Faculty of Forestry at theUniversity of West Hungary

PhD Thesis

The Examination of Forest Structure Changes with Special Regard to Black Pine and Turkey Oak Species at the Balaton-Uplands

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1. THE DEINIFITION OF THE TOPIC

There were huge changes in the forest assets of Hungary during the last century. Probably it is true that the dictated peace of Trianon caused the biggest change and the biggest decrease in territory and the composition and qualilty of our forest resources. Mr. Mayer Zoltán, a forest engineer, focuses on this fact in his PhD thesis, which was accepted on 13th May, 1936 during a Forestry Faculty meeting. Two high level scientists were members of his examination committee. They were professors Roth Gyula and Fehér Dániel. In his thesis, Mr. Mayer stated that because of the Trianon Peace Treaty the forest management of the smaller sized Hungary had to cope with new tasks. After the treaty, only 1,175,202 ha of the forests which had been Hungarian before WW I, remained. This was a loss of 84.1%, which caused a crisis in the supply of wood. Before the peace treaty, Transylvania and the Uplands of current Slovakia had 1,735,405 ha of pine forest, and 97% percent of this area was transferred to foreign rule. Mr. Mayer clearly stated that the borders of the natural spreading of spruce were outside of the new borders of Hungary. Mr. Mayer's statements are very similar to the thoughts of Ferenc Kiss, who is the father of the afforestation of the Great Hungarian Plain, where he wanted to create an important role for pine trees between the Danube and the Tisza Rivers. 70% of these trees were to be Scots pine and black pine. This is how history may determine the circumstances of management of a certain profession. These were the forces that led to starting the coniferisation of Hungary. In the mountains, spruce was planted, and larch was planted in the beech and oak forests. There was a large amount of afforestation of black pines and Scots pines. The planting of forests on the Balaton Uplands also started. Its structural change has only started recently. There are two significant tree species in the forest assets of Hungary, black pine and Turkey oak. The relation, renewal, and utilization of these two species and their structural changes need a lot of investigation. The stands of Turkey oaks and black pines appear on a huge area of the Balaton Uplands and a significant part of it is in the state sector owned by Balatonfüred Forestry of Bakonyerdő Zrt. The forests of this territory are very important from the point of view of soil, water and nature protection. Recreation is also very significant here. Of course, we should focus on the expectations of a profitable management. This is why it seems to be important to improve the structure of our forest stands.

2.Research Aims

The weakening of the health of black pine made it inevitable that the structure of its stands would be changed. The economic and ecological hypotheses also moved the processes toward natural renewal. After the drought years of the 1990s, Balatonfüred Forestry had to start a program for sanitary felling of damaged black pine trees, and this level of forest health has been maintained since then. This selective cutting was unusual at the time because normally they used clear cutting to remove damaged black pine forests. After fulfilling the jobs of tree utilization, investigators unexpectedly found a happy situation. Opening the pine forests allowed the natural growth of broadleaved species in the understory beneath the mature black pines. New species of seedlings also appeared. The root swelling of the seedlings caused an increase of regrowth. The process of underplanting must be examined to see if it is suitable for a black pine structural change in the short term or long term. It turned out quickly that the underplanting of black pine in an optimal situation was observed throughout the Balaton Uplands. Before examining the structural change, we must get to know the physiological characteristics of jaybirds, which play an important role in the underplanting. We also have to know the special literature in the German language. Consequently the main purpose of my thesis is to support the natural structural change toward black pine and Turkey oak, which may be developed with economic and ecological considerations. The evaluation of the structural change may be complete if we investigate the renewal of black pine and Turkey oak forests and make some comparison with other methods so that we can evaluate the structural change of these two species.

3. Research Hypotheses

The black pine forests in the Balaton Uplands have been in a bad condition.

The physiological weakening has allowed the spread of diseases. The dying of shoots is typical of black pine and this has caused an important loss in territory for this species. The main aim of our policy is to replace them with broadleaved forests. Where black pines are dying, natural underplanting is an optimum way to solve the problem. According to the author, a structural change of black pine and Turkey oak forests is necessary to reform the black pine forests. The middle aged black pine forests need to be replaced by Turkey oak

forests. Wind plays an important role in spreading species with tiny seeds in the process of underplanting. Jaybirds also play a very important role in creating new black pine and Turkey oak forests and working out the structural change. Both the literature and the author's experience support the idea that jaybirds may help spread underplanting. The young forests that will be created by structural change will meet the challenges of forest protection and nature conservation. These new forests also conform to future forestry regulations.
The artificial renewal after clear cutting may be less profitable than the natural reforestation, which is supported by modelling new renewal systems.

4.Research Methodology (Material and Method)

After defining the research aims, my study shows the economic and plant geographic characteristics of the Balaton Uplands. It also deals with the relations among tree stands in the Balatonfüred Forestry of Bakonyerdő Zrt. A detailed display of welfare and forest protection problems is important to show the characteristics of the area. We have to work out the ecological and economic characterizations of black pines and Turkey oaks because they are the two main species of the forest resources of the Balaton Uplands. This is important partially because we have to deal with their systems of renewal. We have to pay particular attention to the diseases of black pine stands. To understand the structural change we have to show the renewal systems of the two main species before the analysis, and they must be evaluated from the point of view of economy and ecology. The economic evaluation must be done according to the net prices of the year 2012, and they must refer to the total renewing cycle. We have to define a good method of examination. Regrowth should be based on the Forest Protection, Measuring and Observing System made by the State Forestry Service in 2003. This evaluated game populations and the change in habitat which they caused. The recording method was changed but recordings made on site were done with similar principles and measurements. There were 47 sample areas within the borders of Balatonakali, which has 9 forest subcompartments. The recordings of the regrowth on the sample areas were done in the month of July in the years of 2006, 2007, 2008, and 2009.
The choice of the sample areas was done with the Digiterra Map Program and using a digital management plan map. We also gave the GPS coordinates of selected points to make their location permanent.

The data of measurement and evaluation were put into a computerized format in the MS Office Excel program. That will allow an ecological analysis. Last but not least, creating five models allows the economic evaluation of 5 regeneration and reproduction systems.

5. Results of the Examinations

We had to analyze changes in the tree stand relations in the Balaton Uplands, where the two main species were black pine and Turkey oak. It is worth showing the natural and artificial methods since it is impossible to give a final evalulation of structural change without them. Black pine was planted in the Balaton Uplands area using bare root planting. After clear cutting only artificial methods of renewal can be used. My study focuses primarily on the possibility of renewing Turkey oak stands and I recommend using mostly the natural renewal of Turkey oak stands.

Advantages of Afforestation of Turkey Oak Stands:

1. We create a mixed stand with many species and very often forests of different ages.
2. We can exceed the required number of species which can help speed the regrowth and its differentiation.
3. Afforestation is a lot more resistant to game damage than natural regrowth.

Disadvantages of Natural Renewal of Turkey Oak Stands:

1. The renewal cannot be done in many cases if we do not protect the acorns from wild boars.
2. Forestry companies are required by law to replant on a large area.
3. We need a bigger territory if we want to cut the same number of trees.

The Ecological Evaluation of the Structural Change of Black Pine and Turkey Oak:

First I calculated the total number of a certain number of species in a sample area. Then I used these data to estimate the amount within one hectare. Then I made an average for each forest subcompartment. I made a similar table to show the data for the height of trees. Evaluating the data shows that the number of specimens in the regrowth areas shows an increase in succeeding years up until 2008, but there is a slight decrease in 2009.

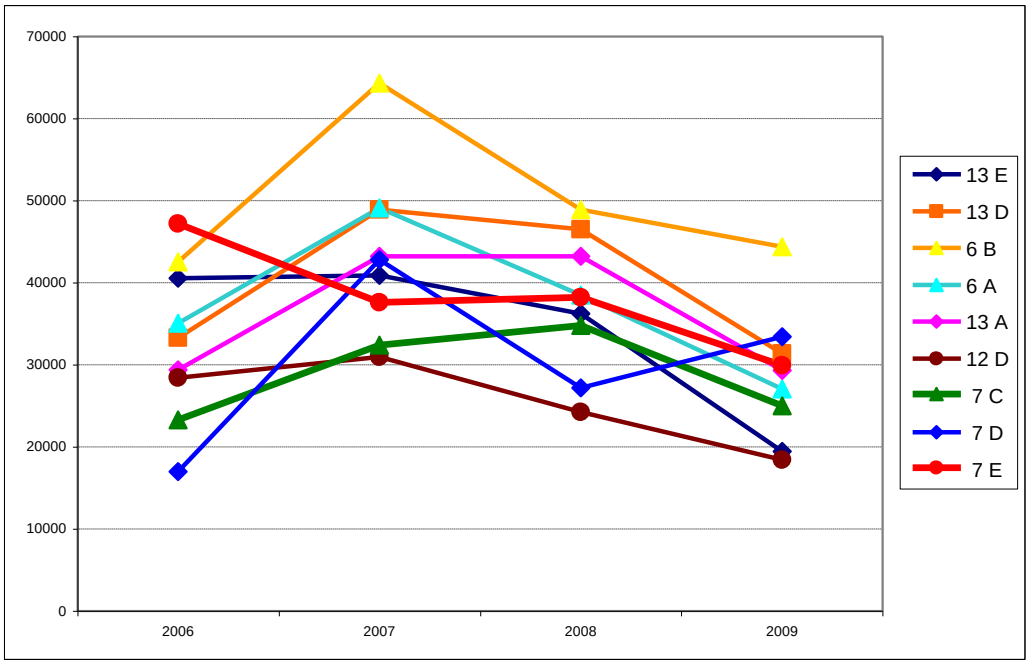

Figure 1: The change of specimen number of regrowth (no/ha) in each subcompartment during years in a row.

The fourth appendix of a 2009 law by FVM (Order XXXVII 153/2009, 13th XI.) about forests, forest protection and forest management, details expectations of afforestation of main and mixed species. I will show the two target stand types, and the number of specimens, where there was natural renewal in the Balatonakali area.

Target stand type	Main tree species	Main regrowth species that need 100% canopy closure – average number per hectare	Minimally expected average number of specimens of main species after final cut
Turkey oak forests	TOF	**15,000** (20,000)	**8,000** (15,000)
Downey oak forests	DOF	**7,500** (15,000)	**3,000** (6,000)

The numbers outside brackets are the minimum number of specimens of main species on the examined territory. The values in brackets show the expected number of specimens of main

species and mixed species in the afforested area (appendix 5 of FVM order of 153/ 2009, 13th XI). The regulations require the following mixed species:

Turkey oak (CS) forests: pedunculate oak, sessile oak, downey oak, hornbeam, early maple, high ash, silver lime, bird cherry, wild pear (KT), beam tree, service tree.

Downey oak and Turkey oak forests: sessile oak, downey oak (MOT), field maple (MJ), field elm (MSZ), high ash, flowering ash (VK), wild pear, beam tree, service tree, silver lime.

If we show the number of specimens in a bar diagram of the main species per hectare on the examined subcompartments in the last examined year, and we add the expected number of specimens of the downey oak Turkey oak and Turkey oak target stands, we can state that the number of seedlings of a forest subcompartment in an afforested area is much higher than expected (FF: black pine).

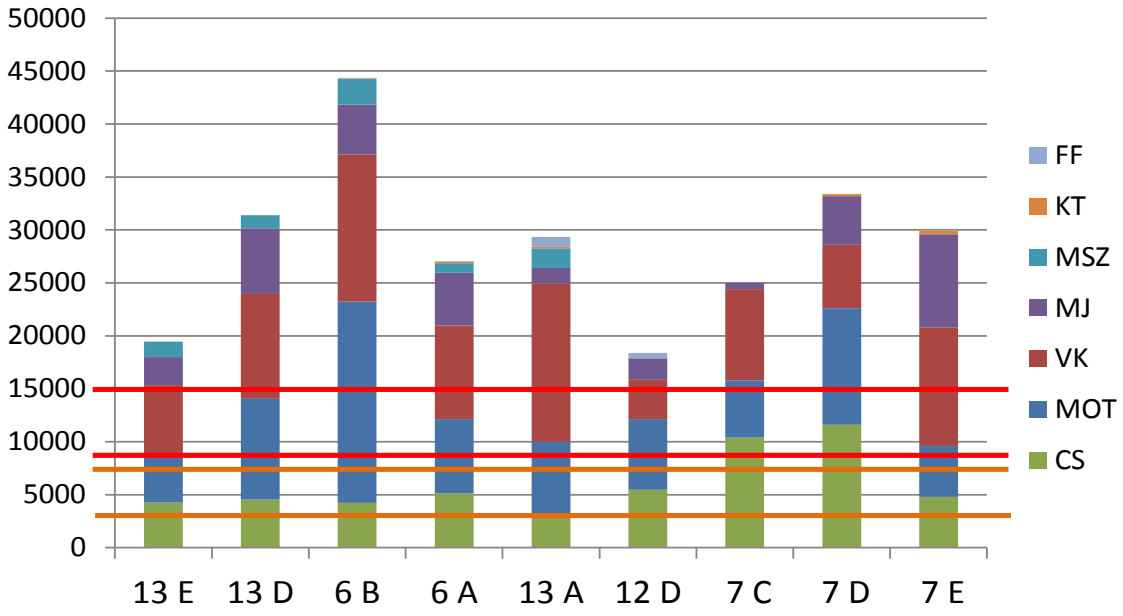

Figure 2: The change of specimen number of regrowth (no/ha) in the examined subcompartments in 2009

There are tree cutting classes of V and VI that are not profitable for tree cutting.

Soil protecting and afforestation might be successful and completed if they have 50% of the expected number of specimens. The examined forest subcompartments are labeled not profitable.

If we measure height increases, the changes are easy to follow. The tree specimens on the examined areas show an increase of middle intensity.

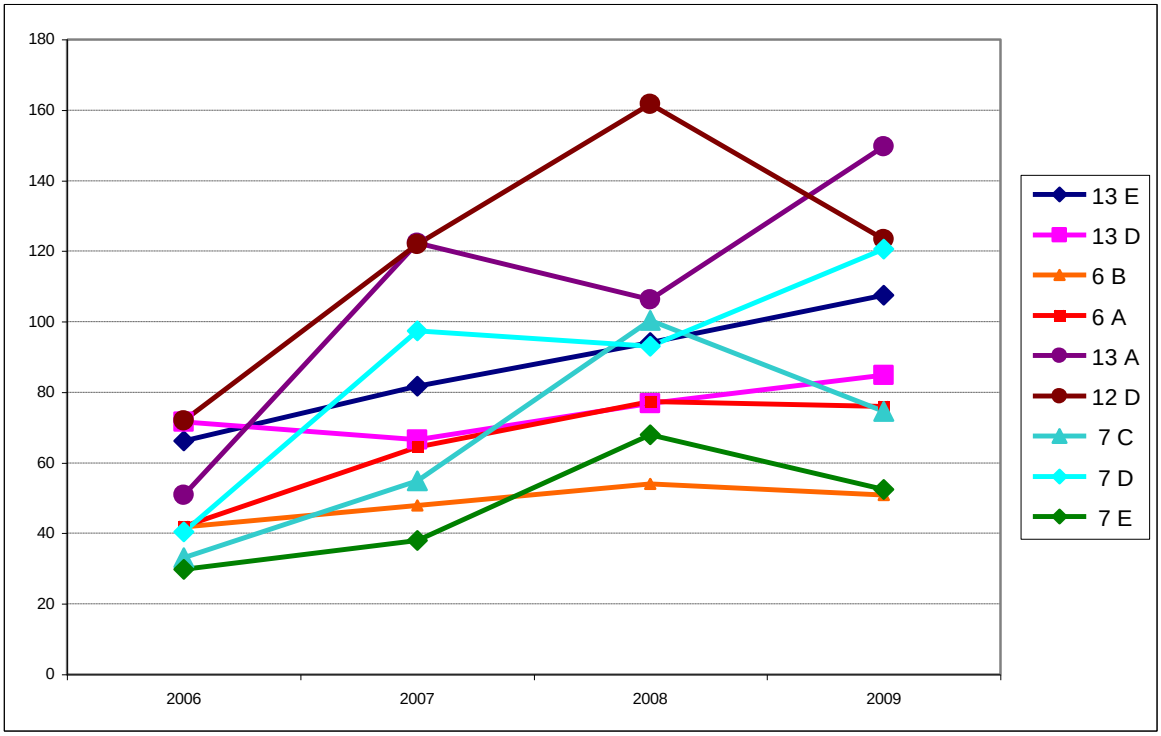

Figure 3: The change of regrowth height (cm) in each subcompartment during years in a row.

If we show the average height of the four main and subspecies in the examined subcompartments in the last year, we can reach a very valuable conclusion.

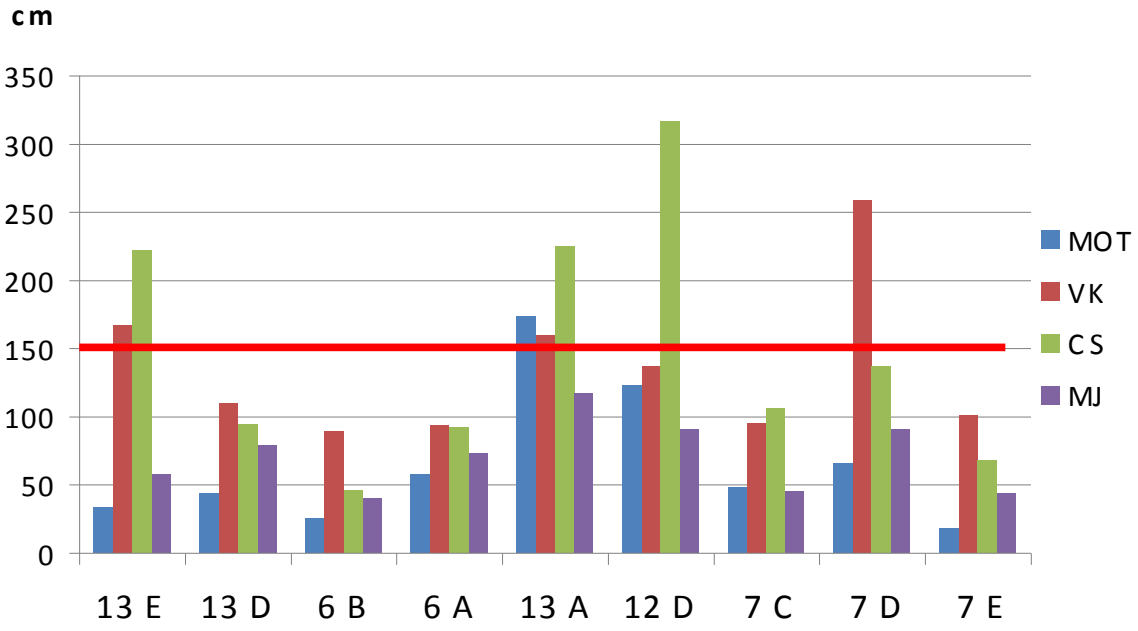

Figure 4: Regrowth height in each subcompartment during 2009

As time goes on, Turkey oak will have an advantage in height compared to other species. If we expect a final minimum height of 1.5 meters according to the FVM order (153/2009, 13th XI), then there will be some loss in the finished examined subcompartments. According to the regulations, we do not have to take the expected height into consideration in the tree cutting classes of V and VI. Our expectations came true that the low average height index was caused by the damaging presence of lower species that are part of the main stand.

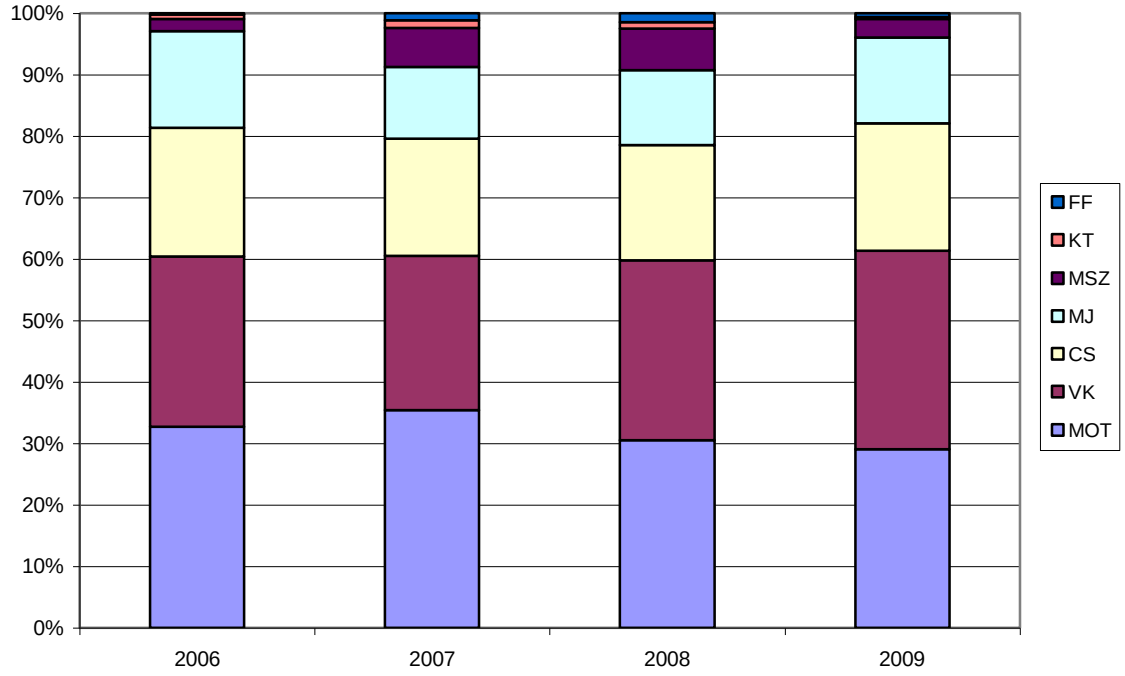

Figure 5: Distribution of specimen number by tree species in percentage (all examined subcompartments)

Experts see a favorable picture in the numbers of specimens. The role of Turkey oak main species has been confirmed. There are no problems in forest protection.

The Technological and Economic Evaluation of the Transformation of Black Pine Stands into a Broadleaved Forest:

It is extremely important for an expert to see what financial benefit comes from this procedure. An economic evaluation can easily by done If we summarize the technological process of the structural change.

1. More experts are not needed to fulfill this professional task.

2. Choosing the correct timing, measuring and technology is very important for the optimization of tree harvesting. There should be preparatory cutting between 5% and 10% and sanitary harvesting must be applied until final removal cut. Tree harvesting

should not be done in cold weather. We suggest making forwarded skidding and delivery if the relations in the stand allow it.

3. After the sanitary harvesting, site clearing is not necessary. However, it is necessary after the final removal cut. This costs 33,000 Forints per hectare at 2012 prices. Site clearing means piling up the forest residue onto stumps but without burning, because there is a serious danger of fire on the Balaton Uplands. During the past years, we have used chipping of crowns when cutting black pine. The is very economical. This eliminates the cost of site clearing. The cost of chipping based on 2012 forestry fees is as follows:

    - Unit costs of chipping: skidding of crowns: 3,000 Ft per ton
      chipping of crowns: 2,800 Ft per ton
      transport of chips: 1,200 Ft per ton
      total: 7,000 Ft per ton
    - Unit income of chipping: 12,000 Ft per ton
    - Unit profit of chipping: 5,000 Ft per ton

    On the basis of th above results we can say: This supports the use of chipping when doing final removal cut of pine forests.

4. We do not need artificial seedling replacements. We recommend going over the entire area with Göhler scissors. We should cut back regrowth down to the ground level. At 2012 prices this costs 22,000 Ft per hectare.

5. We do not have to intervene in the natural differentiation process because of the optimal structure and the large number of specimens in the regrowth. This also means that we do not need continuous care. However, continuous care may be recommended before revision. An expert might decide if continuous care is needed at the state of the final removal cut.

We can put the economic evaluation into the right circumstances if we make a model of the renewing system, which is the topic of this dissertation. The models are based on the following principles:

Different regrowth systems were used and the renewals were completed in 2012. We also have to deal with the estimation of yield from forest utilization because variations in time and measure of tree harvesting influence the results.

If we go back in time, we can define different stages of the work which are characteristic of forestry. We also have to define the costs per unit together with the data for profit. The models of sylviculture consist of the average indexes of the costs per unit of the Balatonfüred Forestry of Bakonyerdő Zrt. (Forints per hectare). We show the tree utilization yeilds as the result of the average selling prices (Forints per cubic meter) and as the results of the direct costs of tree cutting. We may more precisely define the data in the 5th column (Forints per hectare) because the amount of wood harvesting per hectare (cubic meters per hectare) is multiplied by the profit per cubic meter (Forints per cubic meter). The values (8th column) of the net yield (Forints per hectare) of tree cutting sylviculture costs and the results of the yield should be extended to the present time with a 2% interest so that the timing factor will influence the result in a suitable way. The per unit costs of the replacement are corrected with the 60% average measure which is characteristic of forestry. The five models are the following after key:

Sorszám:	ordinal number
Évek:	years
Fahasználati tevékenység:	harvesting
Erdőművelési tevékenység:	silviculture
Nettó hozam:	neat yield
Prolongáló tényező (2%-os kamattal):	prolonging coefficient (2% rate)
Prolongált eredmény:	prolonged outcome
FVB (bontóvágás):	preparatory cutting
FVV (végvágás):	final removal cut
Újulatvisszavágás:	regrowth cutting
Bozótírtás:	bush cutting
Makkvetés:	acorn sowing
Kerítés:	fence
Pótlás:	fill-in planting
Folyamatos ápolás:	maintenance
Erdősítés:	forestation

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
Sorsz.	**Évek**	**Fah. tev.**	**m^3/ha**	**Ft/ha**	**Erdőművelési tevékenység**	**Ft/ha**	**Nettó hozam Ft/ha**	**Prolongáló tényező (2%-os kamattal)**	**Prolongált eredmény (Ft/ha)**
14	**1998.**						0	1,32	0
13	**1999.**						0	1,29	0
12	**2000.**						0	1,27	0
11	**2001.**						0	1,24	0
10	**2002.**	FVB	80	320 000			320 000	1,22	390 078
9	**2003.**						0	1,20	0
8	**2004.**	FVB	80	376 000			376 000	1,17	440 544
7	**2005.**						0	1,15	0
6	**2006.**	FVB	50	270 000			270 000	1,13	304 064
5	**2007.**						0	1,10	0
4	**2008.**	FVV	100	600 000	Újulat visszav.	17 000	583 000	1,08	631 058
3	**2009.**						0	1,06	0
2	**2010.**						0	1,04	0
1	**2011.**						0	1,02	0
0	**2012.**						0	1,00	0
	Össz.:		**310**	**1 566 000**			**1 549 000**		**1 765 744**

Table 1, model 1: Underplanting of a black pine forest with broadleaved species

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
Sorsz.	**Évek**	**Fah. tev.**	**m^3/ha**	**Ft/ha**	**Erdőművelési tevékenység**	**Ft/ha**	**Nettó hozam Ft/ha**	**Prolongáló tényező (2%-os kamattal)**	**Prolongált eredmény (Ft/ha)**
14	**1998.**						0	1,32	0
13	**1999.**						0	1,29	0
12	**2000.**	FVB	90	315 000	Bozótirtás	16 000	201 000	1,27	254 917
					Makkvetés	38 000			
					Kerítés (3 szálas)	60 000			
11	**2001.**				Pótlás	62 000	-62 000	1,24	-77 089
10	**2002.**				Bozótirtás	21 000	-21 000	1,22	-25 599
9	**2003.**						0	1,20	0
8	**2004.**	FVB	100	470 000	Bozótirtás	24 000	446 000	1,17	522 560
7	**2005.**						0	1,15	0
6	**2006.**				Bozótirtás	26 000	-26 000	1,13	-29 280
5	**2007.**	FVV	120	684 000	Újulatvisszav.	16 500	667 500	1,10	736 974
4	**2008.**						0	1,08	0
3	**2009.**				Foly.áp.(adapteres)	27 900	-27 900	1,06	-29 608
2	**2010.**						0	1,04	0
1	**2011.**				Foly.áp.(adapteres)	28 500	-28 500	1,02	-29 070
0	**2012.**				Foly.áp.(adapteres)	29 500	-29 500	1,00	-29 500
	Össz.:		**310**	**1 469 000**			**1 119 600**		**1 294 305**

Table 2, model 2: Underplanting of a black pine forest with Turkey oak acorn

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
Sorsz.	**Évek**	**Fah. tev.**	**m^3/ha**	**Ft/ha**	**Erdőművelési tevékenység**	**Ft/ha**	**Nettó hozam Ft/ha**	**Prolongáló tényező (2%-os kamattal)**	**Prolongált eredmény (Ft/ha)**
14	**1998.**						0	1,32	0
13	**1999.**						0	1,29	0
12	**2000.**						0	1,27	0
11	**2001.**						0	1,24	0
10	**2002.**						0	1,22	0
9	**2003.**						0	1,20	0
8	**2004.**						0	1,17	0
7	**2005.**	TRV	310	1 550 000	Erdősítés	250 000	1 148 000	1,15	1 318 691
					Kerítés (Panel)	105 000			
					Foly. áp.(kézi)	47 000			
6	**2006.**				Pótlás	120 000	-216 000	1,13	-243 251
					Foly. áp.(kézi)2x	96 000			
5	**2007.**				Foly. áp.(kézi)2x	101 200	-101 200	1,10	-111 733
4	**2008.**				Foly. áp.(kézi)1x	50 700	-50 700	1,08	-54 879
3	**2009.**				Foly. áp.(adapteres)	27 900	-27 900	1,06	-29 608
2	**2010.**				Foly. áp.(adapteres)	27 900	-27 900	1,04	-29 027
1	**2011.**						0	1,02	0
0	**2012.**				Foly. áp.(adapteres)	29 500	-29 500	1,00	-29 500
	Össz.:		**310**	**1 550 000**			**694 800**		**820 693**

Table 3, model 3: Artificial renewal of a black pine forest with black pine

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
Sorsz.	**Évek**	**Fah. tev.**	**m^3/ha**	**Ft/ha**	**Erdőművelési tevékenység**	**Ft/ha**	**Nettó hozam Ft/ha**	**Prolongáló tényező (2%-os kamattal)**	**Prolongált eredmény (Ft/ha)**
14	**1998.**	FVB	40	112 000	Bozótirtás	14 100	97 900	1,32	129 177
13	**1999.**						0	1,29	0
12	**2000.**				Bozótirtás	16 000	-16 000	1,27	-20 292
11	**2001.**						0	1,24	0
10	**2002.**	FVB	80	400 000	Bozótirtás	21 000	379 000	1,22	461 999
9	**2003.**						0	1,20	0
8	**2004.**				Bozótirtás	24 000	-24 000	1,17	-28 120
7	**2005.**	FVB	80	520 000			520 000	1,15	597 317
6	**2006.**				Bozótirtás	25 500	-25 500	1,13	-28 717
5	**2007.**	FVV	80	600 000			600 000	1,10	662 448
4	**2008.**				Foly. áp.(+vegyszer)	50 000	-50 000	1,08	-54 122
3	**2009.**				Folyamatos ápolás	27 900	-27 900	1,06	-29 608
2	**2010.**						0	1,04	0
1	**2011.**				Foly. áp.(adapteres)	28 500	-28 500	1,02	-29 070
0	**2012.**				Foly. áp.(adapteres)	29 500	-29 500	1,00	-29 500
	Össz.:		**280**	**1 632 000**			**1 395 500**		**1 631 513**

Table 4, model 4: Natural renewal of a Turkey oak forest with Turkey oak

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
Sorsz.	**Évek**	**Fah. tev.**	**m^3/ha**	**Ft/ha**	**Erdőművelési tevékenység**	**Ft/ha**	**Nettó hozam Ft/ha**	**Prolongáló tényező (2%-os kamattal)**	**Prolongált eredmény (Ft/ha)**
14	**1998.**						0	1,32	0
13	**1999.**						0	1,29	0
12	**2000.**						0	1,27	0
11	**2001.**						0	1,24	0
10	**2002.**						0	1,22	0
9	**2003.**						0	1,20	0
8	**2004.**	TRV	280	1 680 000	Erdősítés	230 000	1 405 000	1,17	1 646 181
					Foly. áp.(kézi)	45 000			
7	**2005.**				Pótlás	110 000	-204 000	1,15	-234 332
					Foly. áp.(kézi)2x	94 000			
6	**2006.**				Foly. áp.(kézi)2x	96 000	-96 000	1,13	-108 112
5	**2007.**				Foly. áp.(adapteres)	26 900	-26 900	1,10	-29 700
4	**2008.**				Foly. áp.(adapteres)	27 900	-27 900	1,08	-30 200
3	**2009.**				Foly. áp.(adapteres)	27 900	-27 900	1,06	-29 608
2	**2010.**				Foly. áp.(adapteres)	27 900	-27 900	1,04	-29 027
1	**2011.**						0	1,02	0
0	**2012.**				Foly. áp.(adapteres)	29 500	-29 500	1,00	-29 500
	Össz.:		**280**	**1 680 000**			**964 900**		**1 155 703**

Table 5, model 5: Artificial revewal of a Turkey oak forest with Turkey oak

The models very clearly show that the black pine - Turkey oak structural change (the topic of this dissertation) is a good example, which should be followed since it produces the biggest prolonged yield. The results clearly show that if the structural change cannot be done in a natural way, acorns should be underplanted. Artificial reforestation with black pines can only be done when we have the results of an economic analysis. When renewing Turkey oak forests, natural reforestation is the most economical.

6.Summary

The Balaton Uplands are a definite part of the Pannon Region. People living here have been dealing with viticulture and tourism. Let us consider the relation of the Romans and the quality wine of Dörgicse, or we can talk about the vivid life of the Reform Age or historical and literary traditions, or today's upturn in the economy, vivid life and events. Forest management in the Balaton Uplands should be observed in a different way from that of the Bakony. The yields of forest management make a profitable management possible, but we have to have a symbiosis with different managers and the welfare role of forests must also be

considered. Requirements of forest protection and the tree stands must also be observed because of social expectations. The writer has worked for the Balatonfüred Forestry of Bakonyerdő Zrt. for 14 years, and this has shown him the management priorities. We had to put aside the classic forest management models because of the social, nature protection and economic expectations. We have to emphasize the need to learn about natural processes. This is why we have to deal with the afforestation of Turkey oak forests and we need to add that the black pine - Turkey oak structural change is very significant. The effective accomplishment of the natural renewal of Turkey oak forests is a basic principle for forest managers at the Balaton Uplands. The black pine - Turkey oak structural change is a smaller but important step. The transformation of damaged black pine forests into broadleaved forests must have a top priority. Due to the extreme weather, the decrease of the area of black pine forests seems to be an irreversible process. We have to create new forests and the structure of the new forests is a main concern of my paper. The social, soil conservation, nature preservation expectations and the economic factors mean that the best method for the black pine - Turkey oak structural change is the natural regrowth. It is true that the new forests are mixed, variably aged and stable forests, which requires human capital, good organization combined with low costs. This is a good solution that fits today's challenges. The money that will be saved should be spent on brush removal and welfare development tasks. Both have to be continuous in the operation of forestry in the long run. Due to the structural change, the ratio of broadleaved forests will expand on the entire territory of the Balaton Uplands. We can also state that the average health of forests will improve. I strongly feel that the new forests will have a better chance to support game species. This might help decrease certain tensions. Another paper should deal with the concrete definition of the value of game bearing capacity. The role of black pine in the succession process is inevitable and this paper should prove this fact.

7. Listing of the Theses

1. Black pines are more sensible for protecting forests than certain mixed broadleaved forests. In the region of the Balaton Uplands extreme weather conditions are typical and influence the structure of the forest stands. Balanced data of tree utilization show that increased pine damage require forest managers to do significant sanitary tree harvesting. This is also true for Balatonfüred Forestry of Bakonyerdő Zrt.

2. The regeneration of Turkey oak forests should also be done in a natural way. This is true for both an economic and an ecological point of view. The sanitary clear felling of the damaged black pine stands and their artificial renewal is a very costly process and the result is ambiguous. We also have to deal with drought damage and the necessity of building fences. Natural afforestation and underplanting can be done without fences.

3. After the black pine - Turkey oak structural change, forests with stable mixed species of different ages will appear. The spectrum of tree species is very rich: turkey oak, sessile oak, downey oak, Italian oak, flowering ash, field maple, aspen, grey poplar, bird cherry, wild apple, beam tree, service tree, and also some black pines. The structural change of forests can also be done on soils with acidophile pH value and especially on acidic brown forest soil. Both types are found east of Csopak. There is sessile oak instead of Turkey oak on these forest sites and in the underplantings. The operation of the structural changes is also important on this part of the Balaton Uplands, where sanitary clear felling cannot be done because of social and nature protection expectations.

4. After World War II, the health of black pine forests was improved by avoiding excessive density. This makes middle aged black pine forests more stable and light will allow natural underplanting. Jaybirds play a significant role in natural underplanting, especially for tree species with big seeds. In the region of forests with black pine - Turkey oak structural changes, jaybirds must be protected and should never be killed. Old German traditions demonstrate that we can build on the useful activities of jaybirds. The results at Balatonakali also prove this fact. An economic analysis shows that if a natural underplanting process is unsuccessful, Turkey oak should be underplanted with acorns if we want to change black pine stands.

5. The biggest challenge of today's forestry profession is how to meet the exepctations of nature protection. The structural change of black pine - Turkey oak without chemicals creates a condition in the forest, where both forest management and nature protection are acceptable. Economic and ecological analyses prove that a balance among different expectations might be found.

6. A suitable method to evaluate the forest structural change is included in my dissertation. Using ecological evaluations, I have shown that young forests have been

created confoming to all the regulations. My models that have been worked out in the economic evaluation prove my hypothesis that natural afforestation of the black pine - Turkey oak structural change is a good example to follow, because it is economically profitable, and it is true for all forest managers working with the same circumstances.

8. Publications and Lectures

Publications:

HORVÁTH, E., LAKATOS, F., SZEKRÉNYES, T. (2012): Damage done by oak processionary in the territory of the Balatonfüred Forestry. Erdészeti Lapok, yr. CXLVII, vol. 4, pp. 108-109

SÁNDOR, GY., SZEKRÉNYES, T., TARI, T., NÁHLIK, A., (2012): Investigations in wild boar reproduction-biology at the Balatonfüred Forestry of Bakonyerdő Zrt. Nimród, yr. 100, 7. (Under publication)

SZEKRÉNYES, T.(2012): The trasformation of damaging black pine forests into broadleaved forests in the Balaton-Uplands. Tájökológiai Lapok, yr. 8, (accepted for publication)

SZEKRÉNYES, T. (2012): The role of jaybirds in the natural transformation of black pine forests into broadleaved forests in the Balaton-Uplands. Magyar Apróvad Közlemények, vol. 11 (accepted for publication)

WÁGNER, M., HOLL, K., SZEKRÉNYES, T., (2010) : Natural renewal of damaging black pine stands with braodleaved species in the Balaton-Uplands. In: LETT, B., (ed.): Mészáros Károly Memorial Session, Publisher for the University of West Hungary, Sopron, pp. 19-36.

Lectures:

International Union of Forest Research Organizations Working Party, 7,02,02, 21st-26th May.
Title of my lecture: Sanitary condition of black pine forests in the Sági Forest

Országos Erdőrendezési Napok (National Forest Management Days), 15th June, 2002.
Title of my lecture: Black pine – Turkey oak structural change from the point of view of a forest manager

Combined program of OEE Erdőművelési és Fahasználati Szakosztályok. 20th May, 2003.
Title of my lecture: Relations of a structural change in sylviculture and tree utilisation

Pro Silva Nagyrendezvény, 28th June, 2003.

Title of my lecture: The trasformation of black pine forests into broadleaved ones

OEE Vándorgyűlés, 9th June, 2006.

Title of my lecture: The transformation of black pine forests into broadleaved ones in the Sági Forest

Entente Florale Europe, Kokoska-valley, 30th June, 2011.

Title of my lecture: The recreational significance of the Kokoska-valley at Balatonfüred