INFORMATION MANAGEMENT SYSTEM WITH DATA PROCESSING ALGORITHM APPLIED IN THE FORESTRY SECTOR

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Abstract

In this paper, it is proposed to design and implement a relational database in order to store, manage and apply a calculation algorithm on the information obtained based on the inventories carried out in the arboretums affected by downhills and wind breaks within the Production Unit VII Văratec, Sudrigiu Forestry District - Bihor Forestry Direction, to provide the desired data at any given time using appropriate computer tools.

The relational database contains the tables Amenity Units and Parties connected by the junction table Volume by species, in which were recorded the volumes by species evaluated in the parties constituted in the arboretums of the affected amenity units.

In the query Increase AU was calculated the annual increase of the arboretum in the amenity unit, and in the query AU P V was calculated for all constituted parties the volume corresponding to the amenity unit in the associated party. In the report AU P V are displayed the amenity units, the parties made for them, the volumes corresponding to each party and the corresponding volume was calculated for each amenity unit, as well as the total volume of amenity units.

Key words: relational database, algorithm, amenity unit, parties, volume

INTRODUCTION

A database is a tool for collecting and organizing information. A computerized database is a container of objects. It can contain one or more tables where information is stored, organized and classified. A relational database stores its tables in a single file, along with other objects, such as forms, queries, and reports.

Within the forestry sector, the use of relational databases is appropriate given the specificity of current and prospective activities, referring to a number of specific indicators. Consequently, the computerized management of the data related to the arboretums that have been affected by extreme meteorological phenomena (downhills and massive wind breaks) is

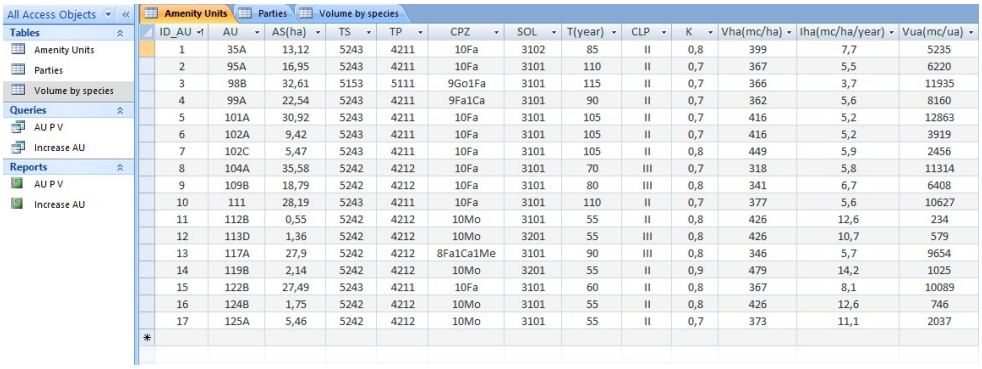
necessary for the elaboration and application of appropriate management strategies.

MATERIAL AND METHOD

The case study was carried out within the Production Unit VII Văratec, Sudrigiu Forestry District - Bihor Forestry Direction, in the arboretums that were affected by the downhills and the massive wind breaks from 17.09.2017.

Consequently, the inventory of the affected wood material in the mentioned arboretums was realized, the obtained information was organized in a database, implemented for the purpose of their efficient exploitation.

The data is stored in a relational database, which can be managed with a database management system, such as the Access application in the Microsoft Office software package, which provides the desired data at any given time. As a result, the stored data is structured and classified in the database tables, organized on different themes, well defined, so that there is no redundancy. One of the desires of designing a database is to eliminate duplicate data. To achieve this objective, the data is divided into several tables according to the subject, so that each aspect is represented once. In this regard, the following themes were considered for the implementation of the database tables: a table with data on the amenity units entitled "Amenity Units", as can be seen in fig. 1 and a table with data on parties entitled "Parties", as can be seen in fig. 2.


All Access Objects

Tables
- Amenity Units
- Parties
- Volume by species

Queries
- AU P V
- Increase AU

Reports
- AU P V
- Increase AU

Amenity Units | Parties | Volume by species

ID_AU	AU	AS(ha)	TS	TP	CPZ	SOL	T(year)	CLP	K	Vha(mc/ha)	Iha(mc/ha/year)	Vua(mc/ua)
1	35A	13,12	5243	4211	10Fa	3102	85	II	0,8	399	7,7	5235
2	95A	16,95	5243	4211	10Fa	3101	110	II	0,7	367	5,5	6220
3	98B	32,61	5153	5111	9Go1Fa	3101	115	II	0,7	366	3,7	11935
4	99A	22,54	5243	4211	9Fa1Ca	3101	90	II	0,7	362	5,6	8160
5	101A	30,92	5243	4211	10Fa	3101	105	II	0,7	416	5,2	12863
6	102A	9,42	5243	4211	10Fa	3101	105	II	0,7	416	5,2	3919
7	102C	5,47	5243	4211	10Fa	3101	105	II	0,8	449	5,9	2456
8	104A	35,58	5242	4212	10Fa	3101	70	III	0,7	318	5,8	11314
9	109B	18,79	5242	4212	10Fa	3101	80	III	0,8	341	6,7	6408
10	111	28,19	5243	4211	10Fa	3101	110	II	0,7	377	5,6	10627
11	112B	0,55	5242	4212	10Mo	3101	55	II	0,8	426	12,6	234
12	113D	1,36	5242	4212	10Mo	3201	55	III	0,8	426	10,7	579
13	117A	27,9	5242	4212	8Fa1Ca1Me	3101	90	III	0,8	346	5,7	9654
14	119B	2,14	5242	4212	10Mo	3201	55	II	0,9	479	14,2	1025
15	122B	27,49	5243	4211	10Fa	3101	60	II	0,8	367	8,1	10089
16	124B	1,75	5242	4212	10Mo	3101	55	II	0,8	426	12,6	746
17	125A	5,46	5242	4212	10Mo	3101	55	II	0,7	373	11,1	2037

Fig. 1. Table Amenity Units

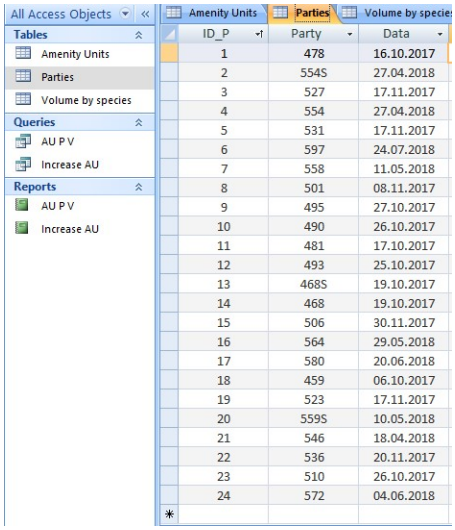


Fig. 2. Table Parties

The Name, the type of data and the description of the fields in the Table Amenity Units are shown in fig. 3.

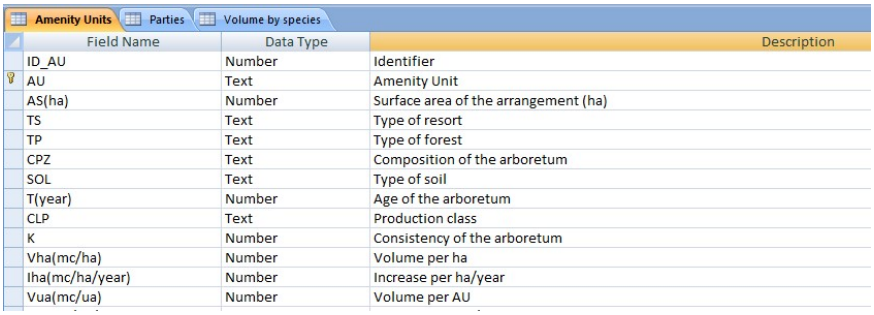


Fig. 3. Name, type of data and description of the fields in the Amenity Units table.

In order to make the database as flexible as possible, so that the information that has been divided by themes can be put together, the database tables are connected by means of connection relations. Consequently, queries can be created that question the database and reports that arrange the information extracted from the database for printing.

The connection relationship between the Amenity Units table and the Parties table is considered. A amenity unit can be evaluated in one or more parties. On the other hand, a party may evaluate one or more amenity units. Therefore, for each record in the Amenity Units table, there may be multiple records in the Parties table. At the same time, for each record in the Parties table there may be several records in the Amenity Units table.

Consequently, the Amenity Units table connects with the Parties table through a *many-to-many* type relationship. To achieve this, a third table, called the junction table, is created, which records the result of each evaluation of a amenity unit by a party. In the table entitled "Volume by species", the volumes by species identified in each party made for each amenity unit are recorded, as can be seen in fig. 4.

Amenity Units | Parties | Volume by species

ID	AU	Party	Fa	Go	Ca	Mo	Ci	Fr	Ju	Pam	Pac	Ulm	Me	Plt	Ann
1	35A	478	1235	0	0	0	0	3	12	4	0	0	0	0	0
2	95A	554S	1204	0	0	0	0	0	0	0	0	0	0	0	0
3	95A	527	871	54	16	0	0	0	0	0	0	0	0	0	0
4	95A	554	430	29	12	0	5	0	0	0	0	0	0	0	0
5	98B	531	131	2148	3	0	0	0	3	0	0	0	0	0	0
6	98B	597	9	32	2	0	0	0	0	0	0	0	0	0	0
7	99A	558	34	0	3	0	0	0	0	0	0	0	0	0	0
8	99A	501	764	84	140	4	0	0	0	0	0	0	0	0	5
9	99A	495	1445	72	71	11	17	0	0	4	0	0	0	0	0
10	101A	490	333	0	0	2	2	0	7	0	0	0	0	0	0
11	101A	481	1309	6	4	0	31	7	0	10	16	0	0	0	0
12	101A	493	2284	32	0	2	23	0	0	13	19	5	0	0	0
13	102A	468S	1081	0	0	0	0	0	0	0	0	0	0	0	0
14	102A	468	135	0	0	0	20	0	0	45	0	0	0	0	0
15	102C	506	1044	13	0	0	39	0	0	34	0	0	0	0	0
16	104A	564	4012	106	31	0	0	0	0	0	0	0	0	0	0
17	104A	580	1098	0	0	0	0	0	0	0	0	0	0	0	0
18	109B	459	2575	164	2	0	5	0	0	4	0	0	0	0	0
19	111	523	4343	0	0	0	0	0	0	5	0	0	3	0	0
20	112B	559S	32	0	0	175	1	0	0	0	0	0	11	1	0
21	113D	559S	25	0	1	303	1	0	0	0	0	0	14	2	0
22	117A	546	65	0	2	0	0	0	0	0	0	0	0	0	0
23	117A	536	2754	4	49	9	0	0	0	35	0	0	140	0	0
24	119B	559S	64	0	0	784	0	0	0	8	0	0	54	13	0
25	122B	510	2829	0	24	0	0	0	0	9	0	0	3	0	0
26	124B	572	2	0	0	23	0	0	0	0	0	0	1	0	0
27	125A	572	31	0	5	601	0	0	0	1	0	0	19	3	0

Fig. 4. Table Volume by species

In a relational database it can be created queries that query the database. The query is a powerful tool for analyzing and summarizing information from a database. It is a question asked to the tables in a database, allowing the selection of the data of interest, the use of various criteria that can sort, filter and calculate the selected data. Filters are applied to limit the displayed records to those that correspond fit certain criteria, the sortings to sort the records and the algorithms to perform calculations with the data stored in the tables.

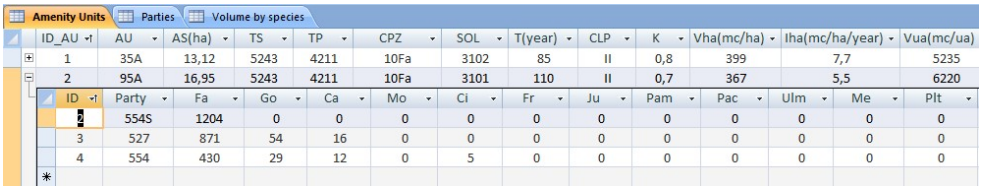
In order to print the data extracted from a database it can be created reports that are objects of the database specially designed for this. They organize the data in the most readable way, allowing the grouping, sorting and summarizing of the data from the displayed records. A report consists of data extracted from tables or queries, which are also called record sources, and graphical information stored with the report's design.

The group or report footer is used to print summary information for the group, respectively for the entire report. When placing a calculated control that uses the Sum aggregate function, the sum is calculated for the

current group if the footer of the group is used, respectively for the entire report in the case of the report footer.

RESULTS AND DISCUSSION

Following the connection of the Amenity Units table with the Parties table through a many-to-many type relationship, for each amenity unit from the Amenity Units table, the corresponding party from the Parties table can be seen, as well as the results of each evaluation stored in the Volume by species table, as can be seen in fig. 5. Also, for each party from the Parties table it can be seen the evaluated amenity units, from the Amenity Units table, as well as the results of each evaluation, as in fig. 6.

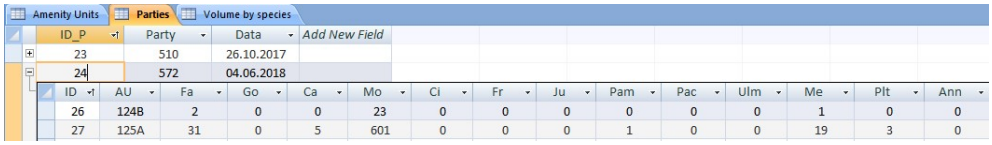


Amenity Units | Parties | Volume by species

ID_AU	AU	AS(ha)	TS	TP	CPZ	SOL	T(year)	CLP	K	Vha(mc/ha)	Iha(mc/ha/year)	Vua(mc/ua)
1	35A	13,12	5243	4211	10Fa	3102	85	II	0,8	399	7,7	5235
2	95A	16,95	5243	4211	10Fa	3101	110	II	0,7	367	5,5	6220

ID	Party	Fa	Go	Ca	Mo	Ci	Fr	Ju	Pam	Pac	Ulm	Me	Plt
2	554S	1204	0	0	0	0	0	0	0	0	0	0	0
3	527	871	54	16	0	0	0	0	0	0	0	0	0
4	554	430	29	12	0	5	0	0	0	0	0	0	0

Fig. 5. The parties corresponding to the amenity unit and the results of each evaluation.



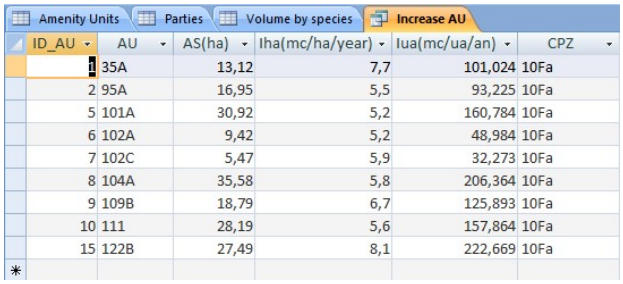
Amenity Units | Parties | Volume by species

ID_P	Party	Data	Add New Field
23	510	26.10.2017	
24	572	04.06.2018	

ID	AU	Fa	Go	Ca	Mo	Ci	Fr	Ju	Pam	Pac	Ulm	Me	Plt	Ann
26	124B	2	0	0	23	0	0	0	0	0	0	1	0	0
27	125A	31	0	5	601	0	0	0	1	0	0	19	3	0

Fig. 6. The amenity units corresponding to the party and the results of each evaluation.

In the query entitled "Increase AU", the fields AU, AS (ha), Iha (mc / ha / year), CPZ from the table of Amenity Units were selected, the increase on the amenity unit per year was calculated and filtered by Composition of the arboretum for the value 10Fa , as can be seen in fig. 7.



Amenity Units | Parties | Volume by species | Increase AU

ID_AU	AU	AS(ha)	Iha(mc/ha/year)	Iua(mc/ua/an)	CPZ
1	35A	13,12	7,7	101,024	10Fa
2	95A	16,95	5,5	93,225	10Fa
5	101A	30,92	5,2	160,784	10Fa
6	102A	9,42	5,2	48,984	10Fa
7	102C	5,47	5,9	32,273	10Fa
8	104A	35,58	5,8	206,364	10Fa
9	109B	18,79	6,7	125,893	10Fa
10	111	28,19	5,6	157,864	10Fa
15	122B	27,49	8,1	222,669	10Fa

Fig. 7. Increase on the amenity unit per year and filtered by value 10Fa.

In the query entitled "AU P V", the AU field was selected from the Amenity Units table, respectively the Party field from the Parties table, and the volume corresponding to the amenity unit from the associated party was calculated for all performed parties based on the evaluated volumes of the identified species, as can be seen in fig. 8.

AU P V

AU	Party	Volum
95A	527	941
95A	554	476
98B	531	2285
98B	597	43
99A	558	37
99A	501	997
99A	495	1620
101A	490	344
101A	481	1383
101A	493	2378
102A	468S	1081
102A	468	200
102C	506	1130
104A	564	4149
104A	580	1098
109B	459	2750
111	523	4351
112B	559S	220
113D	559S	346
117A	546	67
117A	536	2991
119B	559S	923
122B	510	2865
124B	572	26
125A	572	660

Fig. 8. The volume corresponding to the amenity unit from the associated party based on the volumes of the identified species.

In the design of the report entitled "AU P V" controls were placed to display data from the ID_AU and AU fields of the Amenity Units table, from the Party field of the Parties table and from the Volume field of the query AU P V. Also, the displayed records were sorted by field ID_AU, grouped by field AU and the corresponding volume for each amenity unit was calculated based on the volumes corresponding to each performed party for that amenity unit, as well as the total volume of the amenity units, as can be seen in fig. 9.

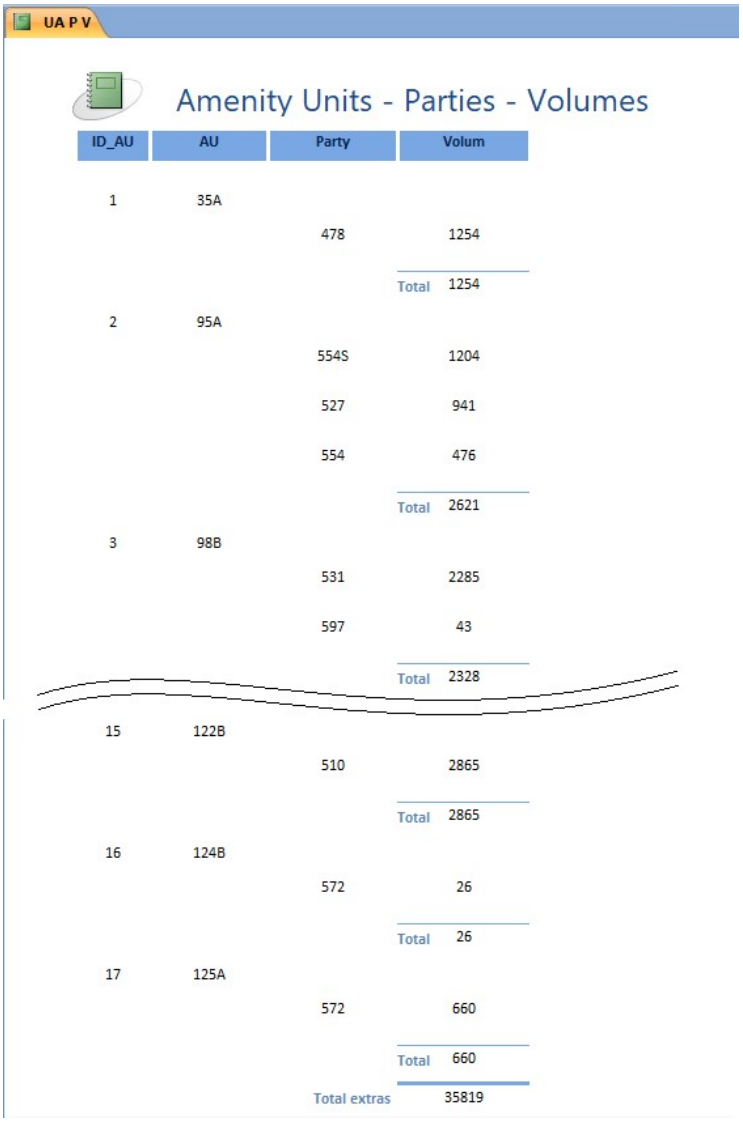


Fig. 9. AU P V report with the volume of each amenity unit and the total volume of amenity units.

CONCLUSIONS

A relational database has been implemented which contains the table Amenity Units with data on the existing amenity units in the plots of the Sudrigiu Forest District in Bihor county and the Parties table with data on the parties performed for the evaluation of these amenity units.

The Amenity Units table was connected with the Parties table through a *many-to-many* type relationship, by the junction table Volume by

species, in which the volumes by species identified in each party made for each amenity unit were recorded.

In the Increase AU query the fields: Amenity Unit, Surface area of the arrangement, Increase per hectare per year, Composition of the arboretum were selected, the Increase on the amenity unit per year was calculated and filtered after Composition of the arboretum for the value 10Fa. In the AU P V query the fields: Amenity Unit, Party were selected and the volume corresponding to the amenity unit from the associated party was calculated for all performed parties.

In the AU P V report were displayed the amenity units, the parties made for them, the volumes corresponding to each party and the corresponding volume for each amenity unit was calculated, as well as the total volume of the amenity units.

This database can be used to store information obtained from field surveys and use them as needed. The computerized management of the results of the various applications made in the field, allows the development of real-time strategies and the adoption of alternative solutions for the various current practical problems.

Acknowledgment

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