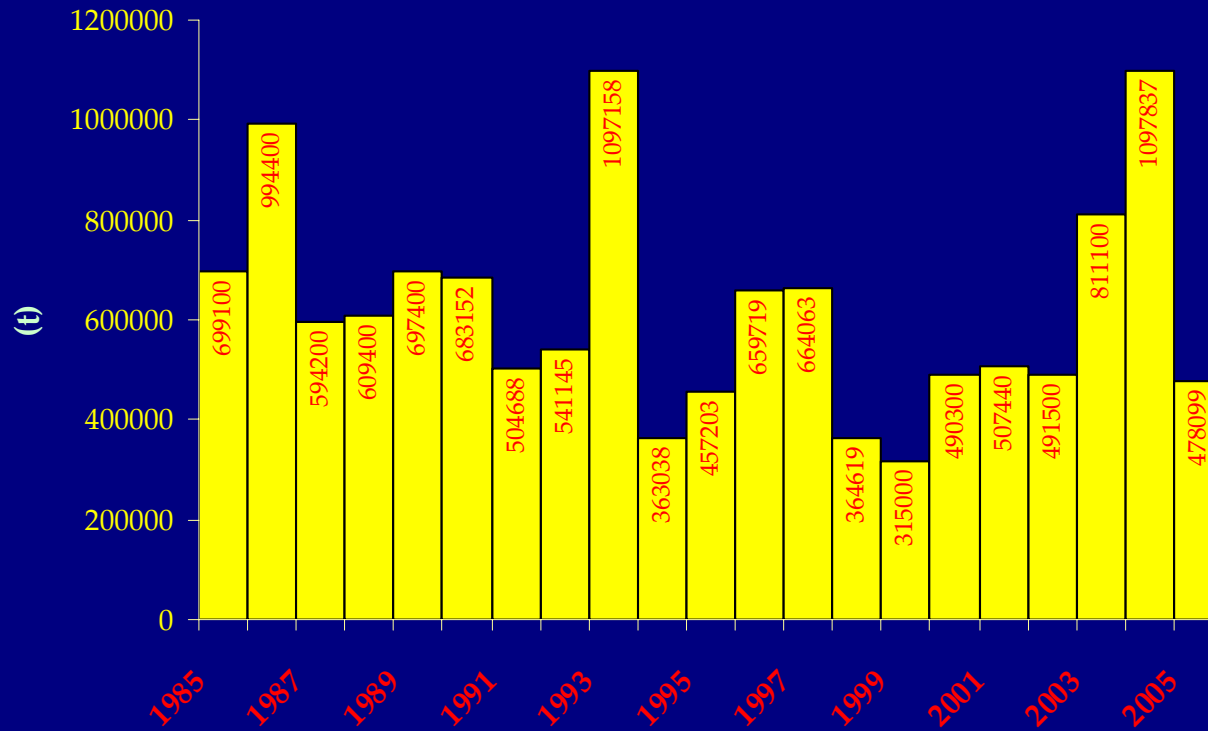
Utilizing of Natural Resources from Romanian Plain for Promoting Apple Organic Culture

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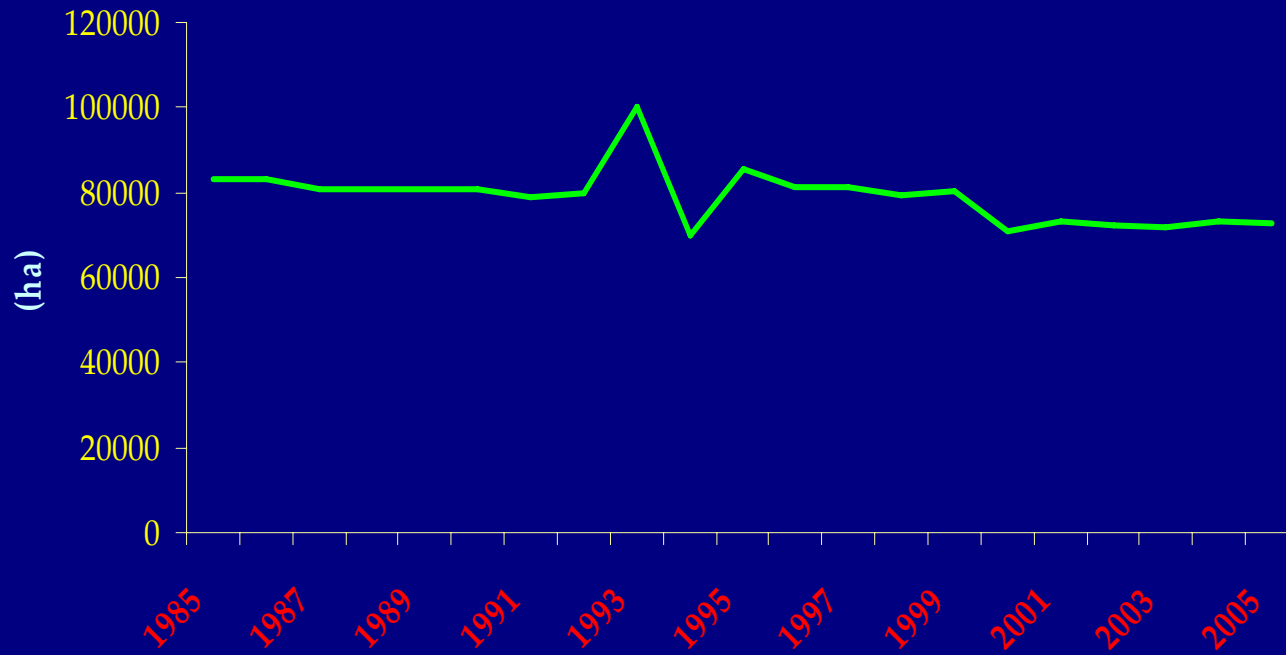
Fruit Growing in Romania

- **Important transformations during last 2 decades:**
 - Reform of land fund and giving back the land to the real owners
 - Large fruit farms splitted between land owners
 - Subsistence farms of 0,1 to 3,0 ha, rarely 5,0 to 10,0 ha
 - Cut off of many orchards including apple ones
 - Decrease of orchard area from 330.000 ha (100.000 ha apple orchards) to less then 220.000 ha (80000 ha of apples) (FaoStat Database, 2005)
 - Apple orchards representing 40% of the total fruit tree orchards in Romania, being the second fruit crop after plum, which has a 45% weight.
 - Apple production decreased

Apple Fruit Production in Romania (FaoStat Database, 2005)



Apple Area Harvested in Romania (FaoStat Database, 2005)



General characteristics of apple culture in Romania

- Apple culture is 80% situated in the subCarpathian hill area, the rest of it is located into the plain areas of the country.
- The river valleys have favorable soils for apple growing.
- On hills the soils are poor, with high clay content and poor drainage.
- The climatic conditions are favorable (9-10 °C annual mean temperatures, 700 – 850 mm annual rainfall, low intensity winds).

Fig. 1. The main relief forms in Romania.



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General characteristics of apple culture in Romania

- The *florae* is rich in *Malus sylvestris* and *Pyrus sylvestris* populations and other wild relatives of fruit crops.
- The *florae* is favorising the development of *Venturia inaequalis*, *Podospaera leucotriha*, *Carpocarpa pomonella*, *Melolontha melolontha*, *Anthonomus pomorum* diseases and pests.

Apple Culture Systems in the subCarpathian hill area

Culture systems	No. of trees/ha	Training systems	Soil maintenance
Conventional intensive type	850-1250	Palmette with oblique branches	Permanently free of weeds through mechanical mobilization
Classical or extensive type	up to 500	Modified Leader and Mixed Pyramid	Covered with multi-annual grasses

Apple cultivar and rootstock assortment

Culture Systems	Cultivars	Rootstocks
Conventional intensive type	'Golden Delicious' 'Jonathan' 'Starkrimson' 'Starking Delicious' 'Roșu de Voinești' 'Delicios de Voinești' 'Wagener Premiat' 'Kalterer Böhmer'	MM 106 M4 MM 111 M9
Classical or extensive type	'Parmain d'Or' 'Jonathan' 'Crețesc de Vâlcea' 'Pătul' 'London Pepping'	Seedling rootstocks: PF 'Crețesc de Vâlcea' PF 'Pătul' <i>Malus sylvestris</i>

Perspectives of apple organic culture in Romania

- During the last decade there is a tendency of extension the apple culture into the plain area from South Romania.
- The intensive system of culture is used (2000 trees/ha).
- The possibility of establishing organic orchards exists because of the areas with superior natural resources comparative with the hill area.
- Several advantages offered by the plain area are:
 - superior soil quality, good fertility and drainage;
 - plan relief, mechanization of culture technology;
 - fusion the land surfaces in order to set up orchards of 10-30 ha;
 - lack of pathogens and related wild species into the flora;
 - short distances to the markets (cities).
- Into the plain area the water is defficitary.
- The annual rainfall is 450-550 mm
- Irrigation is required.

MATERIALS AND METHODS

- The first modern orchards corresponding to organic culture were established into the plain area after the year 2000 near important cities: Bucharest (Sărulești, Moara Domneasă), Ploiești (Valea Călugărească), Craiova (Ghidici). Each of them has more than 10 ha of apples.
- **Cultivars:** ‘Florina’, ‘Generos’, ‘Sir Prize’, ‘Liberty’, ‘Idared’, ‘Starkrimson’, ‘Golden Delicious’
- **Rootstock:** M9
- **Planting distances:** 3,5 m by 1,5 m (1900 trees/ha).
- The trees are supported by three wires disposed on concrete posts.

MATERIALS AND METHODS

- Planting of trees was carried out in mobilized soil (deep ploughing at 60 cm depth and disc) into trenches of 40 to 45 cm deep and in pits.
- **Fertilization:** 40 t/ha manure on entire surface, 20 kg of manure/tree was added (in total, 80 t/ha).
- Every three years 20 t/ha of manure were used as fertilizer on one meter on both sides of the tree rows.
- **Phytosanitary treatments:** two sprayings per year applied in March, at bud break (CuSO_4 , conc. of 1,5%) and in May (CuSO_4 , conc. of 0,5%).

RESULTS AND DISCUSSION

In this paper the first results obtained into a 10 ha organic apple orchard located at Sărulești - Călărași, in the Romanian Plain. The orchard is in the 5th leaf and 3 consecutive yields were recorded (2003 – 2005).

Both planting methods used assure a success rate of more than 97 %. The trunk growth during the 5 years after planting indicates net differences between cultivars (Table 1).

The lowest value of Trunk - Cross Sectional Area (TCSA) was recorded for 'Starkrimson' (12,6 cm²), the highest for 'Florina' (18,6 cm²). Differences of TCSA values for cultivars are statistically significant at a level of $P= 0,05$ (LSD 5,0%).

'Florina' (a) and 'Generos' (b) cultivars have the highest TCSA values, comparative with 'Golden Delicious' (Control).

Table 1. Trunk cross sectional area of several apple cultivars (in the 5th leaf) planted in Sărulești - Călărași through different methods.

No.	Cultivar	Planting method	Trunk Cross Sectional Area (cm ²)	± Difference between methods for same cultivar *	± Difference between cultivar mean ** (cm ²)
1	'Idared'	Trench	14,6	0,2	0,8a
		Pit	14,4	Control	
		Mean	14,5		
2	'Golden Delicious'	Trench	13,6	-0,2	Control
		Pit	13,8	Control	
		Mean	13,7		
3	'Starkrimson'	Trench	12,7	0,2	-0,1 a
		Pit	12,5	Control	
		Mean	12,6		
4	'Florina'	Trench	18,5	-0,3	6,9 a
		Pit	18,8	Control	
		Mean	18,6		
5	'Generos'	Trench	17,4	-0,2	5,8 b
		Pit	17,6	Control	
		Mean	17,5		
Total mean		Trench	15,4		
		Pit	15,4		

* Differences between TCSA of cultivars are statistically significant at $P=0,05$ (LSD 5%).

** 'Florina' (a) and 'Generos' (b) cultivars have the largest TCSA values comparative with 'Golden Delicious' (Control).

Apple trees started to produce economical yields in the 3rd year after planting (Table 2).

Fruit yield was 10,6 t/ha, the third one 20,5 t/ha.

Into the second year the fruit yield was close to that of the first one due to non-favorable weather conditions during blooming.

The highest average fruit yield was recorded at 'Idared' (17,0 t/ha), 'Florina' (16,1 t/ha).

'Generos' produced 13,4 t/ha and 'Golden Delicious' 14,8 t/ha).

The lowest yield was recorded at 'Starkrimson' (9,3 t/ha).

Table 2. The yield of organic apples depending of cultivars at Sărulești - Călărași.

No.	Cultivar	Yield (kg/tree)				Yield (t/ha)			
		2003	2004	2005	Mean	2003	2004	2005	Mean
1	'Idared'	7	7,4	12,4	8,9	13,3	14	23,6	17
2	'Golden	6,4	6,4	10,6	7,8	12,2	12,2	20,1	14,8
3	'Starkrimson'	2,7	4,4	7,6	4,9	5,1	8,4	14,4	9,3
4	'Florina'	6,7	6,2	12,5	8,5	12,7	11,8	23,7	16,1
5	'Generos'	5	5,3	10,9	7,1	9,5	10,1	20,7	13,4
	Mean	5,6	5,9	10,8	7,4	10,6	11,3	20,5	14,1

During the first bearing years the fruit size recorded overpasses the average size of those cultivars, but the quality was dependant in an important manner on the disease and insect pest (Table 3).

The percentage of fruits attacked by diseases and pests varied from 1,8 % for 'Florina' to 7,9 % for 'Golden Delicious'.

In the first three bearing years the pathogen attack increased but without affecting too much the yield (0,80 – 2,57 t/ha).

Scab resistant cultivars ('Florina', 'Generos') are not attacked by *Venturia inaequalis*, this disease having highest incidence in the area.

The fruits were affected by insect pests such as *Carpocarpa pomonella*.

Table 3. Fruit quality affected by diseases and insect pests depending on cultivar and year of bearing.

No.	Cultivar	Percent of fruits affected							
		2003		2004		2005		Mean	
		%	t/ha	%	t/ha	%	t/ha	%	t/ha
1	'Idared'	2,5	0,33	6,9	0,97	10,9	2,57	6,8	1,29
2	'Golden	3,6	0,44	8,8	1,07	11,4	2,29	7,9	1,27
3	'Starkrimson'	2,1	0,11	5,1	0,42	8,5	1,22	5,2	0,58
4	'Florina'	0,8	0,1	1,3	0,15	3,4	0,8	1,8	0,35
5	'Generos'	1,1	0,1	1,6	0,16	4,6	0,95	2,4	0,4
	Mean	2	0,22	4,7	0,55	7,8	1,57	4,8	0,78

The Romanian market is not yet used with organic fruits and this is reflected by the selling prices.

Organic apples had only a 5-10 % higher price than the “non-organic” ones and that because of their look and size.

There is the fear that the orchards will be affected over time by diseases and pests and, in this respect, the growers will not have the chance to have rentable orchards, although the ecological conditions are the most favorable for apple culture.

In order to solve this, the growing of resistant cultivars with good quality fruits can be taken into good account.

CONCLUSIONS

In Romania, as in other countries, the orientation of fruit growers towards organic culture, which is healthier and cleaner of chemical pollution agents, accentuated.

The favorable areas for organic culture of apples in Romania are the plains, which have important potential natural resources.

Lack of large populations of diseases and insect pests into the plain florae favorize the apple organic culture more than the subCarpatian hill area (with *Malus* related florae or with plant hosts for different diseases and pests).









‘FLORINA’

(‘Jonathan’ x complex hybrid)



‘GENEROS’

[‘Frumos de Voinești’ x (‘Parmain d’Or’ x *Malus kaido*)] x ‘Jonathan’



Thank you very much
for your attention!