

Web-enabled Decision Support System on Most Probable Producing Ability and a Searchable Database on Herd Strength for Livestock Farm Management

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Abstract—An estimate of the producing ability of cattle, known as Most Probable Producing Ability (MPPA) is an important measure, which provides an estimate of future productivity of a dairy animal as the basis of the past productivity (in term of repeatability of the trait and the number of records). At present, no tool seems to be available for computing MPPA online. In this paper, a Web enabled decision support system is proposed for online computation of MPPA using Microsoft Visual Studio 2005, and ASP.NET 2.0 technology with C#.NET software engineering tools. The same technology is used for developing a searchable database on herd strength management. This software is useful for farm managers in screening of dairy livestock animals for culling and selection of superior animals, which can be used for breeding programs with genetically superior proven sires to produce next crop of young bulls for progeny testing. **Keywords:** Cattle, Dairy, Decision Support System, Most Probable Producing Ability, Livestock Farm, Web

Introduction

In the agricultural sector, which is in the midst of powerful changes influenced by industrialization and modernization, farm consolidations, reduced or eliminated subsidies, environmental limitations, land use conflicts, biotechnology, and increased overall risk, the availability, accessibility, and application of contemporary expert agricultural information is of high priority for farmers, technicians, and researchers. In response to these changes and demands for the most current information, numerous scientific and academic institutions and industry have turned to Decision Support Systems (DSS) as a means of packaging biological, agricultural, and technical information to make the information more easily accessible and useful for various beneficiaries in a rapidly transforming and competitive world. DSS's are a specific class of computer-based information systems (Keen, 1978) that support technological and managerial decision making by assisting the organization with knowledge about ill-structured or semi-structured issues. Ill-structured problems are usually less tangible and generally do not have structured solutions. Therefore, solving such problems requires creativity, logic and reasoning, intuition, experimentation, and in some cases best guesses. In this paper we

report the creation of a Web enabled decision support system on Most Probable Producing Ability (MPAA) and a searchable database for livestock farm management.

Materials and Methods

The MPPA, also known as Expected Producing Ability (EPA), of dairy animal indicates its inherent milk producing ability. The regression of the future records on the existing performances, *i.e.*, an estimate of how far the milk yield will be repeated in the next lactation, will give a reasonable idea about the genetic potential of the dairy animal for the milk production. The EPA of a milch animal is estimated on the basis of difference between n number of records of an animal and the herd average. On the basis of estimated EPA, the dairy animal in a herd should be ranked and a certain percentage of the low ranked dairy animals are disposed of from the herd. The proposed software intends to facilitate the dairy herd man/scientific research worker for selection of good animals for improving the milk production in the herd. The mathematical formula used for computing MPPA of a production trait (Lush, 1945) is as follows:

$$MPPA = \mu + \frac{nr}{1 + (n-1)r} (\bar{X}_i - \mu)$$

where μ = Herd average; n = Number of lactations; r = Repeatability; \bar{X}_i = Average of all the lactations of i^{th} animal. The animal, which produces less than average MPPA or below a certain level of MPPA is culled from the herd.

SOFTWARE DESCRIPTION

Web enabled decision support system on MPPA and a searchable database on Herd Strength is developed using Microsoft Visual Studio 2005 (ASP.NET2.0 with C#.NET) as front end and Microsoft SQL SERVER2005 as back end. The software is run under Windows 2000/XP/Vista environment. The software contains the various DLLs (DynamicLink Library) developed using C#.NET for generation and randomization of EPA And Herd Strength.

The GUI (Graphical User Interface) for the software is menu driven and requires minimal key board input. The software has four modules namely data management module, Catalogue of EPA , catalogue of Herd Strength and Report Generation The system can be accessed using any browser but is best compatible with Microsoft Internet Explorer.

Results and Discussion

A DSS is an interactive software-based system intended to help decision makers compile useful information from raw data, documents, personal knowledge, and/or business models to identify and solve problems and make decisions. Decision support systems are used by organizational decision-makers to improve strategic, tactical and operational decisions. Some DSS's on different aspects of livestock farm management have been developed across the world such as, cow culling DSS developed by the Department of Agricultural and Resource Economics, The University of Arizona (<http://ag.arizona.edu/arec/cull/culling>); DairyPert

expert system for management and operation of dairy herds throughout the United States (**Kalter and Skidmore 1991**); LAIT-XPRT VACHES expert system for dairy herd management developed on the basis of expert information drawn from several dairy management/nutrition experts (**Pellerin et al., 1994**); HeatProc expert system (**Rieder, 1992**) for assessment of milk pasteurisation plants with regard to product safety, product quality and energy economy; DairyPro software package (**Kerr et al., 2003**) designed to assist dairy farmers in northern Australia to make strategic decisions on their farm; a fuzzy logic based decision support system for feed allocation for dairy farm (**Morag et al., 2000**) that allocates concentrated feed to cows through individual feeders according to their performance; National Dairy Development Board (NDDB) is also continuing its endeavor in the country to provide real time information to dairy cooperatives by setting up Internet-based Dairy Information System (IDIS) (**Anonymous, 2004**). Evidently, no software seems to be available for computing Most Probable Producing Ability, online.

In this paper, a Web-enabled decision support system is proposed for online computation of MPPA and generating various periodical reports to support decision-making on different aspects of livestock management including scerining and selection of superior animals, which can be used for breeding programs with genetically superior proven sires to produce next crop of young bulls for progeny testing.

Three fundamental components of DSS architecture are (**Haettenschwiler, 1999., Power, 2002, Sprague and Carlson, 1982, Marakas, 1999**)

1. The database (or knowledge base)
2. The model (*i.e.*, the decision context and user criteria)
3. The user interface.

The users are also important components of the architecture (Haettenschwiler 1999 Marakas 1999). As described above our software incorporates all these components

The tool described in this paper is user friendly (Fig. 1, Fig.2 and Fig.3) and has an introduction page, which briefly describes the software. The system allows access only to authorized users. Two types of users can access the system, *i.e.*, Administrator and guest. The administrator is authorized to add a new record and to modify or delete an existing record. After successful login the user is permitted to enter the two areas: EPA information and herd strength information. The EPA information area contains the options on import permit EPA record, edit record and show EPA report. The herd strength information area contains options on monitoring the herd strength and adding new herd strength

For login the URL <http://www.ndri.res.in/epa/> has to be typed into the browser. The user then enters a valid user name and password in the text boxes as displayed in the User Login screen. The user then clicks on login button to login into his/her account. If the Login and Password do not match then a message showing "invalid Username/Password" is shown on the screen. There is also an option to contact the administrator to reset the password in case the password is forgotten.

The herd strength shows the total number of animals in dairy herd for different categories of animals. Using this software the herd strength of different animals in the dairy farm can be monitored and the performance of a particular animal in a specified period can also be ascertained using this module. To add to herd strength the breed name is selected and the age is entered in the respective text box. The number of animals

to be added in the database is then selected along with the sex in the dropdown menu. The month and year are also selected in respective dropdown list. Then the user clicks the add button and the confirmation dialog box appears. Finally by clicking the OK button, the information is stored in the database. For searching the herd report the breed name and sex is selected along with the month and the year. The show button is then clicked to get herd report.

To add EPA new record to the database, the animal number in the respective text box is entered. The Date of Birth is entered in the specified format. The date can also be entered using the calendar option. The Dam number and the sire number are also entered in the respective text boxes. The date of first calving (DOFC) is entered which calculates automatically the Age at first calving (AFC). The total lactation number is then entered in the respective text box. The detail of lactation-wise records is also entered in corresponding respective text boxes one by one. The rest of lactation records are filled with zero. For viewing average the user can click on the average button. The user then clicks on the Calculate EPA button for viewing the EPA in the respective text box. The year is then entered in respective text box. Finally the user button clicks on the Add record button and the message is then displayed on the screen.


The software is available online at <http://www.ndri.res.in/epa/>. The software is in use and has been practically used for EPA calculation. In conclusion we have developed a Web-enabled decision support system and a searchable database for herd management as a step forward in the direction of efficient livestock farm management.

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Websites

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Web-enabled Decision Support System for Livestock Form Management by monitoring the Herd Strength and Expected Producing Ability of Cattle & Buffaloes



[Herd Strength](#) [EPA Report](#) [Search](#) [About EPD](#) [EPD Report](#) [Contact us](#)

Search Record by Different Breed


Breed Name: Sex:

Month: Year:


Total:

Breed	Age (Month)	Sex	Total
Murrah	0.5	Female	2
Murrah	1	Female	2
Murrah	2	Female	4
Murrah	3	Female	3
Murrah	4	Female	1
Murrah	6	Female	1
Murrah	12	Female	20
Murrah	24	Female	56
Murrah	30	Female	20
Murrah	36	Female	19
Murrah	40	Female	35
Murrah	Buffalo	Female	145

Fig.1: A screenshot of the pages of the reported decision support system



Web-enabled Decision Support System for Livestock Form Management by monitoring the Herd Strength And Expected Producing Ability of Cattle & Buffaloes



[Home](#) [Add Herd](#) [Add EPA](#) [Search Herd](#) [Update EPA](#) [EPA Report](#) [Photo Gallery](#) [Delete Record](#)

About:-A herd is a large group of animals and is a form of collective animal behavior. The term is usually applied to mammals, particularly ungulates.Herd Strength is the total number of animal in Cattle yard.So perticular duration and diffrent category of animal just like as Sahiwal and Tharparker,Karan Swish,and Murrah buffalo. so we need a perticular software . Using this software we are mesure the hard strength of diffrent animals. and Search the perticular animal in specifice period.




Fig.2: A screenshot of the Front pages of the reported decision support system

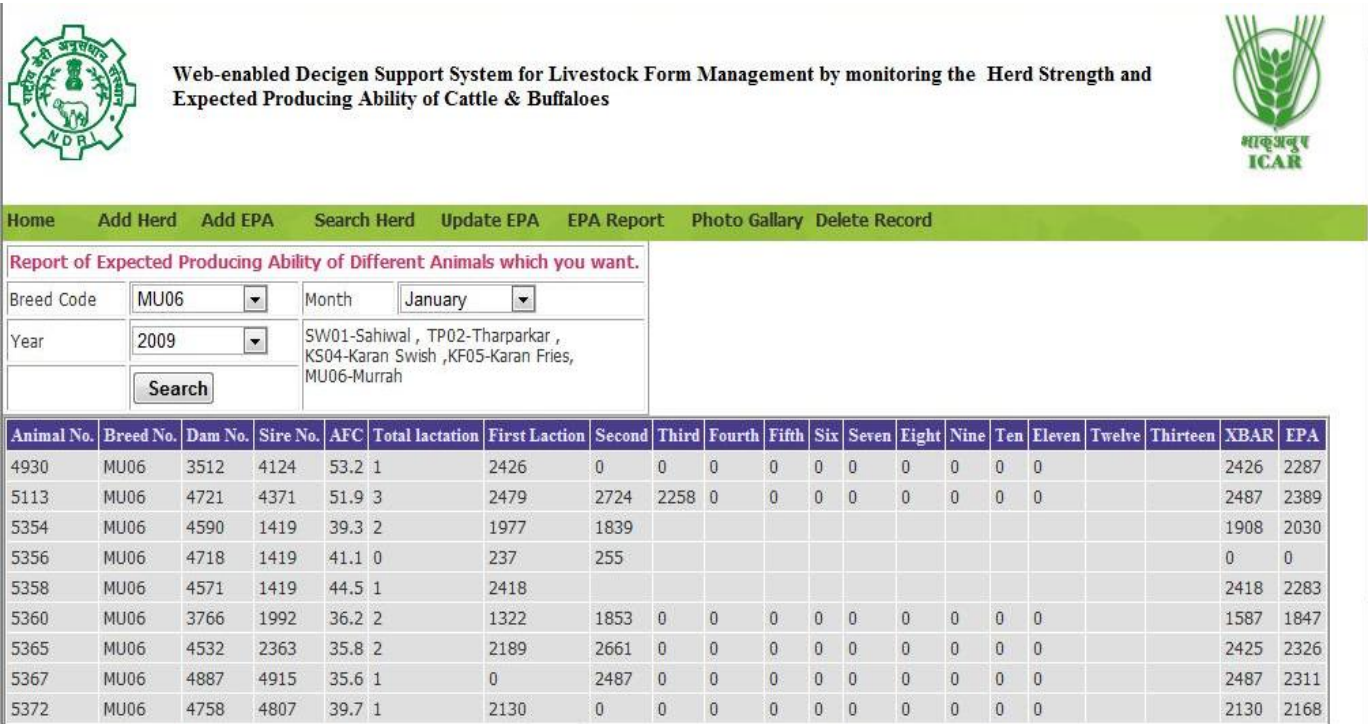


Fig.3: A screenshot of the pages of the reported decision support system