OPPORTUNITIES FOR THE OPTIMIZATION OF TIME AND PRODUCTION NORMS RELATED TO SOME FORESTRY WORKS

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Abstract

Forestry works, also called silvotechnical interventions, are required for all forests, regardless the owner and administrator. These can be done manually or mechanically, depending on their specific and endowment.

The optimization of the forestry works execution is an important prerequisite for the sustainable administration and management of the forests.

The determination of time and production norms for a series of forestry works that are done manually, leads to the streamlining of these works technically and economically.

The achievement of edifying values for time and production norms related to the studied forestry works, requires a relatively high number of observations and an appropriate period of study so as the peculiarities of working conditions in the forestry sector to be captured.

The research was conducted in 2011-2013, in Tinca Forest District within Bihor Forest Administration and in Codrii Cămării Forest District belonging to Dobreşti Municipality, Bihor county.

To obtain some representative results corresponding to the analyzed forestry works, further research and case study are required in other forestry units where applicable activities are similarly designed.

Key words: forestry works, time norms, production norms, local working norms (regional), forestry works performed manually, manual loosening of the soil, seedlings planting.

INTRODUCTION

Silvicultural interventions related to the national forest stock are characterized by a number of technical features, which are often influenced by the so-called local experience.

For most silvicultural interventions there are time and production norms, established on the basis of a series of experimental data, which are unified under the form of ***Time and production norms for forestry works***.

Since today most of the forestry works can be done mechanically, because there are very diversified logistics, it is necessary to establish some time and production norms for this situation.

In some cases, due to particular working conditions, even when executing some forestry works manually, the establishment of some local working norms are required, to streamline those activities (Crainic,2014).

The establishment and the usage of some local or regional working norms require the appropriate registration of primary data on the required working time and energy consumption, where appropriate. To optimize the

local norms, the use of sufficient and representative primary data is required.

The usage of modern database to optimize time and production norms related to forestry works (done manually and / or mechanically) are clear opportunities to streamline the assessment activities and their achievement (Maricas, 2012).

MATERIAL AND METHOD

The case study was conducted in the private forest stock managed by the Dobreşti Forest district belonging to Dobreşti municipality, Bihor County in 2013-photo 2 and within the forest stock managed by Tinca Forest district, Bihor Forestry Department in 2011, photo1.

The research methods are: bibliographic documentation, itinerary observation, site observation, experiment and simulation.

For the study case some manual works were analyzed within the Service contract no. 234/03.08.2013 and the Service contract 446/10.03.2011.

Photo 1- Loosening of soil in terraces within the tree stand from Tinca Forest District

The works executed manually were represented by the soil loosening in wide strips of 80 cm and with a depth of 12-15cm, located at a distance of 2.0 m from one axis to the other for the flat land and on the contours line in the case when the mobilized land is on a slope- photo 2.

Photo.2-Soil loosening in terraces on an area of wooded pasture within *Codrii Cămării* Forest district

The works for the installation of woody vegetation were also studied by planting the seedlings with nude root manually in prepared ground (on mobilized strips)-photo 3, photo 5.

The planted seedlings belong to the species of beech (*Fagus sylvatica*), cherry (*Prunus avium*), oak (*Quercus petraeea*) and ash (*Fraxinus excelsior*).

Soil loosening was done by mountain hoes-photo.6, which is made of special steel, which is not brittle and therefore allows a proper preparation for the maximum efficiency use in the case of the works specific to the forest stock.

These mountain hoes were purchased from Slovakia at an average price of approx. 10 EUR/piece.

For planting the seedlings the mountain hoe was used for the works within Codrii Cămării Forest District-photo.4 and the spade and mountain hoe that RA for the works within Tinca Forest District.

The delimitation of terraces, which were deployed, was done with a ruler with a nominal length of 25m and with a string and their execution was done with stakes.

Photo.3- Cherry seedlings

Photo.4-Mountain hoe used for the soil loosening and planting

Photo.5-Oak seedlings planted on terraces with loosened soil in an area of wooded grassland within Codrii Cămării Forest District

The recording of working time was carried out with an electronic timer in seconds.

RESULTS AND DISSCUSIONS

The data recorded in the field for soil loosening refer to the time necessary to achieve the test samples with the dimensions 2.0x0.8x0.15 m and are presented in tabular form-photo.6.

Table 1

Determination of time norm to loosen the soil in terraces for an area occupied by grassland to be afforested within Codrii Cămării Forest District

Crt. no.	Working time (s/2mx0.8m)	Crt. no.	Working time (s/2mx0.8m)	Crt. no.	Working time (s/2mx0.8m)	Crt. no.	Working time (s/2mx0.8m)
1	139	34	92	67	77	100	109
2	151	35	109	68	96	101	91
3	192	36	99	69	91	102	88
4	67	37	141	70	164	103	121
5	223	38	132	71	155	104	115
6	267	39	183	72	81	105	162
7	166	40	133	73	115	106	168
8	158	41	128	74	97	107	79
9	233	42	82	75	102	108	120
10	215	43	90	76	149	109	107
11	305	44	81	77	98	110	144
12	244	45	91	78	122	111	132
13	441	46	110	79	109	112	153
14	392	47	90	80	97	113	197
15	409	48	67	81	122	114	172
16	144	49	97	82	87	115	120
17	150	50	112	83	151	116	133
18	141	51	117	84	149	117	162
19	154	52	132	85	112	118	112
20	152	53	109	86	119	119	97
21	138	54	155	87	98	120	90
22	156	55	142	88	86	121	109
23	148	56	167	89	71	122	86
24	136	57	198	90	78	123	92
25	189	58	92	91	109	124	141
26	151	59	81	92	102	125	122
27	102	60	71	93	62	126	112
28	80	61	92	94	91	127	124
29	77	62	98	95	77	128	116
30	112	63	165	96	81	129	119
31	71	64	155	97	108	130	127
32	101	65	199	98	92	-	-
33	118	66	82	99	121	-	-

$$N_{ep} = 130\,piece$$

$$T_{ep} = 4783s$$

$$t_{ep} = \frac{T_{ep}}{N_{ep}} = \frac{4783s}{130} = 47.83s/piece \cong 48s/piece,$$

$$t_{ml} = \frac{T_{ep}}{N_{ep}} = \frac{4783s}{130} = 47.83s/piece \cong 48s/piece,$$

$$t_{mp} = \frac{T_{ep}}{N_{ep}} = \frac{4783s}{130} = 47.83s / piece \cong 48s / piece ,$$

where:

N_{ep} - number of test samples;

T_{ep} - time required to loosen all test samples;

t_{ep} - time required to loosen a test sample;

t_{ml} - time required to loosen a meter of terrace;

t_{mp} - time required to loosen a square meter of terrace

Therefore, we determined the time to perform all the test samples of a test sample, of a meter of terrace and of a square meter of terrace.

Photo.6-Soil loosening in terraces on a wooded pasture area within U.A.T. Dobreşti, Bihor County.

Table 2

Determination of time norm to loosen the soil in terraces in a stand covered with substitution works in Tinca Forest District

Crt. no.	Working time (s/2mx0.8m)	Crt. no.	Working time (s/2mx0.8m)	Crt. no.	Working time (s/2mx0.8m)	Crt. no.	Working time (s/2mx0.8m)
1	190.03	11	204.03	21	108.5	31	225.25
2	184.13	12	177.35	22	205.54	32	91.5
3	156.06	13	161.1	23	209.16	33	150.03
4	106.56	14	72.87	24	57.56	34	99.34
5	220.13	15	82.78	25	95.34	35	88.84
6	127.34	16	83.97	26	74.37	36	112.06
7	155.56	17	63.43	27	135.94	37	123.14
8	144.25	18	104.75	28	114.85	38	104.34
9	132.31	19	123.69	29	176.75	39	78.21
10	147.44	20	111.35	30	110.65	40	96.56

$N_{ep} = 130 piece$

$T_{ep} = 4783s$

$$t_{ep} = \frac{T_{ep}}{N_{ep}} = \frac{4783s}{130} = 47.83s / piece \cong 48s / piece,$$

$$t_{ml} = \frac{T_{ep}}{N_{ep}} = \frac{4783s}{130} = 47.83s / piece \cong 48s / piece,$$

$$t_{mp} = \frac{T_{ep}}{N_{ep}} = \frac{4783s}{130} = 47.83s / piece \cong 48s / piece,$$

To determine the time and production regulations when planting the deciduous bare-root seedlings in previously prepared land, the time required to achieve each planting hole and the planting of each seedling were recorded by using the mountain hoe (Table 3 and Table 4) and spade (Table 5).

Table 3

Determination of time norm to plant the deciduous seedlings by using the mountain hoe, in previously prepared ground within Codrii Cămării Forest District

Crt. no.	Working time (s/seedling)	Crt. no.	Working time (s/seedling)	Crt. no.	Working time (s/seedling)	Crt. no.	Working time (s/seedling)
1	28	26	51	51	48	76	51
2	19	27	41	52	51	77	57
3	32	28	45	53	48	78	41
4	42	29	37	54	37	79	55
5	58	30	43	55	46	80	44
6	37	31	48	56	33	81	39
7	83	32	37	57	45	82	43
8	94	33	33	58	51	83	55
9	71	34	57	59	48	84	51
10	66	35	64	60	53	85	47
11	95	36	47	61	41	86	41
12	46	37	56	62	38	87	49
13	38	38	57	63	42	88	35
14	46	39	53	64	46	89	40
15	65	40	48	65	43	90	52
16	57	41	55	66	52	91	46
17	44	42	39	67	31	92	44
18	53	43	43	68	57	93	41
19	41	44	55	69	61	94	45
20	39	45	39	70	48	95	52
21	51	46	43	71	38	96	63
22	37	47	42	72	54	97	48
23	48	48	50	73	32	98	43
24	37	49	53	74	44	99	51
25	35	50	44	75	67	100	54

$N_p = 100 piece$

$T_{100} = 4783s$

$$t = \frac{T_{100}}{N_p} = \frac{4783s}{100\,piece} = 47{,}83s / piece \cong 48s / piece,$$

where:

N_p - number of planted seedlings;

T_{100} - time required for planting a number of 100 seedlings in prepared ground;

t - time required for planting a seedling in prepared ground.

Table 4

Determination of time norm to plant deciduous seedlings by using mountain hoe in previously prepared ground within Tinca Forest District

Crt. no.	Working time (s/seedling)	Crt. no.	Working time (s/seedling)	Crt. no.	Working time (s/seedling)	Crt. no.	Working time (s/seedling)
1	6.97	43	11.91	85	15.66	127	20.00
2	7.16	44	12.06	86	15.68	128	20.16
3	7.53	45	12.06	87	15.69	129	20.22
4	7.53	46	12.09	88	15.91	130	20.50
5	7.93	47	12.12	89	15.94	131	20.53
6	8.19	48	12.16	90	16.03	132	20.75
7	8.59	49	12.16	91	16.15	133	21.06
8	8.90	50	12.28	92	16.37	134	21.09
9	8.94	51	12.28	93	16.44	135	21.43
10	8.97	52	12.34	94	16.47	136	21.69
11	9.44	53	12.43	95	16.53	137	21.87
12	9.50	54	12.53	96	16.66	138	22.15
13	9.85	55	12.63	97	16.78	139	22.46
14	10.00	56	12.81	98	16.81	140	22.53
15	10.13	57	12.81	99	16.93	141	22.75
16	10.28	58	12.87	100	17.13	142	23.07
17	10.38	59	12.91	101	17.16	143	23.13
18	10.44	60	13.03	102	17.22	144	23.25
19	10.53	61	13.13	103	17.22	145	23.75
20	10.64	62	13.15	104	17.28	146	23.97
21	10.65	63	13.32	105	17.35	147	24.75
22	10.69	64	13.41	106	17.35	148	25.65
23	10.69	65	13.44	107	17.41	149	25.85
24	10.78	66	13.44	108	17.47	150	27.09
25	10.81	67	13.47	109	17.53	151	27.75
26	10.90	68	13.79	110	17.56	152	28.53
27	10.94	69	13.96	111	17.69	153	28.69
28	10.97	70	14.00	112	17.81	154	28.84
29	11.09	71	14.03	113	18.19	155	29.81
30	11.25	72	14.03	114	18.34	156	30.47
31	11.31	73	14.44	115	18.44	157	30.87
32	11.32	74	14.60	116	18.50	158	31.43
33	11.35	75	14.66	117	18.53	159	31.47
34	11.37	76	14.69	118	18.69	160	32.47
35	11.43	77	14.75	119	18.84	161	32.72
36	11.44	78	14.97	120	19.13	162	33.97
37	11.47	79	15.06	121	19.13	163	34.44
38	11.47	80	15.07	122	19.16	164	35.28
39	11.50	81	15.33	123	19.44	165	35.56
40	11.50	82	15.43	124	19.53	166	38.68
41	11.69	83	15.50	125	19.53	167	41.75
42	11.81	84	15.53	126	19.54	168	50.10

$$N_p = 168 piece$$
$$T_{168} = 2872.76 s$$
$$t = \frac{T_{168}}{N_p} = \frac{2872.76 s}{168 piece} = 17.09 s / piece \cong 17 s / piece ,$$

Table 5

Determination of time norm to plant deciduous seedlings by using the spade in prepared ground within Tinca Forest District

Crt. no.	Working time (s/seedling)	Crt. no.	Working time (s/seedling)	Crt. no.	Working time (s/seedling)	Crt. no.	Working time (s/seedling)
1	40.44	11	59.40	21	70.94	31	56.38
2	40.72	12	60.00	22	81.67	32	58.14
3	41.25	13	60.41	23	85.97	33	51.32
4	41.97	14	60.65	24	86.47	34	59.42
5	42.28	15	61.41	25	88.63	35	60.01
6	43.76	16	64.06	26	62.32	36	58.41
7	47.35	17	65.63	27	55.32	37	56.54
8	55.78	18	67.38	28	56.55	38	61.45
9	55.94	19	67.50	29	49.21	39	60.16
10	57.72	20	69.44	30	58.21	40	60.03

$$N_p = 40 piece$$
$$T_{40} = 2380.24 s$$
$$t = \frac{T_{40}}{N_p} = \frac{2380.24 s}{40 piece} = 59.51 s / iece \cong 60 s / iece ,$$

CONCLUSIONS

Determination of time and production norms specific to some silvicultural works executed manually, such as soil loosening and plantation of bare-root seedlings in previously-prepared ground is a definite way to streamline them.

The values of the time and production norms are considerably influenced by the site conditions and used logistics.

To obtain appropriate values representative for the time and production norms, it is required a relatively high number of test samples made during the developement in time of the respective forestry works.

Time and production norms determined locally and / or regionally can perpetuate certain features and working conditions of the various forest works (manually or mechanically), positively influencing their design processes, purchasing and implementation.

The recorded data and the results should be included in the databases, which results in homogeneous representative values of the analyzed and studied elements.

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