

SMART CATTLE SHED

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Abstract : Most of the farmers and dairy farms have to maintain cattle manually. There is no cleanliness in the cattle which may cause several diseases to the animals. In summer most of the animals in cattle suffer from the heat. All these problems can be solved by the “SMART CATTLE SHED” which has automated systems for feeding the cattle by checking the levels of water and grass periodically. The excreta of the animals in the shed will be cleansed by a flush system through which the animal excreta is stored into a pit. These stored animal excreta can be further used of making Fertilizers or to produce Gobar gas.

IndexTerms - Cattle maintenance, Automated grass and water feeding, Automated cleaning.

I. INTRODUCTION

Although the technology in the world is increasing drastically in all the areas, The Agriculture sector is in the bottom line. This project deals with agricultural sector especially when it comes to **cattle**, there are several things to be done to maintain a cattle either by a single farmer or by a large dairy farm, The maintenance of the cattle is being done manually with heavy labour using the old methodologies. For a change this project “**SMART CATTLE SHED**” has three automated systems to maintain the cattle. Firstly, an automated grass feeding system through which the grass supply to the cattle is done periodically. Secondly, an automated water feeding system through which the water supply to the cattle is done whenever the level of water in the container is low. Thirdly, an automated system to clean the animal excreta and store it in a pit. which can be further used as fertilizers or to produce gobar gas. Along with these three automated systems there is a temperature sensor in the shed which checks the temperature of the shed and whenever the temperature of the shed is very high then water sprinklers which are fixed at the top of the shed will get powered on which can reduce the heat in the cattle animals which further leads in good productivity.

II. RESEARCH METHODOLOGY

Since the beginning of 2000, Automatic Feeding Systems (AFS) for total or partial mixed rations (TMR or PMR) have been developed. The commercial farms have only shown interest in the technology since the last 5-6 years. In AFS, the feed delivery is programmable, which makes it easy to increase the feeding frequency (Hollander et al.,2005). Bisaglia et al (2013) reported that 80% of the farms in Netherland with Conventional Feeding System (CFS) distributed the feed once per day and number of feed pushups for those farms were 3.5 ± 1.6 times per day while farms with automatic feeding system distributed the feed 7.8 ± 2.0 times per day with the intervals between feeding of 3.1 ± 0.9 hours. There was a decrease in time for feeding 16.4 seconds per cow per day with AFS compared to 33.2 seconds per cow per day with CFS. Grothmann et al., (2010) reported that the working time measurements in dairy farms in European countries using automatic feeding techniques. The working time of AFS using farm with 60 animals had spent 50.6 man power minutes per day and a farm with 120 animals had spent 65.2 man power minutes per day.

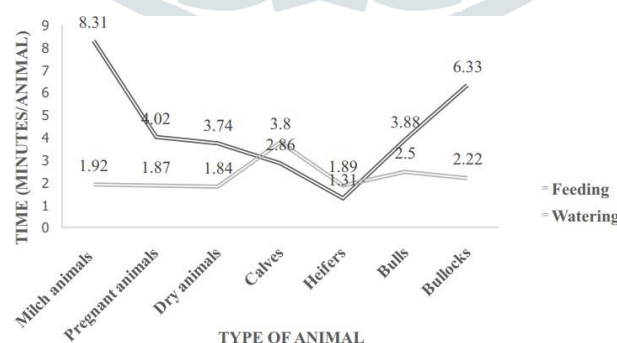


Figure 1 Time taken for feeding and watering of minutes per animal per day respectively.

Feeding the same herd with feed mixer wagon, including feed distribution and feed pushing three times would require 71.3 man power minutes per day for 60 animals and 202.8 man power minutes per day for 120 animals, with a working time saving of 112.15 man power minutes per day. There was a substantial difference in favor of AFS in 120 animals.

Table 1 Comparison of conventional feeding system (CFS) and automatic feeding system (AFS)

S.no	Activity	CFS	AFS
1	Feeding (man-minutes/120animals)	202.3	65.2
2	Feed distribution (times/day)	3.5	7.8
3	Feeding frequency (no./day)	1.4	7.8

Labour requirement for the cleaning of shed

The cleaning was more labour intensive in tie-stalls than in loose housing systems. The time taken for cleaning the shed of milch, pregnant and dry animals were 3.70 ± 0.55 , 3.95 ± 0.72 and 3.88 ± 0.47 man minutes per animal per day respectively. There was no significant difference in cleaning the shed of milch, pregnant and dry animals. The time taken for cleaning the shed of calves and heifers were 2.95 ± 0.33 and 3.99 ± 0.35 man-minutes per animal per day respectively. Less time was observed for cleaning the calf pens while more time was spent in heifer's shed. This may be due to the difference in the size of the shed. The time taken for cleaning the shed of bulls and bullocks was 4.25 ± 0.92 and 3.83 ± 0.92 man- minutes per animal per day respectively.

Table 2 Average minimum wages per day

S. no	Type of labour	Wages per day (Rs)
1	Unskilled	292.31
2	Semi-skilled	306.92
3	Skilled	338.38
4	Highly Skilled	373.07

III. EXISTING SYSTEMS AND ITS LIMITATIONS

❖ EXISTING SYSTEMS

- Most of the farmers often used to supply the grass and water to the cattle manually.
- Some of the dairy farms are using Tractors for the feeding of cattle while most of them are using heavy labour.
- Animal excreta produced in the dairy farms is being cleansed manually.
- The cattle is treated in the same way irrespective of the climatic conditions.
- A company named Feedstar has introduced automated grass feeding system.

❖ LIMITATIONS

- It requires more Human Attention.
- There is no cleanliness in the cattle which may cause several diseases to the animals.
- Irrespective of the climatic conditions the cattle is maintained in the same way.
- The animal excreta should be dumped into a pit manually.

IV. PROPOSED SYSTEM

This project proposes three automated systems for maintaining cattle. When comes to dairy farms , maintaining a cattle is not that easy as it requires heavy manpower to do several things like grass feeding, water supply, shed cleaning. To reduce the manpower and introduce technology into agriculture sector here we are with "SMART CATTLE SHED". The three automated systems are as follows

- Automated grass feeding by checking the levels of grass periodically.
- Automated water supply, the water levels in the container are checked using an HC-SR04 ultrasonic sensor and whenever the level of water is low then the water pump is turned on automatically and as the water fills the level of water becomes high and then the water pump will get powered off automatically.
- Automated Dung cleaning system is used to clean the animal excreta and store it into a pit.

V. SYSTEM ARCHITECTURE AND DATA FLOW DIAGRAM

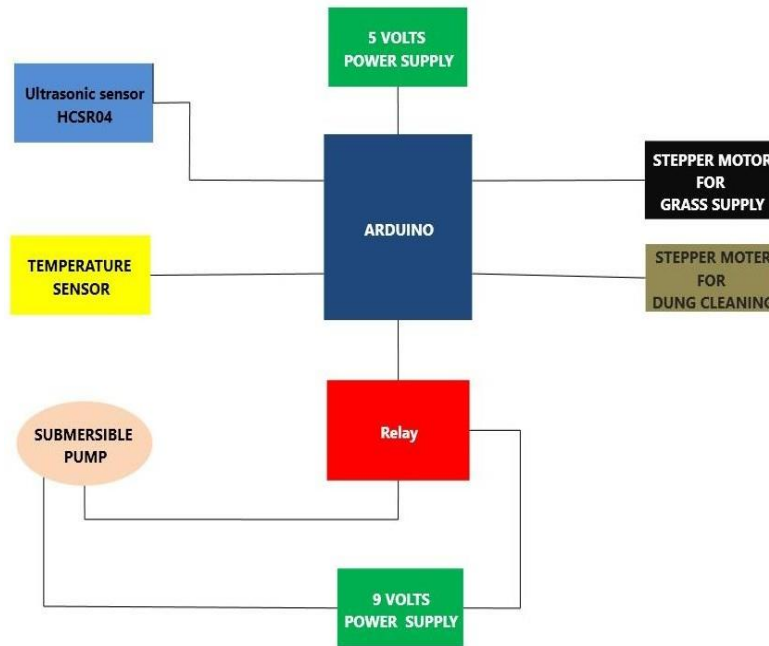


Fig 2 System Architecture

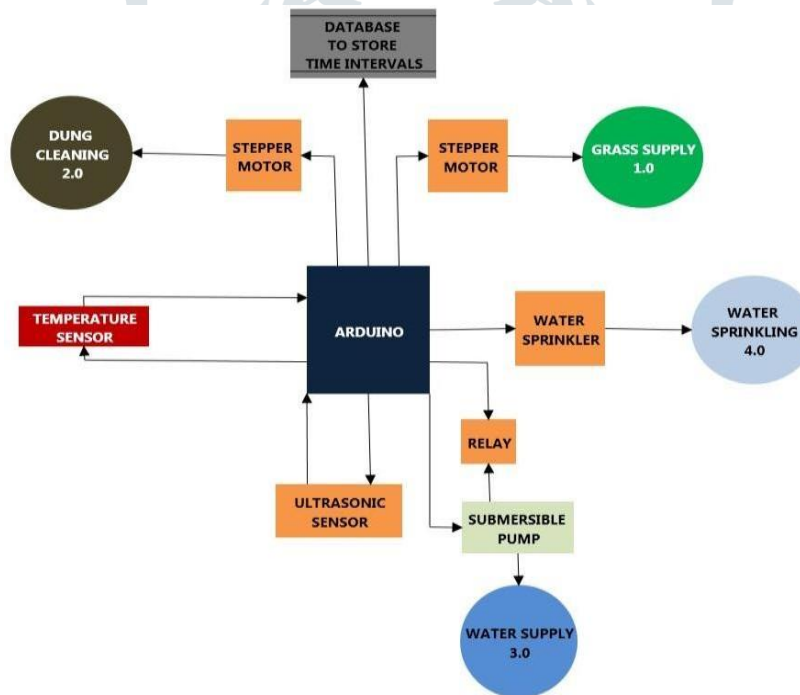


Fig 3 Data Flow Diagram

VI. EQUATIONS

HC-SR04 Sensor

Ultrasonic ranging module HC - SR04 provides 2cm - 400cm non-contact measurement function, the ranging accuracy can reach to 3mm. The modules includes ultrasonic transmitters, receiver and control circuit. The basic principle of work :

- (1) Using IO trigger for at least 10us high level signal.
- (2) The Module automatically sends eight 40 kHz and detect whether there is a pulse signal back.
- (3) IF the signal back, through high level , time of high output IO duration is the time from sending to returning.

$$\text{Distance} = (\text{high level time} * \text{velocity of sound (340M/S)}) / 2$$

VII. RESULT ANALYSIS

This project thus leads to a fully automated cattle maintenance, by reducing the cost of labour which is on an average Rs 300/- per day. Thus resulting in better productivity from the cattle and reducing the man power.

EXISTING STSTEM	PROPOSED SYSTEM
<ul style="list-style-type: none"> • Grass supply is done manually. • Water supply is done manually. • Cleaning of the shed is done manually. • Heavy labour is required. • Labour average wage per day is around Rs 300/- which is Rs 109000/- per person per year and the labour used could range from 30 to 100 based on the size of the cattle. • More time consumption as one labour should cover a given set of animals. • Irrespective of climatic conditions the cattle is treated in the same way. 	<ul style="list-style-type: none"> • .Automated grass supply system. • Automated water supply system. • Automated dung cleaning system. • Very less labour is required. • Here irrespective of labour wage machinery cost is mostly concentrated as each system machinery would cost from 2-5 lakhs , so for all the three systems it would be around 6 lakhs to 15 lakhs, Which is the cost of 15 labours per year. • Less time consumption as the speed of the machinery is pretty fast. • The cattle is treated well in summers

VIII. CONCLUSION

The conclusion of this project “SMART CATTLE SHED” is to provide automated systems for the maintenance of the cattle reducing the manpower and cost of labour. Through the technology Internet Of Things (IoT) it became possible to built those automated systems and used as per our requirement by programming those devices to what they have to do. This project can be further enhanced by introducing more efficient methods of maintaining the cattle and further a new automated system for animal washing will be introduced which will clean the animals automatically. An application can be created to update the details of the systems through an sms using a GSM module or via a notification through the app.

IX. FUTURE ENHANCEMENT

This project can be further enhanced by introducing more efficient methods of maintaining the cattle and further a new automated system for animal washing will be introduced which will clean the animals automatically. An application can be created to update the details of the systems through an sms using a GSM module or via a notification through the app.

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