Possibilities for Examination of Electric Shepherds

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Abstract: - This article discusses the benefits of pastoral livestock production. It defines the need for the construction of separate areas for the keeping of free-ranging livestock. The benefits of enclosing grazing livestock through the construction of electropastures are discussed, as well as possible problems in their operation, such as breakage. As a consequence of the interruption, the electric shepherd does not provide a controlled grazing environment, allowing other animals to enter, or the current ones to leave the enclosed area. Electropasturing provides animals with the best terrain from the pasture through plot grazing. Opportunities to survey electric shepherds and their integrity are analyzed for proper functioning. A new method allowing localization for the exact location of the electric shepherd's break is discussed.

Key-Words: - electric shepherds, free-range livestock, sensors, livestock farming, livestock production, free grazing.

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1 Introduction

The argument in favor of pasture-grazing dairy cows is examined under the following six headings: best land use for food production; soil carbon sequestration; carbon footprint; animal health and welfare; impacts of pasture-grazed milk on human health; and consumer demand for pasture-grazed milk. Uncultivable peat soil that receives only moderate degrees of fertilization is the type of land that is most suitable for grazing. The carbon footprint of grazing is smaller than that of other milk production methods due to soil carbon sequestration. Lameness and hock integument state are two examples of indicators of animal health and well-being that are positively impacted by the amount of grazing. Human health may benefit from the higher levels of carotenoids, omega-3 fatty acids, conjugated linoleic acid, and essential amino acids found in milk from cows fed pasture as opposed to diets based on silage and concentrates. Milk producers, processors, and supermarkets are meeting consumer demand for milk and milk products from cows that are permitted access to pasture during the grazing season, [1].

As grazers by nature, dairy cows can express natural behavior when given access to pasture, [2]. But because of genetic selection, modern cattle now produce more milk and have higher nutrient needs than their ancestors did, [3]. It's possible that these cattle can't get all the nourishment they need from grazing alone, [4]. In various regions of the world, cows must also be kept for at least a portion of the year due to seasonal grass growth, climate, and soil conditions, [5]. As a result, housing livestock over the winter has been standard procedure; nevertheless, certain management approaches call for holding cows year-round, [6]. Greater control over feed intake is made possible by indoor housing, which contributes to maintaining production levels and body condition.

Herbage mass does influence grass consumption, which among other things raises milk yield but is not a primary determinant of dairy cow preference for pasture. Only during the daytime does distance influence pasture utilization, which suggests that dairy cows are more motivated to reach pasture at night. Last but not least, compared to cows with free access to pasture, housed cows spend less time lying down and produce less milk. Giving dairy cows control over their own surroundings appears to provide advantages for both welfare and productivity and as such, it should be viewed as the ideal to aim for [7].

2 Material and Methods

The benefits of pasture rearing are that the animals develop in conditions as close to natural as possible. Free movement improves hoof condition, and strengthens leg muscles and joints of livestock. This way of rearing is best for preventing all kinds of infections on farms. When animals walk on grass,

their hooves are naturally cleaned and dried. The use of pastures reduces labor input per unit of production by about 17 % and increases cow fertility by 6-7 %.

Cows are always cleaner in pasture than in barns. Outside in nature, the animals have a natural behavior, they choose their own places to lie down and plants to eat. The fresh green grass provides the animals with the vitamins they need and improves the health and fertility of the herd (Figure 1).

Fig. 1: Pasture rearing of cows

The advantages of pastoral livestock farming are:

- The animals are cleaner during grazing than when they are barn-raised.
- Cows are encouraged to behave naturally - they can do what they want.
- Through a better supply of vitamins, the health status and fertility of the herd are improved.
- Lower feed costs.
- Guarantee of cheap protein supply.
- Lower labor costs as the need to harvest, feed and clean manure is eliminated.

Pasture rearing reduces farmers' feed costs by ensuring cheap protein in livestock rations. Farmers can save costs by hiring extra workers to clean stalls and feed feed. Livestock products from grassed livestock are lower in fat and higher in nutritional value than those from animals raised on grain feed in barns. For this reason, some dairies buy milk from grassed animals at higher prices because it is of better quality.

Monitoring and protecting the herd outdoors is much more difficult than in the barn. Therefore, farmers often find it best to combine the two ways of keeping animals, according to the seasons. The area required for a cow in pasture rearing is 3-4 acres. Farmers are aware that in the field the cows will choose the best grass for food. Farmers should therefore select sites with rich grazing, [8].

High technology is also leaving its mark in animal husbandry. Over the years, direct human intervention in various types of farming activities has become increasingly obsolete, and modern inventions, of which modern electric herders are a part (Figure 2), have taken their place. They are designed for fences and are intended to restrict livestock from going outside. Putting up the permanent fences needed for allotments requires more money, which is why different types of electric grazers are used.

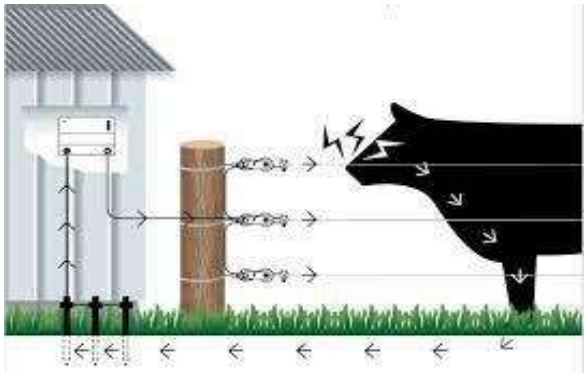

Fig. 2: The fence is made of electric shepherds

Today's electric fences can be defined as a psychological fence for animals, which includes a number of wires (fence rope) mounted on special insulators.

The energizer produces short and high-voltage pulses between the wires and the ground (Figure 3). This is the reason why when the animal touches the electrified wire, it starts receiving electric shocks. In this way, the animal becomes accustomed to staying away from the fence. They are completely harmless to humans and farmed animal species. For an energizer to function properly, the system must be well-designed, built, and maintained. It is desirable that the energizer is of a higher power rating, as well as being appropriate for the type of animals it will confine. The device operates on the following principle - an animal that touches the wires in the fence closes the electrical circuit to the ground and thus receives an unpleasant but harmless sensation that repels it. Animals that do not touch the ground will not close the circuit and will not get an unpleasant sensation (for example, flying birds). For efficient and proper operation of the electric fence, vegetation should not be allowed to grow up to the wires from the fence. If this happens, the plants that touch the fence close the circuit and so the current pulses flow to the ground and the fence remains inoperative.

Livestock keepers should be aware that electric traps are suitable for the deterrence of various agricultural species such as cows, sheep, goats, pigs, and horses, and the benefits of their use are

extremely many. They save a lot of labor and at the same time help to save money. Instead of hiring a person to invest valuable time standing next to the herd, he can let the cattle graze freely and the electric shepherd will take care of their safety, restricting them from going outside the pens. The device is also described as a cost-effective investment, [9].

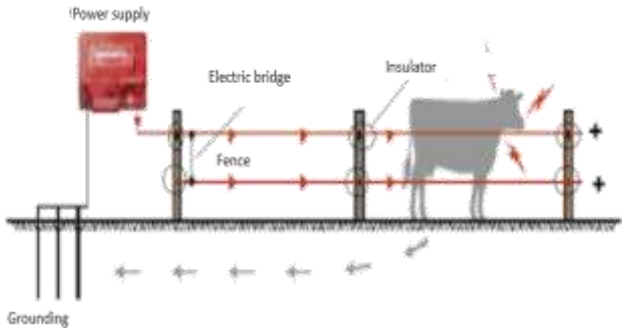

Fig. 3: Structure of electric shepherds, [9]

The electropasters do not pose any danger to humans and animals. Livestock that are fenced in may receive an electric shock, but it is brief and does not result in injury. Therefore, these types of devices are allowed for use and do not have any restrictions. However, this investment is fully justified given the opportunity to keep the herd full, with no missing and no escaped animals. Still, there are some conventions, such as the fact that you must be able to run electricity to the place where the shepherds will be put down. If not, solar panels will have to be installed, which are a bit more expensive.

All year round the cows are free and all this happens thanks to the electric shepherd because they are already getting used to the territory and do not cross the border. The electric shepherd is a tool to help livestock farmers and it may be the cheapest way to keep your animals safe.

Electric shear systems are highly efficient, making them an indispensable companion in agriculture.

There is no farmer who has not experienced relief in his work after using an electropastor. And there is no doubt that the investment is cost-effective. Most often used for plot grazing, it is suitable and applicable for farms with large numbers of animals. It encloses a large area which is divided into several smaller plots. The animals stay in each plot for a maximum of 2-3 days and then move to the next plot with fresh, recently sprouted grass. In this way, the animals move around the plots until the first grazed plot is fully recovered. Through the shepherd, the animals get only the best of the pasture. The energy expenditure for walking is minimized, so more energy is directed to milk, and meat production, [10]. The problem with electric sheaths is that the fence ropes, which carry the current, can be broken by external natural influences, animals, or human interaction. When the rope breaks, the electric shepherds stop producing pulses, making it impossible for animals to pass through, or have their territory disturbed by other wild animals. For farmers with many acres of land, it will be difficult to identify broken electric shepherds and the exact location of the breakage. Finding escaped animals will take a lot of time and resources, which will lead to big losses. For a farmer with a used plot of about 1000 acres, the electric shepherds are about 20 kilometers. To walk the entire parcel to see where the electric shepherds have been severed would be time-consuming. It can take a long time, even days, from the time the electric shepherd is severed to the time it takes to locate the break. During this time, the entire herd may escape.

For the detection of an intermittent power supply, devices are available which are called signal lamps or light alarms (Figure 4). These warning lights flash green with each pulse of the fence and when the voltage on the rope drops below 3000 V the light stops flashing and thus indicates that the fence is no longer protecting the herd. There are also signal alarms, where the light signal is switched on when the high voltage on the fence is dropped. The disadvantage of these lights is that they are used on very small plots. The light is visible at a distance of 1 km, which is too short a distance for an electric shepherd. Even if seen, it would require time to locate the point of the powerline break, as these lamps only show that the fence rope is broken, but not the point of the break.

A robot is a machine with automatic control that can autonomously perform certain tasks, almost always with the help of electronic hardware and programmed instructions. There are many types of robots, they are used in many different environments and for many different purposes, and despite the differences in their application and construction, they still have common features in terms of how they are built. All robots have a mechanical design, shape, and size intended to achieve the specific task.

The mechanical parts of robots are powered and controlled by electrical components. To move, the robot needs energy of some type. Robots' electrical systems are used for movement (through motors), sensing (thermal, sound, position, and energy status are measured using electrical signals), and operations (robots require a certain amount of

electrical power to activate and carry out basic tasks).


Fig. 4: Light alarm for electric shepherds

Software with some degree of programming code is present in every robot. Robots make decisions about what to do and when based on their programming code. Without a program that specifies exactly how it should move, a robot that needs to follow a specific path cannot move, even if it has the ideal mechanical design and receives the appropriate quantity of energy from its battery. Programs are essential to a robot because, even with superior mechanical and electrical design, a poorly written program would result in very poor performance on the duties assigned to it, if they are performed at all.

A remote-controlled robot has a predetermined set of commands that it will only execute if and when it receives them as a signal from the control source, which is the remote control device. There are three different kinds of robotic programs: artificial intelligence, remote control, and hybrid. Artificially intelligent robots interact with their surroundings on their own (without a source of control) and can utilize their previous programming to decide how to react to items and issues they come across. A programming style that incorporates both features is called a hybrid.

In this paper, a robot is proposed to give a signal when the fence rope of the electropaster is broken. The robot is designed for the most widely used electric traps consisting of a ring insulator (Figure 5). This robot is attached to the fence rope along which the current flows. When this rope breaks, the power supply along the entire length of the electric shepherds stops, at which point the robot, which has a built-in battery, starts to move along the rope and when it reaches the point of interruption it transmits a signal from a GPS receiver to a device chosen by the farmer, such as a mobile phone. It sends the exact location of the break to the electric shepherds, thus the farmer will be able to react quickly and repair the fence rope, thus not wasting time searching for the breakpoint and so there will be less likelihood of animals escaping the enclosure.


Fig. 5: Ring insulator through which the rope passes, [10]

Each plot has called gates for the passage of livestock, machinery, and people (Figure 6). The gate is the entrance and exit of the electric fence. The spring gate is constructed in places where fences need to include a perimeter for safe passage. This means that it must be able to close and open while still conducting current. When the gate is open, the fence should still be electrified. A connection to a high-voltage underground cable needs to be built underground. Electric fence gate handles are of hook and spring construction, with models designed for strip also available with a 40mm connector. The spring implanted in the handle is made of galvanized metal alloy, so as to ensure constant tension in the wire from which the fence is constructed. Since there is no way for the crawler to pass through the handles, crawlers have to be put on both sides of the gate. The spring gate is built in places where fences need to include a perimeter for safe passage.

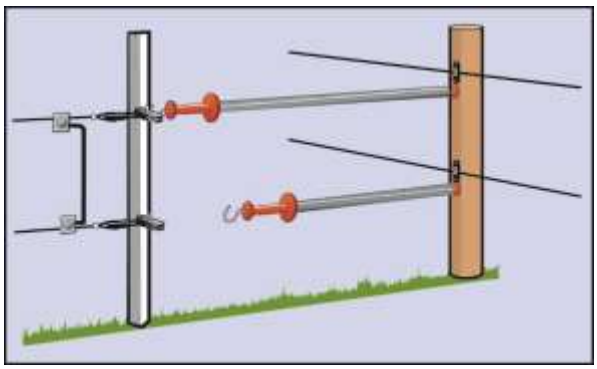
Fig. 6: Doors of the electric fence

3 Results and Discussion

It is well known that different robots and designs of robots can go and be driven and controlled on ropes, cables, etc., [11], [12], [13], [14]. The idea of a robot-based electric shepherd can provide the exact location of electric fence breakage. The principle of work for robot-based electric shepherds is as follows: as is shown in Figure 7, for faster crawling

of the electric shepherds, it is suggested to place two robots at two opposite corners in one electric fence wire Figure 7(3) for faster examination of the electric shepherd. When the robots start examining the area of electric fence wire (2) with the robots going in different directions Figure 7 (4) aiming to contact each other. This will make the crawl much faster thus reducing the time for the cattle to exit the electric fence. When the robot reaches the rope break point it sends a signal to the farmer with the exact location, for this purpose, a Global Positioning System (GPS), [15], receiver will need to be built into the robot to decode the time signal and calculate its position. Another cost-effective variant of using one robot at an electric fence can be done by using the accelerometer in the core of the robot. When the accelerometer of the robot reports significant displacement by Z, sends an alarm to the farmer.

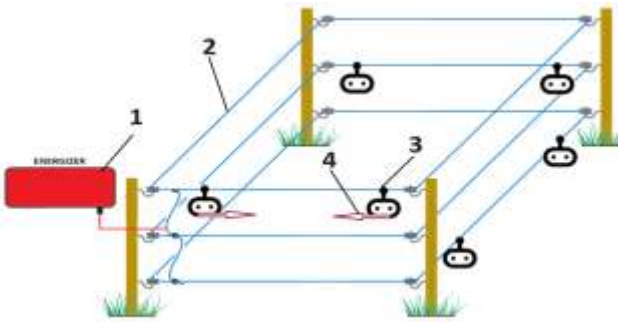

Fig. 7: Direction of movement of the robot on the electro-paste; (1) energizer, (2) plot, (3) robots, (4) direction

4 Conclusion

The advantages of pasture farming are many, and favourable for both animals and farmers. To increase the efficiency of pasture use, they are allotted. The plots are fenced with permanent fencing or electric fencing. This is a modern and good fencing solution. Electric fencing is sufficiently reliable, inexpensive, easy to install and dismantle, and does not interfere with pasture cultivation. They can be used to accurately separate a plot for day grazing or larger plots depending on the farmer's preference. The disadvantage of electric shepherds is that if it is broken the animals will be able to escape from the plot. By setting up works to detect broken electric - pastures, livestock will be well-fenced in. This way there will be no losses from escaped animals or predators getting into the plot. The robots will detect the broken plow rope as quickly as possible and send a signal to the farmer, thus enabling him to react as quickly as possible and protect his herd.

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Conflict of Interest

The authors have no conflicts of interest to declare.

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