

# The economics of modern plum orchards in the Czech Republic

R. VÁVRA<sup>1</sup>, J. BLAŽEK<sup>1</sup>, J. MAZÁNEK<sup>2</sup>, L. BARTONÍČEK<sup>3</sup>

<sup>1</sup>*Research and Breeding Institute of Pomology Holovousy, Czech Republic*

<sup>2</sup>*Šampima, Rovensko pod Troskami, Czech Republic*

<sup>3</sup>*Libonice, Hořice, Czech Republic*

**ABSTRACT:** This paper deals with an evaluation of the economics in two commercial plum orchards which were established between 1993–1997 using dense tree-spacing and modern principles of orchard management. This evaluation was conducted in 1994–2004 with the following cultivars: Bluefre, Common Prune, Čačanska lepotica, Čačanska najbolja, Gabrovska, Hamanova, Opal, President, Ruth Gerstetter, Stanley, and Valjevka. Orchard establishment costs, pruning costs, annual orchard operating and pest management costs and returns up to 11 years of growth are given. A denser planting had a positive influence on total yields per hectare with higher returns. Costs per ton of fruit mostly varied between 4 and 7 thousand CZK, whereas farmer prices fluctuated between 7.6 to 13.6 thousand CZK per ton. The highest returns after seven years of growth from one hectare were exhibited by the cultivar President on rootstock St. Julien A in the spacing 4 × 2.5 m followed by the cultivar Stanley on rootstock Myrobalan and the same spacing.

**Keywords:** plum; cultivars; yields; costs; duration of pruning; economics; returns

The increase of plum orchard hectareage in the Czech Republic by almost 2.5 times during the last 10 years proves a demand of the fresh fruit in the market. Plum trees occupy about 6% of the total fruit orchard area in the country at present; plum orchards constitute of 1,113 ha in which cultivars Stanley (25%) and Čačanska lepotica (23%) dominate. During the last 5 years, a promising development for future plum production in the Czech Republic have taken place with the planting of 531 ha of new orchards of the crop. Furthermore, an age structure of plum orchards is very favourable. Young plantings before the stage of fruit bearing comprise 36% and the plantings at the beginning of fruit bearing period comprise 18% of total plum orchard acreage. On the other hand, orchards in the stage of full bearing comprise 35% and old ones only 11% (BUCHTOVÁ 2004; BLAŽEK, KNEIFL 2005).

Good knowledge of economics of growing is a very important factor for every grower before he renovates an orchard of any crop. The Department of Agricultural and Resource Economics, UC Davis supplies studies of production economics for many commodities that can be downloaded at <http://cost-studies.ucdavis.edu>. As for plums, the recent study

was done based on the hypothetical farm operation, production practices, overhead, and calculations under the assumptions of model production practices described (DAY et al. 2004).

At present, new plum cultivars are being introduced into growing in the Czech Republic that bear bigger fruits, are more precocious in bearing and fit generally better for modern dense plantings of compact trees. Also some new rootstocks are more suitable for this development (ROZPARA, GRZYB 1998; BLAŽEK et al. 2004). Better-quality products of new large-fruited plum cultivars currently create a better market demand of fresh fruit. The main customers are the supermarket chains in the Czech Republic. Experts predict that the production can still be further expanded. For this a thorough analysis of the market situation is required as well as appropriate conditions for production in the country (Kiss 2004).

Plums are a labour-intensive crop. Labour costs are thus the major cost factor in plum production. It is important to analyse labour input and to determine which cultivars and production forms are the most efficient (KNUTSEN, TORBJØRN 2004). For the above stated reasons, the cost of establishment of a modern plum orchard and the economics of plum production

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Table 1. Survey of orchard variants used in the study

Location	Cultivar	Rootstock	Year of planting	Spacing (m)	Number of trees/ha	Total area (ha)
Brtev	Čačanska lepotica	St. Julien A	1994	5.5 × 3.5	519	0.35
	Čačanska najbolja	St. Julien A	1994	5.5 × 3.5	519	0.17
	Common Prune	Pixy	1993	5.0 × 3.5	571	0.22
	(local)	St. Julien A	1993	5.0 × 3.5	571	0.46
	Gabrovska	Myrobalan	1995	5.0 × 3.5	571	1.27
	Hamanova	Myrobalan	1995	5.5 × 3.5	519	0.18
		St. Julien A	1995	5.0 × 3.0	667	0.27
	Opal	St. Julien A	1994	5.5 × 3.5	519	0.28
	Ruth Gerstetter	St. Julien A	1994	5.5 × 3.5	519	0.09
	Stanley	Pixy	1993	5.0 × 3.5	571	0.75
		St. Julien A	1993	5.0 × 3.5	571	0.13
	Valjevka	Myrobalan	1995	5.0 × 3.5	571	0.41
		St. Julien A	1995	5.0 × 3.5	571	0.27
Žernov	Bluefre	St. Julien A	1997	4.0 × 2.5	1,000	0.10
	Common Prune (Prune)	Myrobalan	1997	4.0 × 2.5	1,000	0.10
	Common Prune (Drö)	St. Julien A	1997	4.0 × 2.5	1,000	0.10
	Opal	Myrobalan	1997	4.0 × 2.5	1,000	0.10
	President	St. Julien A	1997	4.0 × 2.5	1,000	0.10
	Ruth Gerstetter	St. Julien A	1997	4.0 × 2.5	1,000	0.10
	Stanley	Myrobalan	1997	4.0 × 2.5	1,000	0.40

for the fresh market in the conditions of the Czech Republic are analysed in this study using data gathered from two new well-grown orchards.

## MATERIAL AND METHODS

Data for the economic analyses were gathered in two commercial orchards established in small farms from 1993 to 1997 using denser tree spacing than had been common in the past in the Czech Republic as well as some modern principles of orchard management. A detailed survey that describes the course of establishment of both orchards and the planting material used is given in Table 1. In total 11 cultivars were used there, namely: Bluefre, Čačanska lepotica, Čačanska najbolja, Common Prune (with 3 different clones), Gabrovska, Hamanova, Opal, President, Ruth Gerstetter, Stanley, and Valjevka. Regarding rootstocks, St. Julien A was planted there the most frequently, but in 6 cases the traditional Myrobalan seedling and in 2 cases clonal dwarf rootstock Pixy were used. Only certified virus-free planting stock was used in all cases.

Both orchards were situated in locations of the East Bohemia region. The first location in Brtev was in a valley near the town Lázně Bělohrad on a gentle slope with a dry and sunny position to the south.

The soil was predominantly clay and the elevation was 300 m above sea level. Annual precipitation ranged there around 650 mm. This orchard was not equipped with drip irrigation. The other planting location in Žernov was situated on the southern foot of Kozákov, a hill near the town Semily. The land was level and open to prevalent wind. The soil was medium clayey of good fertility and the plough layer was deep. The land was situated at the elevation of 370 m a.s.l. This orchard was equipped with drip irrigation. A review of cultivars and rootstocks used in both locations is mentioned in Table 5 together with the year of planting and spacing of trees. Planting material for the orchard in Žernov was bought in Italy, including two clones of Common Prune (Drö and Prune). Planting material for the orchard in Brtev was bought in Czech nurseries.

Trees in both orchards were well trained to free spindles after planting using bending. In previous years they were maintained with minimum pruning. Herbicide fallow was kept in rows. Grass in the alleys between rows was mowed. Fungicide and pesticide treatments were minimised to an essential treatment against fungal diseases (Baycor, Horizon) and pests (Magus, Reldan). For the preservation of the virus-free status of trees all the plantings were

Table 2. Orchard establishment costs using a spacing of 4 × 2.5 m (1,000 trees/ha)

Group of costs	Specification	Costs (thousand CZK/ha)
Material	trees (included tree shelter)	90.0
	material for fencing	7.5
	fertilisers	9.1
	seeds	2.6
	total	109.2
Labour	setting-out	3.0
	planting	5.7
	fencing	2.5
	total	11.2
Machine work	tillage and soil preparation	2.4
	fertilising	0.9
	sowing	1.0
	total	4.3
Total		124.7

A mean exchange rate in 2005 was about 29 CZK per € or 25 CZK per USD

carefully inspected annually (twice per season) and all trees showing symptoms of plum pox (PPV) were immediately removed. No single incidence of PPV, however, was recorded in Žernov. On the other hand in Brtev, where the orchard was located close to the village with many garden trees infected by PPV, up to 1% had to be discarded every year.

In both orchards all costs and incomes were recorded annually, starting with the establishment of the orchards. Most of the records were kept separately for single cultivar-rootstock combinations. Yields were also recorded individually for all cultivar-rootstock combinations. The size of trees for each combination was measured using a sample of 10 randomly selected trees with the procedure previously described by BLAŽEK et al. (2004). Time that was necessary for tree pruning and harvest was estimated upon the sample shots. As the cost of orchard establishment was substantially increased in the Czech Republic during the last 10 years, the original figures were adjusted to the present price

level and these adjusted costs were used for final cost calculations. A mean exchange rate in 2005 was about 29 CZK per one € or 25 CZK per one USD.

## RESULTS AND DISCUSSION

### Orchard establishment costs

For an illustration of the sum necessary for establishing of a new plum orchard without irrigation in the Czech Republic at present, the most desirable situation using a density of 1,000 trees per ha with spacing 4 × 2.5 m has been chosen. This total cost is equal to 124.5 thousand CZK per ha (Table 2). The cost of plantings using a lower density of 519 trees or 667 trees per ha corresponds to 75.2 and 90.4 thousand CZK, respectively.

The cost of the planting material was calculated using 90 CZK per tree including tree shelter and the cost of material for fencing taking 7.5 thousand CZK per ha (this calculation was done supposing that the

Table 3. Mean annual orchard operating and pest management costs

Group of costs	Specification	Costs (thousand CZK/ha)
Material	herbicides	2.0
	pesticides and fertilisers	3.7
	total	5.7
Machine work	mulching	2.1
	application of herbicides	1.0
	application of pesticides and fertilisers	1.6
	total	4.7
Total		10.4

Table 4. Yields recorded within the observed variants in both orchards between 1996–2004

Cultivar	Rootstock	Locality	Yield (kg/tree)								Yield (t/ha)			
			1996	1997	1998	1999	2000	2001	2002	2003	2004	mean	mean	
Bluefre	SJ	Žernov					9.3	18.0	19.0	27.4	33.2	21.4	21.4	21.4
Čačanska lepotica	SJ	Brtev	2.1	10.7	8.7	25.0	29.3	47.3	34.0	26.4	33.6	11.4	11.4	5.9
Čačanska najbolja	SJ	Brtev	1.9	13.3	14.0	29.0	31.1	54.4	16.1	36.6	41.0	26.4	26.4	13.7
Common Prune (P)	Myr.	Žernov					3.7	8.0	6.2	21.9	34.3	14.8	14.8	14.8
	Pixy	Brtev		0.6	1.8	5.4	8.9	6.5	22.2	14.8	16.2	9.6	9.6	5.5
	SJ	Brtev		1.9	3.5	11.1	18.8	10.0	44.7	31.6	13.7	16.9	16.9	9.7
(D)	SJ	Žernov					4.2	9.0	14.0	25.9	41.8	19.0	19.0	19.0
Gabrovska	Myr.	Brtev		8.9	23.8	5.9	15.8	38.2	30.5	8.5	54.8	23.3	23.3	13.3
Hamanova	Myr.	Brtev				0.5	2.4	6.2	2.8	7.5	6.7	4.3	4.3	2.3
	SJ	Brtev				0.5	3.6	17.8	34.0	13.7	27.8	16.2	16.2	10.8
Opal	Myr.	Žernov					5.2	12.0	10.5	21.4	52.1	20.2	20.2	20.0
	SJ	Brtev			2.1	19.6	3.6	17.5	57.9	6.0	57.1	23.4	23.4	12.1
President	SJ	Žernov				8.4	24.1	35.0	18.7	48.1	64.5	33.1	33.1	33.1
Ruth Gerstetter	SJ	Brtev			1.8	2.1	10.0	21.9	15.3	11.9	33.3	13.8	13.8	7.1
	SJ	Žernov					3.3	6.0	3.5	9.9	8.0	6.2	6.2	6.2
Stanley	Myr.	Žernov					12.3	25.0	12.2	33.2	51.0	26.7	26.7	26.7
	Pixy	Brtev	0.8	6.9	7.3	14.4	9.8	19.6	14.4	13.7	20.3	11.9	11.9	6.8
	SJ	Brtev	0.8	13.8	13.7	24.2	15.6	42.7	40.1	50.2	45.1	27.4	27.4	15.6
Valjevka	Myr.	Brtev		0.5	1.2	4.3	8.8	26.6	2.6	52.2	3.4	12.5	12.5	7.1
	SJ	Brtev		0.4	1.0	5.7	7.3	18.9	2.3	20.4	5.2	7.7	7.7	4.4

total size of the orchard is 5 hectares (i.e. its dimensions are 250 × 200 m). The next calculation involves the cost of fertilisers for a deposit fertilising by potassium and phosphorus (9.1 thousand CZK) and grass seeds (2.6 thousand CZK). The cost of drip irrigation was not involved in this present economic balance. From some other study it is known that at present the cost of drip irrigation amounts on average to 82 thousand CZK per ha, including the assembly and construction of the retention reservoir for irrigated water (the calculation is done per size of the irrigation area of 20 ha). The next item of orchard establishment costs involves the machine work for tillage, soil preparation, application of fertilisers and sowing grass seeds, amounting in total up to 4.3 thousand CZK. For this calculation a value of 410 CZK per one hour of machine work was used.

The cost of labour was calculated taking a mean value of 85 CZK per hour that was spent for a survey of the orchard, fencing and planting. The average total cost of labour for the establishment of 1 ha of plum orchard reached 11.2 thousand CZK.

### Orchard operating and pest management costs

The mean annual orchard operating and pest management costs, except for the cost of picking, reached 10.4 thousand CZK in this study (Table 3). This figure included the cost of materials in the amount of 5.7 thousand CZK (pesticides and fertilisers composed 3.7 and herbicides 2.0) and the cost of machine work (mulching and application of pesticides and fertilisers) in the amount of 4.7 thousand CZK. The cost of picking varied from 1.1 to 1.7 CZK per kg of harvested fruits, depending on the size of fruits and difficulties in harvesting each cultivar. The cost of fruit grading and storing before sale varied from 1.2 to 1.5 CZK per kg according to the size of fruits and duration of storage.

### Dependence of yields on cultivar and rootstock

A survey of yields that were recorded in all variants observed in both orchards is given in Table 4. Regarding bearing, President proved to be the most precocious of all the cultivars, followed by Čačanska leptica,

Table 5. Costs of pruning and some influential factors in 2003

Cultivar	Rootstock	Location	Planting density (trees/ha)	Yield (kg/tree)	Yield (t/ha)	Canopy volume (m <sup>3</sup> )	Duration of pruning (min/tree)	Duration of pruning (hour/ha)	Duration of pruning (hour/ton of fruits)	Costs of pruning (thousand CZK/ha)
Bluefre	SJ	Žernov	1,000	27.4	27.4	14.6	5.5	91.5	3.2	7.8
Čačanska leptica	SJ	Brtev	519	26.4	13.7	17.7	8.1	70.1	5.1	6.0
Čačanska najbolja	SJ	Brtev	519	36.6	19.0	17.3	8.0	69.2	3.4	5.9
Common Prune (P)	Myr.	Žernov	1,000	17.6	17.6	24.4	13.5	224.1	10.2	19.0
	Pixy	Brtev	571	14.9	8.5	11.8	5.5	52.3	2.7	4.4
	SJ	Brtev	571	25.1	14.3	22.1	13.0	123.6	14.4	10.5
	(D) SJ	Žernov	1,000	25.9	25.9	19.2	12.5	208.2	8.0	17.7
Gabrovska	Myr.	Brtev	571	8.5	4.9	19.4	9.0	85.5	17.4	7.3
Hamanova	Myr.	Brtev	519	7.5	3.9	13.2	11.0	95.2	24.3	8.1
	SJ	Brtev	667	13.7	9.1	11.4	7.8	86.5	9.5	7.4
Opal	Myr.	Žernov	1,000	21.4	21.4	17.6	9.5	158.2	7.3	13.4
	SJ	Brtev	519	6.0	3.1	13.5	7.5	64.7	20.7	5.5
President	SJ	Žernov	1,000	48.1	48.1	18.4	5.7	94.6	1.8	8.0
Ruth Gerstetter	SJ	Brtev	519	11.9	6.2	12.4	8.4	72.5	11.5	6.2
	SJ	Žernov	1,000	9.9	9.9	17.2	7.3	121.5	12.2	10.3
Stanley	Myr.	Žernov	1,000	33.2	33.2	11.7	7.4	123.2	3.5	10.5
	Pixy	Brtev	571	13.7	7.8	9.2	5.5	52.2	6.5	4.4
	SJ	Brtev	571	50.2	28.7	22.1	9.2	87.4	3.0	7.4
Valjevka	Myr.	Brtev	571	52.2	29.8	21.9	8.3	79.0	2.5	6.7
	SJ	Brtev	571	20.4	11.7	12.4	10.9	103.6	8.7	8.8



Čačanska najbolja and Stanley. In contrast, Common Prune and Hamanova were distinguished by the latest start of bearing. The trees of President cv. were also the most productive, followed by Stanley, Čačanska najbolja, Čačanska leptica and Opal. Mean yields of these cultivars were very close to the values recorded in Serbia using a similar growing system (JANKOVIĆ et al. 1997). Contrary to these results, the lowest yields in Brtev were recorded with Hamanova cv. on Myrobalan rootstock. Very low yields of this cultivar at the location were probably related to the very poor soil in the orchard site, for Hamanova is generally considered as a cultivar of medium productivity level in the Czech Republic (BLAŽEK, KNEIFL 2005). Poor harvest prevailed also among the trees of Valjevka cv. planted on the poor soil at the Brtev site. In Žernov very low yields were recorded in the cultivar Ruth Gerstetter, which was caused by frequent frost damage of the trees.

As for rootstocks, it seemed that the trees on St. Julien A were a little more precocious than the trees on Myrobalan. However, later on the trees on Myrobalan were generally more vigorous and their yields were therefore higher because of larger tree size. The trees on Pixy were similarly precocious as those on St. Julien A, but due to their small size their later yields were much lower. Trees on this rootstock would have needed much higher tree densities.

Data given in Table 4 unambiguously showed that in the Žernov orchard, where nearly twice the number of trees per a unit of area were planted, the bearing period began much earlier, which resulted in markedly higher overall yields. This is a confirmation of a great importance of planting density for high yields and overall economics of the crop (MIKA et al. 1999).

### Pruning costs

The cost of labour necessary for tree pruning depended directly on tree size and indirectly influenced

Table 6. Farmer prices for fresh market plums in the Czech Republic between 1996–2004

Year	Mean price (thousand CZK/t)	Span
1996	11.2	9.6–13.6
1997	11.0	9.4–13.7
1998	10.8	9.3–13.1
1999	9.7	8.2–11.7
2000	10.4	8.8–12.5
2001	9.8	8.3–11.8
2002	9.2	7.7–11.5
2003	10.2	8.7–12.8
2004	9.0	7.6–11.3

yield. Besides, some cultivars required more time for pruning than others. The trees of President and Bluefre were generally easier for pruning; whereas the trees of Common Prune, especially on more vigorous Myrobalan rootstock, were more laborious. As an example, the details on tree pruning of all observed variants in both locations in 2003 were provided (Table 5). Despite the fact that differences in pruning time of one tree were not high and varied from 5.5 to 13.5 min per tree, the differences in the pruning cost of one ha were much greater. The orchard in Brtev required much less time for pruning one ha. Cultivars on Pixy rootstocks took only 52 hours of work per ha, while cv. Common Prune on rootstocks St. Julien A required 123.6 hours per ha. Bluefre in the Žernov orchard, which had a higher tree density, required 91.5 hours per ha, compared to 224.1 hours per ha of Common Prune. The greatest differences were in the cost of pruning calculated for one ton of the crop. While 1.8 hours was necessary for the production of one ton of fruits of President, it was 24.3 hours for Hamanova.

### Farmer prices for fresh market plums

Farmer prices for fresh market plums in the Czech Republic were quite stable during the last decade (Table 6). Nevertheless, there has been a certain tendency toward a gradual cutting of the mean prices due to increasing market saturation. The modification of prices was approximately 30%, which seems to be quite similar to the situation in other countries (KNUTSEN, TORBJØRN 2004).

### Economic characteristics

The orchard establishment costs in the observed orchards varied by around 100 thousand CZK per ha (Table 7). Their exact value was directly proportional to the density of the planting. The total costs per ha varied from 263.2 thousand CZK (Hamanova cv., Brtev) to 727.5 thousand CZK (President cv., Žernov). These sums took account of different picking costs that directly influenced the price of yield in the two orchards. Costs per ton of fruits varied mostly between 4 and 7 thousand CZK, which is nearly 4 times less than it was in Italy 15 years ago (MALAGOLI 1990).

Total incomes varied from 134 thousand CZK in the case of Hamanova cv. in Brtev, up to 2,470 thousand CZK for the cultivar President in Žernov. The exceptionally high value of the latter was linked to the highest yields that this variety generated, and also to the top price for which fruits of the cultivars were sold in the market. The same variants showed

Table 7. Main economic characteristics of plum production according to the observed variants 1993–2004

Cultivar	Rootstock	Location	Number of growing years	Number of trees/ha	Total harvest (t/ha)	Establishment costs/ha	(thousand CZK)				
							Total costs/ha	Total income/ha	Total returns/ha	Costs/ton	
Bluefre	SJ	Žernov	7	1,000	106.9	124.5	503.1	1,045.4	542.3	5.1	4.7
Čačanska lepotica	SJ	Brtev	11	519	112.7	75.2	541.5	1,114.2	572.7	5.1	4.8
Čačanska najbolja	SJ	Brtev	11	519	123.2	75.2	543.7	1,231.5	687.8	5.6	4.4
Common Prune (P)	Myr.	Žernov	7	1,000	74.1	124.5	524.8	721.3	196.5	2.7	7.1
	Pyxi	Brtev	11	571	43.6	80.5	369.8	426.1	56.4	1.3	8.5
	SJ	Brtev	11	571	77.2	80.5	519.1	763.4	337.3	4.4	6.7
(D)	SJ	Žernov	7	1,000	94.9	124.5	580.7	919.2	338.5	3.6	6.1
Gabrovska	Myr.	Brtev	10	571	106.4	80.5	546.7	1,037.5	490.8	4.6	5.1
Hamanova	Myr.	Brtev	9	519	13.5	75.2	263.2	134.0	-129.2	-9.5	19.4
	SJ	Brtev	8	667	65.0	90.4	420.6	620.1	199.5	3.1	6.5
Opal	Myr.	Žernov	7	1,000	101.2	124.5	568.0	970.4	402.5	4.0	5.6
	SJ	Brtev	10	519	85.1	75.2	450.7	796.4	345.7	4.1	5.3
President	SJ	Žernov	7	1,000	198.8	124.5	727.5	2,470.1	1,742.5	8.8	3.7
Ruth Gerstetter	SJ	Brtev	10	519	50.0	75.2	365.6	482.4	116.8	2.3	7.3
	SJ	Žernov	7	1,000	31.2	124.5	343.2	310.4	-32.8	-1.1	11.0
Stanley	Myr.	Žernov	7	1,000	133.7	124.5	580.9	1,237.1	656.2	4.9	4.3
	Pyxi	Brtev	11	571	61.2	80.5	387.3	574.7	187.4	3.1	6.3
	SJ	Brtev	11	571	140.9	80.5	576.7	1,326.9	750.2	5.3	4.1
Valjevka	Myr.	Brtev	10	571	56.9	80.5	403.3	591.8	188.5	3.3	7.1
	SJ	Brtev	10	571	34.9	80.5	358.5	354.6	-3.8	-0.1	10.3

Table 8. The accumulated return values (thousand CZK/ha) according to the observed variants

Cultivar	Rootstock	Locality	Year of growing																
			2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>	5 <sup>th</sup>	6 <sup>th</sup>	7 <sup>th</sup>	8 <sup>th</sup>	9 <sup>th</sup>	10 <sup>th</sup>	11 <sup>th</sup>							
Bluefre	SJ	Žernov		-99.3	15.7	126.7	341.4	542.3											
Čáčanska lepotica	SJ	Brtev		-108.3	-78.1	-57.4	18.5	120.7	280.7	380.4	477.7	572.7							
Čáčanska najbolja	SJ	Brtev		-108.8	-65.8	-21.0	72.9	185.4	377.8	418.3	563.5	687.8							
Common Prune (P)	Myr.	Žernov		-157.5	-132.5	-123.5	20.1	196.5											
	Pixy	Brtev			-132.5	-139.3	-133.5	-110.7	-100.2	-36.3	15.7	56.4							
	SJ	Brtev			-132.7	-138.0	-116.4	-58.2	-40.2	97.0	218.3	244.3							
	SJ	Žernov	(D)	-152.5	-119.4	-60.7	115.8	338.5											
Gabrovska	Myr.	Brtev		-83.2	7.9	13.5	64.3	199.2	292.9	314.5	490.8								
Hamanova	Myr.	Brtev			-131.0	-140.0	-136.0	-145.2	-129.2										
	SJ	Brtev			-147.3	-146.9	-81.4	46.1	102.3	199.5									
Opal	Myr.	Žernov		-140.3	-81.3	-39.0	108.5	402.5											
	SJ	Brtev		-108.4	-54.0	-55.6	-8.0	168.8	178.1	345.7									
President	SJ	Žernov		163.4	495.0	650.5	1,180.4	1,742.5											
	SJ	Brtev			-123.4	-132.3	-109.0	-44.6	-9.6	24.5	116.8								
	SJ	Žernov		-146.9	-125.0	-123.0	-62.5	-32.8											
Stanley	Myr.	Žernov		-84.2	67.5	124.6	366.0	656.2											
	Pixy	Brtev		-118.2	-101.4	-83.3	-43.0	-15.8	46.7	84.5	131.4	187.4							
	SJ	Brtev		-116.1	-67.6	-20.5	57.4	109.6	263.3	359.3	607.4	750.2							
Valjevka	Myr.	Brtev		-122.0	-133.4	-133.6	-112.5	-23.2	-30.7	193.6	188.5								
	SJ	Brtev		-124.5	-139.1	-135.9	-123.4	-67.0	-77.8	-3.0	-3.8								



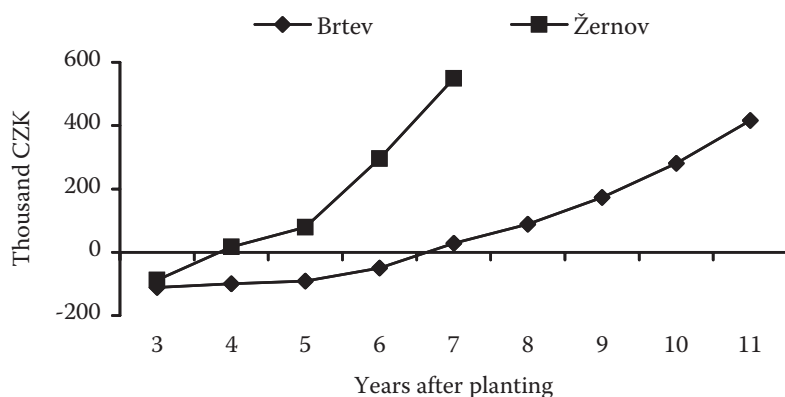


Fig. 1. Course of mean accumulated returns (thousand CZK/ha) in two locations

comparable results for returns per hectare as well; they varied from the loss values of -129 thousand CZK up to 1,742.5 thousand CZK.

However, for the majority of variants, returns ranged from 3 to 6 thousand CZK per ton of fruits. Except for the three least productive variants, the cost for 1 ton of produced fruits was below their selling prices.

### Returns

The cultivar President on rootstock St. Julien A with the spacing of  $4 \times 2.5$  m showed the highest returns (Table 8) and earned 1,742.5 thousand CZK from one ha after seven growing years (in the sixth harvesting year). This variant was followed by the cultivar Stanley on rootstock St. Julien A with the spacing of  $5 \times 3.5$  m with returns of 750.2 thousand CZK achieved after eleven growing years, and 656.2 thousands CZK obtained on rootstock Myrobalan with spacing of  $4 \times 2.5$  m after seven growing years. The cultivars Opal, Bluefre, Čačanska najbolja and Čačanska leptotica also showed high returns.

The highest return in the production of one kg of fruit was displayed by the cultivar President (value of return 8.8 CZK), which also had the lowest costs per

one kg (value of costs 3.7 CZK). On the other hand, losses were prevalent in Valjevka on rootstock St. Julien A (spacing of  $5 \times 3.5$  m), Ruth Gerstetter on rootstock St. Julien A (spacing of  $4 \times 2.5$  m) and Hamanova on rootstock Myrobalan (spacing of  $5.5 \times 3.5$  m). A great importance of the choice of cultivars for achieving the best economic results with plum growing was reported in Switzerland (MELI, ZBINDEN 1989).

The orchards differed in their tree density; much higher returns were obtained in the orchard using higher planting densities (Fig. 1). As for the correlation between returns and different rootstocks, variants on St. Julien A obtained slightly higher returns than variants on Myrobalan (Fig. 2). Plums planted on Pixy had rather inferior economic parameters, apparently because the size of trees of these variants was not proportional to the spacing used in the orchards.

### CONCLUSION

Current trends of modern commercial plum production in the Czech Republic include highly dense orchards (tree-spacing of  $4 \times 1.75$  to  $2.5$  m depending on cultivars) with spindle shaped trees on semi-dwarf rootstocks St. Julien A. Costs per ton of fruits mostly varied between 4 and 7 thousand CZK, whereas

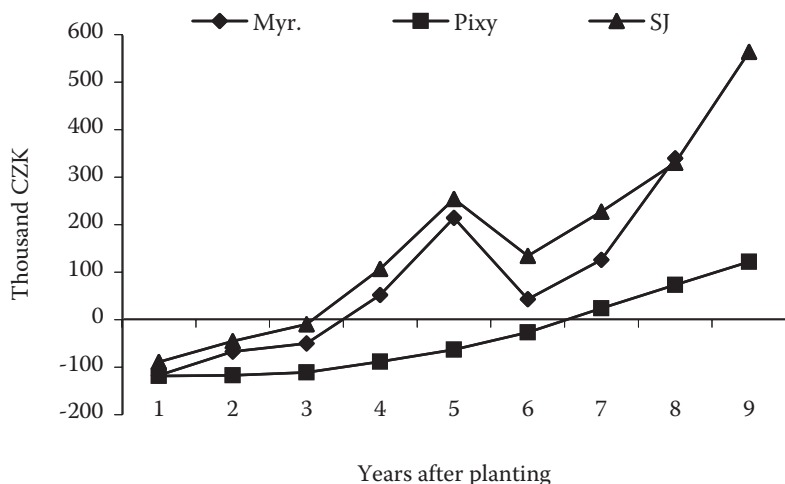


Fig. 2. Course of mean accumulated returns (thousand CZK/ha) according to two rootstocks

farmer prices fluctuated between 7.6 to 13.6 thousand CZK per ton. The highest returns after seven years of growth from one ha were exhibited by the cultivar President (1742.5 thousand CZK) on rootstock St. Julien A in the spacing 4 × 2.5 m, followed by the cultivar Stanley (750.2 thousand CZK) on rootstock Myrobalan with the same spacing. According to the results it is evident that a denser planting had a positive influence on total yields per ha with higher returns. In new orchards large-fruited plum cultivars prevail, such as President, Čačanska najbolja, Čačanska lepotica or Bluefre. The results of this study confirmed that at present the economic situation of the country's plum production is well profitable. The study indicates the importance of the selection of the cultivars that are favoured by the consumer and that generate high yields. Wider ripening periods and high quality products are also important.

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## Ekonomika moderních výsadeb slivoní v České republice

**ABSTRAKT:** Práce se zabývá hodnocením ekonomiky pěstování slivoní ve dvou tržních výsadbách, které byly založeny v letech 1993–1997, při uplatnění hustých sponů výsadby a moderních pěstitelských postupů. Hodnocení probíhalo v letech 1994–2004 při použití těchto odrůd: Bluefre, Domácí velkoplodá, Čačanska lepotica, Čačanska najbolja, Gabrovská, Hamanova, Opal, President, Ruth Gerstetter, Stanley a Valjevka. Jsou uvedeny náklady na založení výsadby, dále náklady na řez, ošetřování včetně ochrany proti chorobám a škůdcům a příjmy až do 11. roku věku výsadby. Náklady na tunu plodů většinou kolísaly v rozmezí 4–7 tis. Kč, zatímco nákupní ceny se pohybovaly v rozmezí 7,6–13,6 tis. Kč za 1 tunu. Vyšší hustota výsadby měla příznivý vliv na výši hektarových výnosů a tím i na celkovou výši zisku. Nejvyšší zisk z hektaru v 7. roce po založení výsadby byl dosažen u odrůdy President, vysazené na podnoži St. Julien A ve sponu 4 × 2,5 m, za kterou následovala odrůda Stanley na podnoži Myrobalán při použití stejného sponu.

**Klíčová slova:** slivoně; odrůdy; výnosy; náklady; potřeba řezu; ekonomika pěstování; zisk

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*Corresponding author:*

Ing. RADEK VÁVRA, Výzkumný a šlechtitelský ústav ovocnářský Holovousy, s. r. o., Holovousy 1, 508 01 Hořice v Podkrkonoší, Česká republika  
tel.: + 420 493 692 821, fax: + 420 493 692 833, e-mail: [vavra.vsuo@seznam.cz](mailto:vavra.vsuo@seznam.cz)

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