



Preparation of a Computer Software Program for the Feasibility Study of Livestock Enterprises

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Abstract: This study was carried out with the aim of developing a software program that will enable the breeder to decide easily during the preparation of the feasibility for livestock enterprises. For this purpose, 63 enterprises in Gaziantep and Şanlıurfa provinces/Turkey were visited between the years 2021-2022 and all the data obtained were evaluated. The "C#" programming language was used in the development of the software program. "Microsoft SQL Server" database was used to store the obtained data. This feasibility program is a software program where productivity checks are performed for enterprises and their personnel. It is a program that can be used easily from a small-capacity enterprises to a large-capacity enterprises. The cost calculations are not included in the program due to the economic conditions of the market. As a result, this program, which was prepared by taking into account software engineering techniques, will provide great advantages and conveniences for enterprises. Risk factors will be determined and alternatives will be presented with this software program that performs enterprises efficiency testing. It has been concluded that this software will be a program that can be preferred by the breeder since it can be used on all computers and offers different alternatives in enterprises establishments.

Keywords: Database, Enterprises, Feasibility, Livestock, Software.

Hayvancılık İşletmelerinin Fizibilite Etüdü için Bilgisayar Yazılım Programının Hazırlanması

Öz: Bu çalışma, hayvancılık işletmeleri için fizibilitenin hazırlanması sırasında yetiştiricinin kolaylıkla karar vermesini sağlayacak bir yazılım programı geliştirmek amacıyla yapılmıştır. Bu amaçla 2021-2022 yılları arasında Gaziantep ve Şanlıurfa illerinde 63 işletme ziyaret edilmiş ve elde edilen tüm veriler değerlendirilmiştir. Yazılım programının geliştirilmesinde "C#" programlama dili kullanılmıştır. Elde edilen verilerin saklanması için "Microsoft SQL Server" veritabanı kullanılmıştır. Bu fizibilite programı, işletmeler ve çalışanları için verimlilik kontrollerinin yapıldığı bir yazılım programıdır. Küçük kapasiteli işletmelerden büyük kapasiteli işletmelere kadar rahatlıkla kullanılabilen bir programdır. Maliyet hesaplamaları piyasanın ekonomik koşulları nedeniyle programa dahil edilmemiştir. Sonuç olarak yazılım mühendisliği teknikleri dikkate alınarak hazırlanan bu program işletmeler için büyük avantajlar ve kolaylıklar sağlayacaktır. İşletmelerin verimlilik testleri gerçekleştiren bu yazılım programı ile risk faktörleri belirlenecek ve alternatifler sunulacaktır. Bu yazılımın tüm bilgisayarlarda kullanılabilmesi ve işletme kuruluşlarında farklı alternatifler sunması nedeniyle yetiştiricinin tercih edebileceği bir program olacağı kanaatine varılmıştır.

Anahtar Kelimeler: Fizibilite, Hayvancılık, İşletmeler, Veritabanı, Yazılım.

1. Introduction

Today, with the widespread use of information and communication technologies (ICT) in all areas of life, there have been radical changes in the structure and understanding of societies. As in most sectors, it is very difficult for the enterprise to continue its activities in the livestock sector without using technology and automation systems, without computers and databases. The main advanced technology components used in livestock are collected under the concept of "computer-aided herd management systems" (Goncu et al., 2015).

There is an increase in the number of medium and large-capacity enterprises engaged in intensive, integrated, organic and industrial livestock. This increase has some advantages and disadvantages. There are 4 main components that make up livestock enterprises. These are structure and facilities, machinery and equipments, live animals, worker and administrative personnel. There is a need for reliable data so that the components of the enterprise can be used in enough numbers and in the correct location. It is

important to establish a healthy database in order to provide reliable data (Anonymous, 2022).

A database is a collection of organized data. As a result of developments and advances in computer technology, databases are created at every stage of production. All data recorded by application software is transferred to the database. The available information kept in the databases includes the land area, the number and area of the sections related to the structure, the number of animals in the enterprise, the facilities, machinery and equipment, the number of working personnel, etc information. A database management system is a software system consisting of more than one program in which studies such as creating a new database, editing, developing and maintaining the created database are performed. This software system enables them to develop interfaces suitable for data input-output and shapes data types on behalf of users. Today, database software such as Microsoft Access, Microsoft SQL and MySQL are used to store the data obtained. The use of these database software and database management systems is important for the breeders. Database software has positive aspects such as data independence, data reliability, data integrity, minimum data repetition, data consistency, data sharing (Ozkan, 2015).

The first software for dairy cow breeding management was introduced in the middle of the 1980's. In livestock, new requirements and trends in data management have begun, which are related to the application of new technologies. In this context, software programmes represent a new and efficient apparatus. In the coming years, the demands of breeders will increase and the existing software will be developed and updated continuously and will be presented with more developed new software (Maciuc et al., 2015).

Software is the name given to all the programs that allow electronic apparatus to do a certain working. In other words, it is a set of expressions created by using computer language to solve an existing problem. In the software to be developed, software engineering techniques are observed. At this stage, it should have features such as correct working, ease of use, easily upgradeable, robustness, reusability, productivity, portability, testability, excellent performance, up to date and documentability. The software is used in livestock enterprises to develop the capacity and improve productivity and transparency in working processes. It is absolutely necessary to plan the usage of the software programmes, in other words to establish with

departments of a farm will be automated (Maciuc et al., 2015; Nizam, 2015).

Feasibility is a comprehensive study that analyzes enterprises from technical, financial, economic, marketing, risk assessment, social and institutional perspectives. The feasibility is prepared before the final investment decision is made. This is an opportunity to foresee risks. A good feasibility study is necessary in order to correctly evaluate the general conditions and production results of the enterprises (Anonymous, 2016; Widayati, 2018).

A breeder who wants to invest will be able to learn which animal species and breed, how many decares of land, and how much budget is required in a very short time with this software program before establishing a enterprises. The breeder will have decided from the beginning whether or not to make the investment. This software program will be a more original product of the feasibility study. In addition, it is important that the programmer who prepares the feasibility program has knowledge about livestock and can produce the correct alternatives for the breeder.

With this study, it was aimed to develop a software program that can be used in the preparation process of feasibility for livestock enterprises. For this purpose, a software program was developed in which technical, economic and financial studies of enterprises in the livestock sector can be kept together. There are various software programs related to livestock enterprises. But the absence of any study on feasibility is important in terms of being an original study.

2. Material and Methods

2.1. Material

In this study, 63 livestock enterprises were used as material. For this study, 63 enterprises operating in Gaziantep and Şanlıurfa provinces/Turkey were visited. 21 of these enterprises are dairy cattle enterprises, 15 beef cattle enterprises, 12 dairy sheep enterprises, 7 fattening sheep enterprises, 5 laying hen enterprises and 3 broiler chicken enterprises. During the visit, photographs were taken and recorded on the computer to obtain the data. In addition, the technical information of the "Zootechnics and Livestock Enterprises Economics" subject was used in the preparation of the software program. The positive and negative sides of the visited enterprises were determined and compared with the existing technical information. All data collected between July-2021 and July-2022 were evaluated in Microsoft Excel program.

2.2. Method

In the development of this software, a Windows 11 operating system computer with Intel Core i5 processor, 16 GB memory (Ram) and 1 TB hard disk was used. "C#" programming language, Microsoft Visual Studio 2019, a programming software supported by .net technology, was used in order to develop a software program for keeping technical, economic and financial study data in livestock enterprises. "Microsoft SQL Server" database was used to record the data of the enterprise. The databases obtained by using the "Microsoft SQL Server" database consist of many tables. While preparing the data files, data fields suitable for the information to be recorded are created. The type of data to be entered in this section is defined and the upper values of the data to be included in this section are

determined. In this database format, the data field type "VarChar" is used for entering numeric data, "SmallDateTime" for entering date data, "Number" and "Float" for entering real numbers, and "Int" for entering integers that are not too large. Key fields are defined to establish connections between tables. Indexes are used to access records faster (Ozkan, 2015; Dasdemi, 2019).

3. Results and Discussion

The enterprises in Gaziantep and Sanliurfa were visited and evaluated in terms of feasibility studies. Before establishing a enterprises, the grower must submit 3 copies of the feasibility report to the state institutions (Agriculture provincial and district directorate). Some information about the livestock enterprises visited is given in Table 1.

Table 1. Number of enterprises visited in terms of using computer software programs

Cizelge 1. Bilgisayar yazılım programlarını kullanma açısından ziyaret edilen işletme sayıları

Enterprises	Gaziantep			Sanliurfa			The overall total
	Using the program	Not using programs	Total	Using the program	Not using programs	Total	
Dairy cattle	8	4	12	6	3	9	21
Beef cattle	3	1	4	8	3	11	15
Dairy sheep	4	2	6	3	3	6	12
Beef sheep	2	1	3	2	2	4	7
Laying hen	2	1	3	1	1	2	5
Broiler chicken	1	1	2	1	-	1	3
	20 (67%)	10 (33%)	30	21 (64%)	12 (36%)	33	63

A total of 63 enterprises were visited, of which 30 in Gaziantep and 33 in Sanliurfa. According to Table 1, 67% of the enterprises visited in Gaziantep use computer and software programs, while 64% of the enterprises in Sanliurfa use computer and software programs. In other words, 1/3 of the enterprises are breeding without computer and software programs. In total, 65% of enterprises monitor their animals with computers and software programs.

For the feasibility study, a needs analysis should be done and how necessary this software should be calculated. During the analysis a enterprises, process and data model suitable for the identified needs was created. In the software preparation stage, the current conditions were analyzed and the needs were determined. The time plan to be followed in the coding stage was created at this stage. The software was coded in accordance with the models created during the design stage. The developed software has been tested. At this stage, necessary corrections were made by returning to the coding development stage of the test results until the software reached a sufficient level. The software, which passed the test phase, was installed. It is the last maintenance-update and a maintenance and update plan

has been created to ensure the sustainability of the system. The calculation screen code is given in Figure 1.

```

1 bagvuru
private void button1_Click(object sender, EventArgs e)
{
    int sayi = Convert.ToInt32(textBox1.Text);

    donum.Text = Convert.ToString(sayi/10);
    personel.Text = Convert.ToString(sayi /50);
    su.Text = Convert.ToString(sayi /12);
    alan.Text = Convert.ToString(sayi * 5);
    saman.Text = Convert.ToString(sayi *2);
    yonca.Text = Convert.ToString(sayi *4);
    silaj.Text = Convert.ToString(sayi *22);
    yem.Text = Convert.ToString(sayi *10);
}

```

Figur 1. Calculator screen code

Şekil 1. Hesaplama ekran kodu

The software prepared at the end of this feasibility study has been developed according to the standards accepted in the livestock industry and has been prepared to comply with the standards of the livestock industry to which it will be applied. The studies of the researchers on this subject and the data collected from Gaziantep and Sanliurfa were evaluated together and a new software program was designed. Login to the program

is made with the user name and a password to be given to the breeder from the login screen interface shown in Figure 2.

When the program is run, an encrypted login screen



Figure 2. User input interface
Şekil 2. Kullanıcı girişi arayüzü

will be encountered. After the user name and password are entered correctly on this screen, the "Main Form" will appear on the screen (Figure 3).



Figure 3. Main menu screen
Şekil 3. Ana menü ekranı



Figure 4. Enterprises type selection screen
Şekil 4. İşletme tipi seçim ekranı



Figure 5. Calculation screen
Şekil 5. Hesaplama ekranı

A new window will appear according to the animal type selected in the main menu (Figure 3). In this study, enterprises with the Holstein breed were preferred. By selecting the animal type from this screen, it is possible to switch to another screen where the data is calculated. On this screen, there is a program that calculates according to the previously obtained data (Figure 4).

Dairy cattle is taken as an example in Figure 4. The necessary structures and facilities, machinery and equipment, number of animals, number of worker and administrative personnel required for the establishment of a dairy cattle business (550 heads) will be automatically reflected on the calculation screen. All values of minimum 100 heads and maximum 1000 animals will be calculated and presented as results. The components and quantities required for the enterprises will be displayed in detail on the calculation screen.

4. Conclusion

In many studies, it has been reported that most of the enterprises owners have a low level of education. In order to make maximum use of computer-aided software programs functionally, it should be prepared by considering the education levels of the breeders. It will be important to take some measures while expanding the application fields of these software in the livestock sector.

Software and automation systems in livestock enterprises are generally applied in large-capacity enterprises. However, it has been reported that software and automation systems can also be applied in small-capacity enterprises, and that it can have a positive effect on enterprises technically and economically. Widayati et al. (2018) investigated on the readiness of the development of beef cattle in Bintuni District, West Papua in terms of technical, social and economic. The same researchers worked on techniques related to land availability, targeted land for the enterprises area, determination of the technical feasibility of the land and feasibility assessment in 62 enterprises. Guilhermino & Esslemont (1993) reported in their study in England that 62% of dairy cattle enterprises use a computer program to produce. The results obtained by the researchers (62%) were similar to the results in this study (65%). Nadaroglu et al. (2014) the temperature-humidity index calculation program was designed as the first agricultural meteorological application for livestock activities in Turkey. The program prepared with the "Temperature-Humidity Index" application calculates the stress values of animals. Stress intensities and color columns are created according to the stress values. With

this program, breeders will be able to take the necessary precautions by seeing the time zones and stress intensities in which their animals can be stressed 72 hours in advance. Nadaroglu et al. (2014), the temperature-humidity index program PHP 5.3. prepared in software language. In the study of Goncu et al. (2015) examined software related to farm animals and studied the utilization rate and efficiency of existing functions. Viazzi et al. (2014) reported that there is a software that automatically detects the lameness problem, which is frequently seen in cattle. Celikyurek & Aygun (2015) prepared a computer program for recording information about sheep and goats in their study. This program is written in Visual Basic. The Microsoft Access files were used as database. Microsoft Excel program was used for reporting processes. The records kept in the prepared computer package program are generally breeding, maintenance, feeding, feed, pre- and post-slaughter data, disease, herd management, pedigree etc. are records. Today, the tendency to use computers in businesses is increasing. For this purpose, there are programs written in Turkish for scientific purposes. The program allows a limited number of technical records to be kept. Maciuc et al. (2015) presented original results on a software program for production and reproduction data management in dairy enterprises. They used a management system database- SGBD for this purpose. Slob & Hurst (2022) mentioned Digital Twins and Industry 4.0 Technologies in their review. Researcher, after applying the selection criteria and quality assessment, selected 22 articles and used them in the literature study. The same researchers conducted their work on five databases, including Scopus (SC), Web of Science (WoS), Springer Link (SL), ScienceDirect (SD), and IEEE Xplore (IEEE). In addition, the databases they used were selected according to their relevance to agriculture and informatics domain.

There are many benefits to using "livestock management software" in enterprises. Livestock management software helps to calculate profit, increase profit and use time positively. Livestock management software is essential for running a successful ranch. It is essential for breeders to make an investment in appropriate software that is designed to meet the demands of modern enterprises. The utilization of farm management software can boost productivity by up to 20%. This software can make the management of a farm incredibly smoother. People who use livestock management software have recorded 40% higher growths and productivity than those who still use traditional cattle management methods. It is expected

that there will be investments made in livestock sector which will aid the introduction of technological advancements both in logistics and farm management. Artificial intelligence is one such technology which needs immediate implementation in the livestock industry. The automated milking booth is a section of animal husbandry which has an increasing application of artificial intelligence system (Singh, 2022).

To increase the efficiency of the enterprise, temporal and spatial data should be used. This requires virtualization of all objects in an enterprise. A digital twin can be used for virtualization. Digital twins (DT) offer a new way to represent a physical object or system in a digital environment. A DT is a data-driven, digital copy of a real-world object or environment that can be used for decision support and systems analysis (Balafoutis et al., 2017; Pylianidis et al., 2021; Verdouw et al., 2021).

The Small and Medium Enterprise Development Authority (SMEDA) was established with the objective to provide fresh impetus to the economy through the launch of an aggressive SME support program. The pre-feasibility study of 100 head dairy cows by the "Small and Medium Enterprises Development Authority Ministry of Industry and Production Government of Pakistan" is based on the business analysis of establishing a dairy farm in the Environmentally Controlled Housing (ECH) system. In this pre-feasibility study, all the necessary information for the establishment of a business is given in detail. The objective of the pre-feasibility study is primarily to facilitate potential entrepreneurs in project identification for investment. The project pre-feasibility may form the basis of an important investment decision and in order to serve this objective, the document/study covers various aspects of project concept development, start-up, and production, marketing, finance and business management. The purpose of this document is to facilitate potential investors in setting up Dairy Farm with ECH system on commercial basis by providing them a general understanding of the business with the intention of supporting potential investors in crucial investment decisions (Anonymous, 2016).

As a result, it is necessary to increase the number of livestock enterprises using computer and software programs. In addition, the agenda proposes growth purposeful policies that support the formalization of micro, small and medium-capacity enterprises. Later, expanding the application areas of the software programs used in the feasibility preparation will be

important in terms of technical, economic and financial aspects.

With this software program, it will be possible to see the information that will be required for a enterprises that is in the setup stage, the deficiencies / surpluses and correct / wrongs for an operating enterprises. In this way, the use of some unnecessary structures, installations, machinery and equipment will be prevented. With this software program, the breeder will be able to receive consultancy services, and as a result, the service quality will increase in feasibility preparation.

The study areas of research (especially small, medium and large-capacity enterprises) should be expanded. Support should be given to the development of local software. This is very important for the economy of the country. Thus, a significant contribution to the economy of the country will be made by reducing software imports from abroad.

Computer package programs to be used in modern livestock enterprises should be prepared by taking into account the opinions and demands of all researchers and breeders and livestock structure. This software program will be prepared in a way that can be used on tablets and mobile phones in future studies. In addition, software studies that make economic analyzes and calculate costs in the future are also considered. It is expected that this study will shed light on other studies to be carried out.

Conflicts of Interest

The authors declare no conflict of interest.

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