Dairy Scheme Prediction and Strengthening Dairy Infrastructure

Neha Samal[#1], Nikita Tupsamindra[*2], Fiza Morve[#3], Tanuja Gund[*4], Prof. S. H. Patil[*5]

[1,2,3,4] Students & [5]Assit. Prof. of Department of Computer Engineering,
JSPM's Jayawantrao Sawant College of Engineering
Hadapsar, Pune-28
Savitribai Phule Pune University, Pune

***Abstract*— Cow survival which is one of the complex traits just like health, environmental factors like farm management, health. Machine Learning (ML) and data-driven techniques are creating greater opportunities for smart dairy farming. So the value of milk is continuously increases due to the increase world population. Dairy products consumption is more in developed countries rather than developing countries. To increased demand for milk products, technological techniques for improving milk yield are required. It is expected that the use of ML and different AI techniques can assist a farmer to overcome different traditional farming challenges, assets, and government schemas and increase milk production. In this research, we address different aspects that a dairy farmer has to face in daily routine life. In this proposed work we also discuss different government schemas and their utilization as per area or as per prediction factor using machine learning techniques and Decision Tree algorithms.**

***Keywords*— Decision Tree (DT) Classifier, Machine Learning & Classification, Dairy Schemes, Cow & Buffalos, Farmers, Government, and Dataset, etc**

I. INTRODUCTION

Central government is facing lot of issue regarding formation of the dairy infrastructure. to resolve this problem government has posted this issue on the hacker rank, there are basic motives of government like collection of data of cows, buffaloes, Dairy farmers, Government registered Dairies etc . every state have different types of requirement depending on the data of the state. like count of cows, buffaloes, farmers, milk requirement of the state on basis of the provided data one of the scheme from 9 central government scheme will be emposed on that state for example (if the count of cows is high but the milk production is low relatively then the scheme related health of the animals will be predicted and many more example like this).

Strengthening Infrastructure for Quality and Clean Milk Production (CMP), a centrally sponsored scheme, has been launched since October 2003 to promote clean milk production through multi-stage intervention at household, DCS and Dairy levels. The scheme is being implemented by the States through the Milk Unions/Federations. Since launching 130 projects at a total cost of Rs. 194.93 crore with a central share of Rs. 159.08 crore have been approved up to 31.10.07. It covers 176 districts and 101 Milk Unions spread over twenty-one states and one Union Territory. Several states and Unions have come forward with new projects for assistance under the scheme. However, the benefits that accrued to the farming community and dairy cooperatives due to the implementation of the scheme is yet to be clearly understood. Therefore the GOI decided to have a comprehensive review of the scheme being implemented in the states and entrusted the task to the Centre for Management Development (CMD), Thiruvananthapuram, Kerala. Six States – Karnataka, Maharashtra, Orissa, Rajasthan, UP and Mizoram – and eleven milk Unions from these states were sampled to represent the agro climatic zones in the country. The consultants from CMD traveled extensively in all the eleven districts/Taluks studying the scheme and meeting the major stake holders. The outcome of the study laid out in six sections; Introduction, Evaluation Objectives and Methodology, Planning and Implementation, Study Findings, Key Issues and Recommendations and Conclusion apart from an Executive Summary in the beginning, is presented in this document. Resilience of animals refers to their capacity to cope with short-term perturbations in their environment and return to their undisturbed status. Lifetime resilient dairy cows are characterized as animals that have a high probability of completing multiple lactations, exhibit good productive and reproductive performance, face few health problems that they overcome easily, and are efficient and consistent in their milk production. Improving resilience in dairy cows yields substantial advantages: it contributes to animal health and welfare, improves the productivity of the farm, reduces the environmental impacts of the sector, and reduces the need for antibiotic usage. Additionally, intensification of the livestock sector, with increasing herd size and limited availability of labour, results in a need for easy-to-manage and healthy herds.

Early predictions of dairy schemes and lifetime resilience can be used as input for decision support tools for farmers and to improve resilience through breeding. However, an early identification of cows that will smoothly go through multiple lactations remains difficult. The challenges an animal will encounter cannot be predicted and will differ from individual to individual, from farm to farm. On top of that, challenges will vary in seriousness (e.g., udder infections with minor versus major pathogens), and indicators for general resilience have currently not been defined. The ability to cope with these challenges is most clearly shown at the end of productive life, and is affected by management decisions.

In this proposed system we implement an web based application in python technology using flask framework. In this system we introduce how dairy schemes applicable in particular area and prediction of those things with the help of different machine learning algorithms like Decision Tree and so on.

II. LITERATURE SURVEY

1. Ebrahimi et al. (2019). Comprehensive analysis of machine learning models for prediction of sub clinical mastitis: Deep Learning and Gradient-Boosted Trees outperform other models. Computers in Biology and Science, 10."This study shows that the two prediction model (GBT and BL) are able to accurately forecast sub clinical mastitis based on multiple milking variables, confirming the power of machine based prediction in solving one of oldest problem in dairy cattle industry."

2. Ehret et al. (2015). Short communication: use of genomic and metabollic information as well as milk performance records for prediction of subclinical ketosis risk via artificial neural network. Journal of Dairy Science Vol.98, 8."Systematically assess the applicability of different sources of information to predicting subclinical ketosis in early lactation."

3. Lopez Suarez et al. (2018). Extraction of pattern to support dairy culling management. Modelling Decision for Artificial Intelligence, 12."The management of dairy farm involve taking decision such as culling a subset of cows to improve dairy production."

4. Lopez Suarez et al. (2018).By Using decision trees to extract patterns for dairy culling management. Springer International Publishing AG 2018, 9."In the present study we used decision trees to develop a model able to classify a cows and buffalos according to average herd productivity."

5. Nguyen et al. (2020). Comparison of the forecast models of production of dairy cows combining animal and diet parameters. Elsevier, 28."Milk production forecasting of the dairy cows is the essential factor that is useful for the dairy farmers in management as well as health monitoring."

III. Problem Statement

Government of India is making efforts for strengthening infrastructure for production of quality milk, procurement, processing and marketing of milk and milk products through various dairy development schemes. So to streamline whole data, a web based portal or application can be create and strengthen dairy assets or infrastructure by all dairy processors of the private and cooperative dairy sector is required. The solution to this problem which will be web portal that support tagging and monitor capital assets created under dairy development schemes based on geographical locations.

IV. Proposed System

➢ Proposed System Architecture:

As we know that all farmers might not be educated and very handy with technology so to make the registration of farmer and to fill in all the necessary data correctly the government approved dearies workers will register the farmers on the web application the central government gives the authority to dairy so the first login provided is dairy login, the dairy can add farmers, the number of cows and buffaloes, milk production, quality of milk, etc, on basis of collected data from all dairies of India, all India data is collected and stored in the data is presented in the graphical format to everyone, to apply the scheme state wise key features are extracted from data and on that data the decision tree Algorithm is applied to get the best fitting scheme for that state.

This research focuses on dairy farming and proposed a framework with different levels. The overall architecture has been described in Figure 1. A user panel for capturing data from farmers and dairy farm cows will send data to the nearest gateway and, with the help of Internet; the data will be transferred to a base station. The base station sends the data to cloud, and the cloud will analyse data using different techniques and methods. Smart dairy farming which is ML enabled has some dairy management techniques for maintaining the logs and historical data. With this data the farmer can also predict the future data according to the environment of the cow. After analysing the captured data, the cloud will send the alerts to the farmer for assisting the cow. This management system can be applied to large-scale dairy farming when there are a lot of animals.

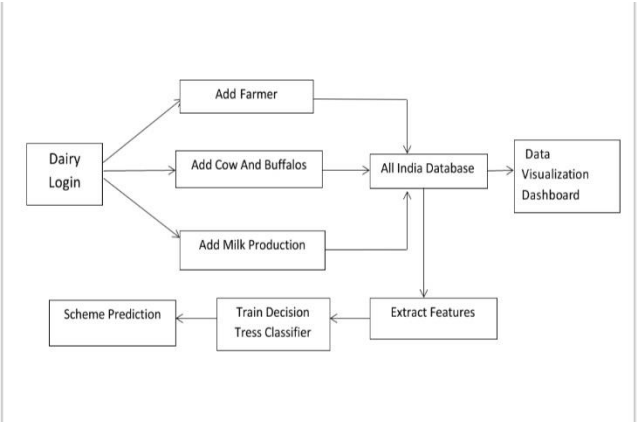

Fig.1: System Architecture

The system will automatically detect the need and send alert to the farmer. There are many factors that can cause lower milk production, but this overall architecture can create a comfortable environment for a cow. It will be helpful for cows and ultimately can increase milk production.

A. **Methodologies (Modules) :-**

Smart Dairy Farming

- Cow and buffalo management:

To improve the health of cows and buffaloes, improve the quality of life of cows and buffaloes, to improve reproduction and life expectancy of cows and buffaloes, cows and buffaloes management plays a vital role.

- Dairy product management:

To improve the quality of milk with all the health check passes and with all the nutritional values, to improve the quantity of milk production without any compromise on the quality of milk dairy product management is very important

- Dairy product and asset management:

As milk production is high and demand for milk and all products that are made from milk like(yogurt, milk cream, ice cream, and sweets) is very high, there is a requirement for a few types of machinery like refrigerators, vehicles, product-specific machines, etc for variety of product making and transporting to manage the requirement and maintain the existing systems dairy product and asset management is very important

- Data Visualization:

All the data that is entered in the system is graphically represented for all specific terms like (the number of farmers, number of cows and buffaloes, milk production in a day week, or month, etc.)

- Result Prediction:

By using the key elements from the provided data and applying the decision tree classifier algorithm to the key elements the prediction of the scheme is made for all states of India where each state-predicted result will be different because it is predicted based on provided data of that particular state.

B. **Algorithms and Techniques:-**

- Decision Trees Classifier.
  - Classification Techniques: this is able to distinguish between dominating and certain low-level features in images and classify them using the Decision Tree Classification technique.
  - Feature Extraction: To extracting dominant features which are rotational and positional invariant, thus maintaining the process of effectively training of the model.

Expected Result:

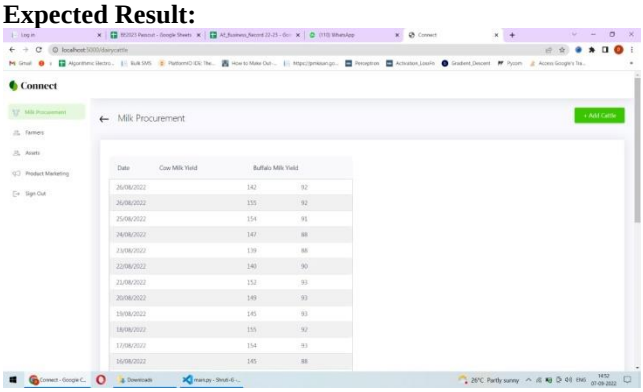

Fig.2: Data Visualization

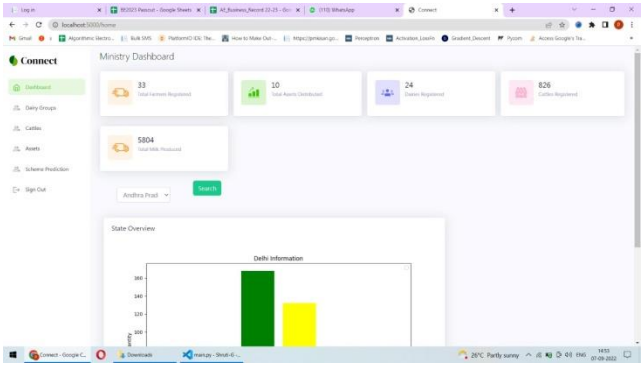

Fig.3: Dashboard

V. Future Scope

Furthermore, a framework that can help a farmer in increasing production of milk has been proposed. The proposed system is an overall architecture for better adoption of the latest techniques for improving the schemas and its procedures. The system with overall architecture, better adaptation of technology, and versatile design can make IoT based farming more efficient. Although it may require heavy investment in initial stages, later on, the improved technological infrastructure can make balance between the invested amount and the earned amount.

VI. Acknowledgment

We would prefer to give thanks the researchers likewise publishers for creating their resources available. We are conjointly grateful to guide, reviewer for their valuable suggestions and also thank the college authorities for providing the required infrastructure and support.

VII. Conclusions

In this modern world, dairy farming is an attractive business that can be supported to improve economic conditions of a country. In this proposed system first count number of cows and buffalos at farmer's side then survey on that area and provide better schemas for the farmer. Efficient milk production and technological methodology can lead to better nutrition of cows, which can be ultimately the reason for more milk production.

VIII. Result Analysis

Smart dairy farming (SDF) is **the basic concept that can fulfill the increasing requests of quality dairy products**. SDF can decrease the use of resources, reduce the environmental issues, and raise the health of animals by using data analysing technologies and advanced sensing.

In this system we can implement an web based application in python technology using flask framework. In this system we introduce how dairy schemes applicable in particular area and prediction of those things with the help of different machine learning algorithms like Decision Tree and so on.

The result analysis is done based on the following parameters is as follows:

- Time consumption
- Response Time
- Computation Cost
- Performance accuracy

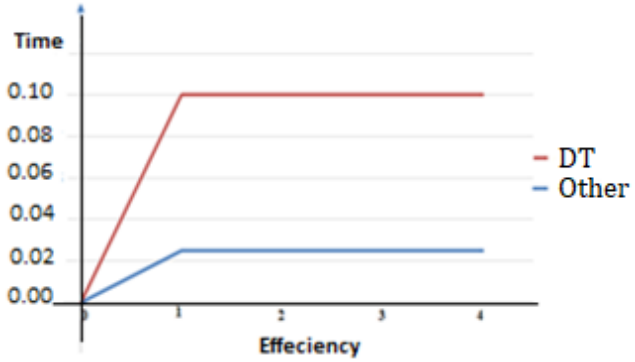

Fig.4: Time and Efficiency Chart

Here, Whole System took more attributes for the input purpose but here mainly concentrates on the Time and Performance of the system. In existing system required more time, space and security issues so we first focus on those things. Supported a couple of attributes we'll get the subsequent analytical result for our proposed system.

Parameter	Existing	Proposed
A	10	4
B	10	5
C	8	8
D	10	3
E	8	2

Table 1: Result Table

Where,

A = Time Consumption.
B = Response Time.
C = Computation Cost.
D = Performance accuracy
E = Scalable & User Friendly.

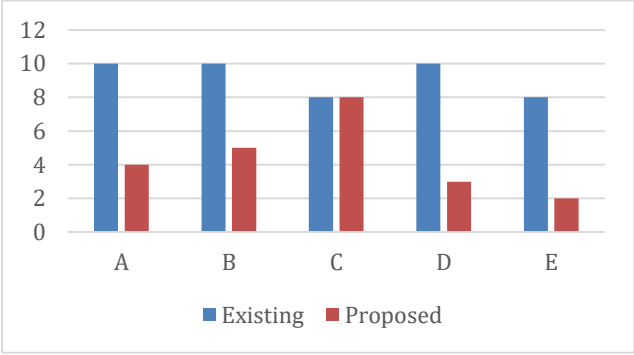

Fig.5: Time line chart of Result Analysis

REFERENCES

[1] W. J. Yan, X. Chen, O. Akca , J. Lim, D. Yan, "Big Data Analytics for Empowering Milk Yield Prediction in Dairy Supply Chains", IEEE International Conference on Big Data (Big Data),2015.

[2] Likki rajeev, p. Suresh kumar, S. koteshwara rao, "Design of Milk Analysis Embedded System for Dairy Farmers", International Journal of Advanced Technology and Innovative Research, 2015.

[3] Lorenzo DiSilvestro1, Michael Burch, Margherita Caccamo, Daniel Weiskopf, Fabian Beck, GiovanniGallo, "Visual Analysis of Time dependent Multivariate Data from Dairy Farming Industry", International Conference on Information Visualization Theory and Applications, 2014.

[4] M. R. Begum, M. Anaruzzaman, M. S. I. Khan, and M. Yousuf, "Factors affecting the milk production of dairy cattle in northern rural areas of Bangladesh," International Journal of Agricultural Research, Innovation and Technology, vol. 4, no. 2, pp. 41–45, 2014R. E. Sorace,

[5] E. Kino, R. Kawakami, T. Minamino et al., "Exploration of factors determining milk production by Holstein cows raised on a dairy farm in a temperate climate area," Tropical Animal Health and Production, vol. 51, no. 3, pp. 529–536,2019

[6] J. Heinrichs, C. Jones, and K. Bailey, "Milk components: understanding the causes and importance of milk fat and protein variation in your dairy herd," Dairy Animal Science, vol. 5, pp. 1e–8e, 1997

[7] C. Lokhorst, "An introduction to smart dairy farming," 2018.

[8] *J. S. Dunklee, A. E. Freeman, and D. H. Kelley, "Comparison of Holsteins selected for high and average milk production. 2. Health and reproductive response to selection for milk," Journal of Dairy Science, vol. 77, no. 12, pp. 3683–3690, 1994.*

[9] G. Mariama, S. Philippe, A. Serge et al., "Analyses of constraints related to milk production in Liptako Gourma in Niger," African Journal of Agricultural Research, vol. 12, no. 23, pp. 1949–1958, 2017.

[10] D. F. Chapman, J. +armaraj, and Z. N. Nie, "Milk-production potential of different sward types in a temperate southern Australian environment," Grass and Forage Science, vol. 63, no. 2, pp. 221–233, 2008.

[11] A. C. Clutter and M. K. Nielsen, "Effect of level of beef cow milk production on pre-and postweaning calf growth," Journal of Animal Science, vol. 64, no. 5, pp. 1313–1322, 1987

[12] A. Kamilaris, F. Gao, F. X. Prenafeta-Bold´u, and M. I. Ali, "Agri-IoT: a semantic framework for internet of things-enabled smart farming applications," in Proceedings of the 2016 IEEE 3rd World Forum on Internet of Things (WFIoT), Reston, VA, USA, December 2016.