Designing a support system in decision making for better management of livestock production

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Summary

Animal identification and record keeping are building blocks for enhancing livestock productivity and effective decision making for genetic improvement programme. The aim of the present situation was to develop online national data repository for goat production system to be utilized by researchers, government, policy makers and developmental agencies. The database will help to manage complex livestock performance data set and will provide input for livestock management decision for better profitability. Goat Production Management Information System (GMIS) has a centralized structure which is user-friendly, E-based information management interactive system which can only be accessed by authorized users. It has been developed using My-SQL, PHP, Java script, HTML, CSS and platform independent. The GIMS is designed to address the following six key issues in management of livestock performance data – Uniform and standardization of data definition – data retrieval of standard performance traits for statistical analysis and report preparation. In order to address these various aspects of livestock data management, the GMIS software has a modular design, on different aspects of livestock production. The modules described for management of animal inventory, growth, milk yield, reproduction, health management, physiological response, buck/doe distribution, trainings conducted, farmers registered, number of cluster/villages covered, details of exposure visits made, awareness camp organized. Besides this, the database will enable us to manage resources, manpower, fund as well as other targets of the project. The website (http://pcgoatcirg.icar.gov.in/) of AICRP on Goat Improvement also provides “knowledge portal” for visitors. Through GMIS, we present a new and simple way of storing and retrieving data for managing livestock production by effective decision making. The database will be used for genetic evaluation of animals by retrieving information on different aspects of goat production.

Keywords: Goat Production System, Database, GMIS.

Introduction

The animal identification and performance recording of livestock species have been carried out by different developing countries. Animal identification and record keeping are building blocks for enhancing livestock productivity and effective decision making for genetic improvement programme. It is necessary to analyze the genetic worth of livestock and to evaluate the breeds for conservation purpose. It is not possible to analyze the data in time frame manner as they are scattered in different registers

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across the region. Therefore, it is necessary to develop the information management software to trace the pedigree as well as performance record. Goat farming with modern scientific inputs will bring social transformation by providing livelihood security to people in most disadvantage places, thereby fulfilling the objective of "Inclusive growth" in our society. Goat production management information system (GMIS) is an emerging field in the intersection of goat production informatics, farmers interaction and business to goat production services and information delivered or enhanced through the Internet and related technologies". The goat production information system is undergoing fundamental changes. Examples of such changes include inventory, growth, male/female reproduction, mortality record and the treatment of chronic diseases that actively involves the goat herd. The emergence of web-based GMIS portals is a natural result of such changes because such portals provide scientist, farmers and other stakeholders easy accesses to information no matter where they are. According to a recent survey, most scientist and farmers agree to access e-base information system via a web-based portal system. The database is primarily aimed to manage data on goats however; in future it can be modified to fulfill the need of other species too.

Main objective of GMIS is to provide users with a computerized tool that allows them to manage complex livestock performance data set, and to provide help in livestock management without relying on specialist computer and data management support.

Material and methods

Language, platform and modules

GMIS, an information system based on MySQL, PHP a server side scripting language along with HTML were used to prepare the information system which can be hosted either on Windows or on Linux platform. Provision has been made for each of the AICRP centers collaborating forms to open secure login and password and update data which can be manage through specific login and password there for each of the calibrating form can update their own records but can't manipulate others. However the administrator being head of the information and management system will have permission combine to collate the information in the manner required to create knowledge base and for statistical analysis. The computational requirement for this information system would be a server having IP address, DNS and dedicated internet gateway. The modules described for management of animal inventory, growth, milk yield, male & female reproduction, health management, physiological report, buck/doe distribution, capacity building programmes, farmers registered, number of cluster/villages covered and funds allocated and its utilization, details of exposure visits made, awareness camp organized and different publications is maintained in integrated databases using a relational database management system. Such a system will enable collecting appropriate data, including quality management and inspection controls i.e. for funds allocated and its utilization, farm/field visits made, number of farmers participated, income and revenue generation by selling of buck/doe etc. Data entry can be made through various modules however, standardized excel formats has been developed and provided for uploading large amount of data in database on one click. This will help to reduce the time consumed while uploading mass data also help in increasing the amount of data in creating the repository. Regular updates in details of budget allocated and utilization leads to prepare monthly reports at Project Coordinator Unit.

The reported data through GIMS can be fetch in M S excel format and direct printing facility to all approved users of AICRP on Goat Improvement. However the basic information regarding breed, publications, availability of elite germplasm, technology developed & its impact and good practices is available at "Knowledge portal" of the AICRP of goat improvement website (*http://pcgoatcirg.icar.gov.in*/) for visitors or general public.

Modules under GMIS database

Following formats were included in Information system.

1. Inventory.
2. Growth.
3. Milk yield.
4. Reproduction.
   - Male reproduction.
   - Female reproduction.
5. Health management.
6. Mortality.
7. Staffing pattern.
8. Finance.
9. GIS.
10. Capacity building.

Results and discussion

The design of GMIS database is, however, particularly challenging due to its unique functionality and security requirements. First, a traditional design of portal systems will encounter difficulties in integrating heterogeneous e-based information system for small remnants production and research and goat rearing techniques implemented with different technologies. The complexity of such integration will make it difficult to extend an existing system with new services. We address the above issues through the design and implementation of a secure web-based centralized information system. To meet the functional requirements, we adopt a knowledge-oriented approach to the design of our database. We then tackle various security issues involved in such a design. More specifically, we outline our solutions for authentication and authorization of users by providing secure login through username and password, for preserving centers privacy through preference negotiation and database technology. Formats for Pedigree and performance recording of goats under farm and field conditions were taken from livestock farms and AICRP units and were standardize to bring uniformity and make it universally applicable in most farming conditions and production system. Initially, the software was launched for 60 days as pilot project. GMIS has definitely quickened the entire of process of performance recording and record keeping. The traditional method of recording information involves individual manual entry; an arduous and a time consuming process. Also there were no uniformity and proper formats for record keeping under the project.

Research data

Inventory

This interface includes information on animal, sire, dam ID along with species, breed, location, sex, mode of entry (by birth or purchase), date of birth and case of disposal. Number of progenies produced by the scenario will automatically be taken from the pedigree record. All the data will be viewed by clicking on the “stock view”.

Growth

This module includes body weight and body measurement of the animal. Once animal ID is entered and click on load button then software automatically collects and show sire, dam ID and past growth records from the inventory and growth database. This will authenticate that correct growth information is entered in the field. It also collects information on date of birth, sex, parity of dam from the reproduction database and shows them for verification. Then body weight growth at birth, 3, 6, 9 and 12 months can be updated by entering the data in the field provided. The data on body measurement like BL (Body Length), BH (Body Length), HG (Heart Girth), can also be entered. The growth data at three months interval is shown from relevant databases. This module also generates average daily gains for different age periods.

Milk yield

In this module the information on weekly milk production data for each can be added. The software calculates partial milk yield for 90 days, 140 days, lactation milk yield, lactation period and average daily milk yield for the lactation period. It also automatically calculates the type of kidding, parity from reproduction database.

In case of Changthangi breed, pashmina production has been recorded. In this module data on pashmina production is maintained. The information on animal number, its parent, sex, parity, pashmina yield, date of pashmina yield, season and weight of animal at pashmina yield can be added. In this module information on pashmina produced from the pashmina goat can be viewed by clicking view yield button in summarized form.

Reproduction

This module includes reproduction performance of doe and buck goats. Like all modules, if animal ID is given, the information on sire and dam, date of birth will be retrieved from Inventory database. The date of service, weight of animal at service, buck identity, date of kidding, type of kidding can be added. After the information on an individual female is entered in the database the software automatically calculates age at first kidding, kidding interval, gestation, service period and parity.

Health management

Health management modules have three sub-module i.e. Health management operations, physiological response and mortality. This module includes the details of preventive health care. After each visit to the cluster / village information on vaccination and treatment related data can be added.

Buck distribution

In buck distribution module user can maintain the records of Buck Distribution of field and income generated by the center. Details of the name of cluster, tag no, name of village, name of farmer, mode of distribution, date of buck provided can be added . By clicking view button user can see all buck distribution record in summarized form.

Finance and accounts

Project Management database

In finance module information related to budget allotted to unit, fund utilization, head wise fund utilization and income generation can be maintained.

a) **Budget Estimate (BE):** Allotted budget of each unit for the financial year is shown in this section. Click on Finance and select Budget Estimate to view BE.

b) **Revised Estimate (RE):** The installment wise amount distributed by PC Unit to each unit is shown in this section. Click on Finance and select Revised Estimate to view RE.

c) **Fund Utilization:** In this module user can submit the details about head-wise monthly fund utilization. Overall budget details i.e. balance funds and expense details can be viewed by clicking on “fund detail

Farmer’s registration

This module maintains the information on registered farmers. In this module entry of adopted farmer related information viz. name of farmer, mobile number, number of goat, registration date, address of farmer can be added. By clicking view button user can view all farmers’ information in summary.

Overview

The overview module helps in monitoring and evaluating the performance of a particular unit by acknowledging flock strength, growth rate, milk production, kidding rate and interval, type of kidding age at first kidding and mortality etc. Such an approach is aimed to establish functional relationship between all AICRP Units and the PC Unit, also in this way the raw data is reportable and readable for experts.

Discussion

A generic data set is distributed along with the GMIS software, consisting of the definitions of essential and useful data files and variables. This generic data set can be individually configured by the user to suit personal requirements by changing existing data files and variables, as well as by adding new data files and variables. The possibility to individually configure the data structure allows users to accommodate a large variety of different goat breed related data. Before GMIS, it creates hazel in preparing sudden weekly and monthly reports and gathering information from eighteen centers of AICRP on goat improvement was a haphazard task. Also for referring past data, we have to find out past year’s annual reports of centers. But after introducing GMIS, it is very easy to search past year’s progress reports, data and publication at one place only.

All the modules in GMIS are prepared as per the manual paper formats which was used traditionally with little bit of modification. Broadly, GMIS is focusing on five main factors of record keeping

1. Inventory.
2. Growth.
3. Reproduction.
4. Health.
5. Capacity building.
6. Finance.

For each of these modules, there are various sub-modules of predefined data. Each module contains the specific layouts which are customized as per the specifications of a particular breed.

Conclusions

In order to address these various aspects of livestock data management, the GMIS software has a modular design, with different modules addressing each of the above mentioned issues. The GMIS database package has been designed to address the following key issues in management of livestock performance:

- Balance of flexibility and standardization of data definition.
- Documentation and definition of data sets.
- Assistance in deriving non-observed data (breed, parity, mating–parturition connection.
- Data validation and error correction
- Reporting for animal management
- Data extraction and calculation of standard performance traits for statistical analysis.
- Number of farmers registered.
- Registered farm overview (Total animals, number of elite bucks, Buck Distributed, Farmers Registered and Growth Rate etc.).

The database will also maintain backup of whole data breed wise/center-wise. GMIS will help to improve the quality and effectiveness of data recording for making better financial decisions. GMIS is user friendly and affordable. It have easiest way to document breed wise record keeping for various aspects like animal identification, growth, lactation/pashmina, reproduction, mortality, income and expense etc.. Simultaneously, GMIS provides complete to PC Unit to evaluate and monitor the overall performance of the entire units pan India quickly. The database provides an insight to research management, analyse production performance and taking appropriate measures for disease occurrence and deficiency. The database also provides an edge to farmers for different advisory with respect to various climatic hazards. Farmer can manage the flock in different agroclimatic zone by following specific package of practices and general practices. The database will serve as repository of availabiliy of improved animals for genetic improvement programme. The database provides the information

the skill requirement and skill acquired by stakeholders. The database will work as repository of available technologies in goat production and as a source motivation for model goat farming and profit making.

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