Grenze International Journal of Engineering and Technology, Jan Issue

IOT based Automated Cattle Fodder System

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***Abstract*—An IoT-based Automated Cattle Fodder is a dairy or cattle feeding device that has been automated. The NodeMCU is used in this framework to introduce the Internet of Things. The NodeMCu connects the feeding device's entire electrical configuration to the cloud. The Load Cell detects cattle feeding automatically by sensing the weight of the sorghum chaffs. The data collected from the load cell will be sent to the NodeMCU to ensure the cattle's continuous feed supply.**

***Index Terms*— Internet of things, Automatic fodder system, cattle food-sorghum, load cell and IR sensor.**

I. INTRODUCTION

Automation is the use of machines, control systems, and information technology to increase the efficiency of product production. Many people in developing countries continue to use hand-driven techniques for cutting cattle feed and manually distributing it in this modern era [1].When driving the cattle feed machine via hand, these machines become insecure, and they often need more professional manpower to perform. In this manual feed cutting process, the farmer or machine operator should hold the cattle feed (sorghum) and slowly insert it into the machine cutting process, where the blade inside the machine cuts the cattle feed into small pieces that are distributed randomly. Following that, manual distribution of the spread cattle feed is required. The main obstacles are high labour requirements and grass blockage, which causes feed interference [3]. Farmers are discouraged from investing in technology development due to a lack of access to business organizations and meagre earnings.

In recent years, efforts have been made to move toward automation, particularly in cattle feeding systems. In some ways, it is to control the cattle feeding activity by using a cattle feeder that combines mechanical and electrical structures to form an automated system [5] rather than manually feeding. Cattle owners who are away for an extended period of time might not be aware of their fed cattle's condition [7].As a result, the automated

Grenze ID: 01.GIJET.7.1.630

cattle fodder device is extremely valuable. The automated cattle fodder system will automatically cut the cattle food (sorghum) into small pieces and distribute it to the cattle, removing the need for human interference. This improves milk productivity by enhancing animal digestion and preventing animals from refusing any portion of their food [4].The number of cutting times at each interval is controlled by a timer. Cattle owners who are absent for an extended period of time will struggle to keep track of their feed cattle [7]. A smart farm system is required for remote operation and monitoring of cattle farms. Developing farm-specific models that individual farmers can use to organize their operations, such as dealing with knowledge overload. This intelligent device also should be able to monitor the entire farm. A cost-effective, intelligent machine can be built using microcontrollers and an IP camera, as well as an Internet or Intranet linked to the devices, such as smart phones or computers. In this paper, we created an IoT-based smart cattle fodder system with the above-mentioned features.

II. Literature Review

Anne Grothman, Franz Nydegger, automatic feeding system for dairy cattle. They automate the cattle feeding system using a rail-guided feed wagon suitable only for the cattle mixture feeding system.
Prof Jimmy Mathew, Extending automation to the farm level feeding system. Energy-efficient farm automation helps to improve the process and efficiency of cattle farming.
Navaneeth B S, A K Murty, Automatic poultry feeder. They develop an automatic feeder that will optimize the feeding of birds suitable only for large scale poultries.

III. Methodology

Figure 1 depicts the various components of the under consideration automated cattle fodder device. A battery power supply serves as the device's energy source, supplying electricity. The NodeMCU is a device that sends data to a receiver via the cloud. Wiper and gear motors are also used to operate the conveyor, blades, and lever mechanism.

The load cell is used to determine how much chaff is present. The weight of the chaffs was then determined, and an equivalent amount of electrical output was produced. This electrical output is received by NodeMCU, which controls the cutting and distribution process, and converted to an equivalent amount of digital input.

The blade slashes the cattle food (sorghum) into tiny parts, which fall into an upper conveyor that carries the chopped sorghum; from there, it travels to a lower conveyor, which is fitted with a lever mechanism that pushes the sensed cattle food to the box held in front of the cattle using the sensing device (IR sensor), holding the machine closed-loop. The weight of the chaffs will be transmitted to the cloud via NodeMCU, and this information will be used to analyze the feeds delivered to the cattle.

A. Components Required

Hardware components:

- Conveyor
- Wiper motor
- Gear motor
- Battery
- IR sensor
- Relay circuit
- Node MCU
- HX711 Module
- Load Cell

Software:

- Microcontroller coding
- C Language

IV. BLOCK DIAGRAM OF PROPOSED SYSTEM

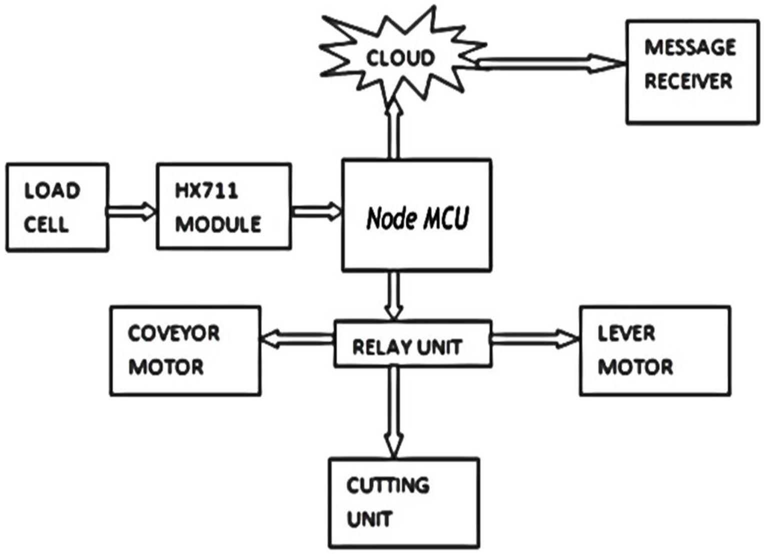

Figure 1. Automated Cattle Fodder System block diagram

V. HARDWARE DESCRIPTION

Figure 2 depicts the mechanical configuration that will be used. It consists of two conveyors and a blade set up to cut and distribute cattle feed without the need for human interference, as well as transfer data to the customer through the cloud using NodeMCU, as previously mentioned.

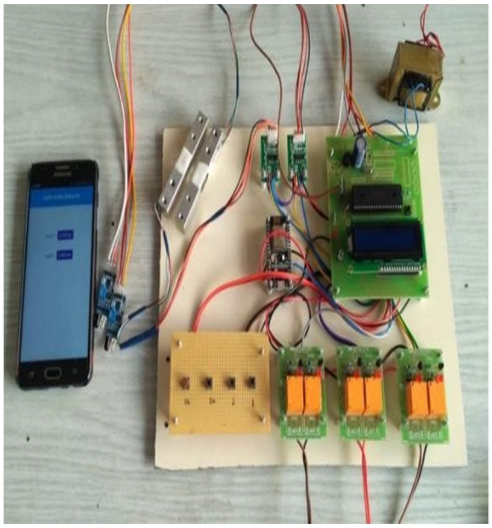

Figure 2. Fodder system hardware model. Figure 3. Configuration of the fodder system'selectrical system

The intended electrical configuration is shown in Figure 3. A filter circuit for pure DC power, a relay circuit for proper motor operation, and a NodeMCU for computer power make up the system. In the driver circuit, low voltage (LV) coils are used.

VI. DIAGRAM OF THE PROCESS FLOW

This is a flow diagram of our proposed work microcontroller software, which shows how our automated cattle fodder system works (AFS).Before the cattle are loaded into this automated cattle fodder system, a load cell checks to see if there is enough feed in the feed box. When the amount of feed in the feed box exceeds a predetermined limit, Convey 1 stops, as does the cutting blade and a lever mechanism that follows. The conveyor 1, cutting blade, and lever mechanism continue to operate until the feed level in the cattle's feed box reach the target level. The system will come to a halt if all of the sensors are activated at the same time.

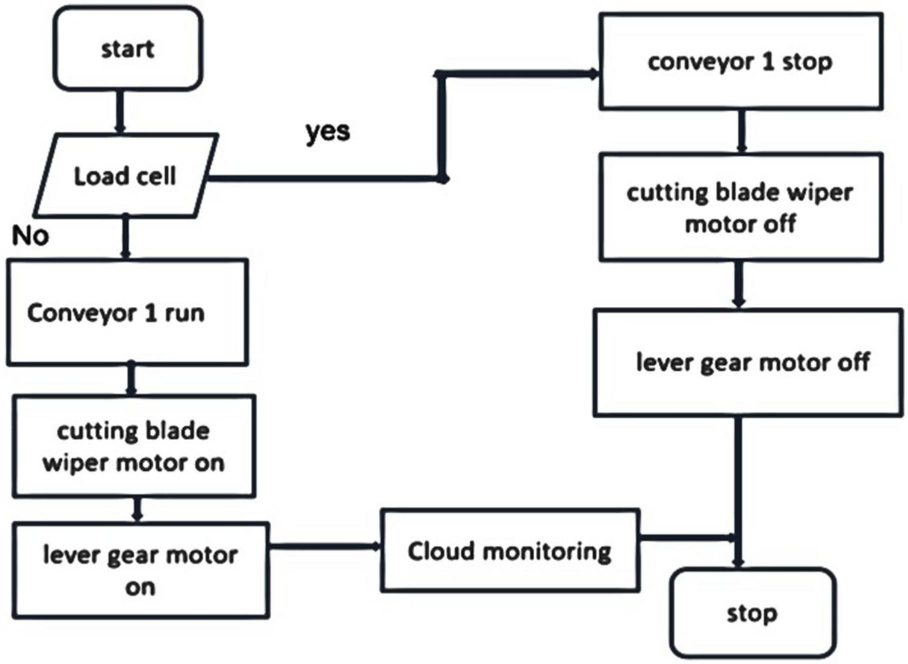

Figure 4. A flowchart depicting the system's operation

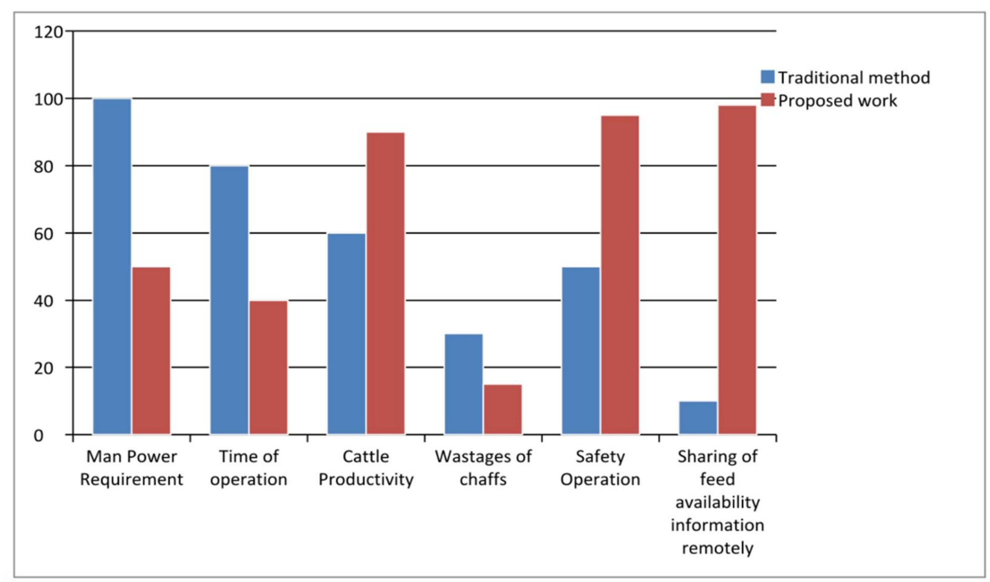

Figure 5. Results Based on Testing

VII. CONCLUSION

The model examined existing feed cutters in developing countries with outdated systems and suggested a novel solution. The following features are part of the design: This system was developed to feed multiple calves at once while reducing the number of assistants needed. It has an automatic cutting unit that is powered by a high torque wiper motor. This machine includes an automatic distribution device that uses conveyors to distribute the chaff.

The feeder control system schedules the animals' meals, reducing human labor significantly. A NodeMCU is used to sync all aspects of this automated farm. The device is easily accessible to the farm owner, who can remotely monitor it using his smart phone. This paper demonstrates how, once information technology is integrated into the farm community, systems and equipment will be able to interact in an automated manner. This will have a positive impact on comfort, energy efficiency, consistency, and safety.

REFERENCES

[1] 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, 2014.

[2] 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.

[3] M. Benchohra, K. Amara, H. Aggad, A. Boulkaboul, A. Y. Kalbaza, and H. Hemida, “Effect of body weight on milking capacity and weight changes in Rembi Ewe,” Livestock Research for Rural Development, vol. 27, no. 3, 2015.

[4] 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.

[5] S. E. Blum, D. E. Heller, S. Jacoby et al., “+e physiological response in the mammary gland to escherichia coli infection reflects a conflict between glucose need for milk production and immune response,” 2019.

[6] T. Xia, C. Song, and J. Li, “Research and application of cow estrus detection based on the internet of things,” in Proceedings of the 2017 IEEE International Conference on Computational Science and Engineering (CSE) and IEEE International Conference on Embedded and Ubiquitous Computing (EUC), New York, NY, USA, 2017.

[7] K. Sejrsen, J. T. Huber, H. A. Tucker, and R. M. Akers, “Influence of nutrition on mammary development in pre- and postpubertal heifers,” Journal of Dairy Science, vol. 65, no. 5, pp. 793–800, 1982.

[8] R.W.Kates, W.R.Travis, and T. J. Wilbanks, “Transformational adaptation when incremental adaptations to climate change are insufficient,” Proceedings of the National Academy of Sciences, vol. 109, no. 19, pp. 7156–7161, 2012.

[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] H. N. Pawar, G. R. Kumar, R. Narang, and R. K. Agrawal, “Heat and cold stress enhances the expression of heat shock protein 70, heat shock transcription factor 1 and cytokines (IL-12, TNF-and GMCSF) in buffaloes,” International Journal of Current Microbiology and Applied Sciences, vol. 3, no. 2, pp. 307–317, 2014.

[11] M. Waked, Kuwait Climate and Heat Stress in Dairy Cattle, University of Kuwait, Kuwait City, Kuwait, 2017.

[12] F. D. Rensis and R. J. Scaramuzzi, “Heat stress and seasonal effects on reproduction in the dairy cow-a review,”:eriogenology, vol. 60, no. 6, pp. 1139–1151, 2003.

[13] D. B. Haley, J. Rushen, and A. M. D. Passill´e, “Behavioural indicators of cow comfort: activity and resting behaviour of dairy cows in two types of housing,” Canadian Journal of Animal Science, vol. 80, no. 2, pp. 257–263, 2000.

[14] J. L. Capper, R. A. Cady, and D. E. Bauman, “+e environmental impact of dairy production: 1944 compared with 20071,” Journal of Animal Science, vol. 87, no. 6, pp. 2160–2167, 2009.

[15] 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.

[16] C. Clutter and M. K. Nielsen, “Effect of level of beef cow milk production on pre-and post-weaning calf growth,” Journal of Animal Science, vol. 64, no. 5, pp. 1313–1322, 1987.

[17] J. P. Verhoosel, M. Van Bekkum, and F. Van Evert, “Ontology matching for big data applications in the smart dairy farming domain,” 2015.

BIOGRAPHIES

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