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Popular Article

Automated Shearing Techniques

Mohammed Ishan Hashmi[1*], Umesh Kumar Jaiswal[2], Rohit Sharma[3], Dipin Chander Yadav[4]

[1,4]Department of Livestock Production Management, [2]Department of Veterinary Extension Education, [3]Department of Animal Genetics and Breeding

Lala Lajpat Rai University of Veterinary and Animal Sciences, Hisar, Haryana, India

Introduction

Sheep make a valuable contribution to the livelihood of the economically weaker sections of the society especially in the mountainous areas by its multifaceted utility of producing wool, meat, hides and manure etc. The act of cutting or removal of wool from the body of sheep is termed as shearing. Sheep are washed at least two days before shearing in order to remove dirt, suint and grease which hinder shearing. Shearing is generally done twice a year in during spring and autumn months. Some producers prefer to shear pregnant ewes before lambing. Shearing before breeding in summer season tends to increase the heat loss from the body and cools the ewe and ram, thus inducing oestrus in the ewe and stimulating spermatogenesis in the ram. The traditional way of clipping wool is the hand shearing by using shearing scissors. It is now an outdated practice and is getting replaced by machine shearing. The task of shearing sheep is skilled, hard work and it is becoming increasingly difficult to attract young people to learn shearing. The physical fitness required for the job is equivalent to that of the best athlete and generally cannot be matched by farmers. Hence shearing is a specialized job.

That's why, the wool industry has funded a long-term project to investigate new alternatives to wool harvesting from sheep. Although the manual shearing process has undergone tremendous advancements, much research interest has been directed upon robotic mechanical shearing and biological substances that cause sheep to lose their fleece. The biological alternative is seen as the most desirable long-term solution; although a biological hormone with the right effect has been discovered, several major difficulties remain to be overcome, particularly those concerned with the variation in response from one sheep to another.

The robotic system is being designed to reduce some of the physical strains and risks when shearing, including shearers being bent over for an extended period of time creating a strain on the back, and instead allowing the shearer to work in a safer and comfortable more upright position. Both the methods are explained further in detail.

1. Sheep Shearing Robots

The automated wool harvesting system is a major innovation in the sector of agriculture and computer engineering. The robots successfully and painlessly remove the fleece from a living animal using a special electrical feedback mechanism. They employed sensor-based real-time adaptive positioning control, which allowed the shearing robots to reprogramme themselves as they tracked the curves of an animal within fixed reference points.

A robot to shear sheep's wool is just one piece of equipment needed for a successful automated sheep-shearing factory. Other components of an automated sheep-shearing system, such as automatic methods of catching sheep, automatic loading apparatus to deliver sheep to the sheep-shearing robot, and automated methods of handling wool after it has been cut from sheep, have been developed by various research institutes in the world. There are two key parts to the actual sheep-shearing robot. The first is a manipulator arm with a shearing tool affixed on the end to cut wool from the sheep; the second is an automatic device that holds and manipulates the sheep to remove all of its wool. For both of these processes, new methods of robot control and design have been developed.

Robots offer the following advantages to the shearing industry:

- Replacement of labour by machinery resulting in more stable and predictable operating costs.
- Greatly improved working conditions, although for fewer people, without the risk of long-term physical impairments encountered in the industry today. Estimates of physical disability in shearers worlung ten years or more range from 50 to 90 percent.
- More consistent and higher quality of shearing, reducing second cut losses, and increasing consistency of fiber length.
- Greatly reduced injuries to sheep. A typical manually shorn sheep receives several visible cuts ranging up to 10 cm in length. Machine shorn sheep sustain fewer, and much smaller, cuts.

There are also some disadvantages associated with robotic shearing:

- It costs a lot of money to make or buy robots.
- They need maintenance to keep them running.
- Energy cost and maintenance
- The high cost of research and development.
- Lack of access to poor farmers

2. Shearing with Bioclip

A biological shearing approach developed in Australia may provide an alternative wool-harvesting method that is more humane, less stressful, results in less wool contamination, and is better for the environment. Several chemical and biological de-fleecing reagents and processes had previously been investigated in wool producing sheep. None of those reagents, however, were optimal or as practicable as a de-fleecing reagent for wool sheep flocks on farms. Bioclip®, a novel product, has been proved to be an effective biological agent for use on farms with big commercial wool flocks.

Bioclip® is a biological Wool Harvesting System (WHS) that has evolved into a streamlined method for harvesting wool from Merino and related sheep breeds. The Bioclip® is based on Epidermal Growth Factor (EGF), a short-chain protein that is a natural product of the animal physiological system. In early studies, the fundamental role of EGF in the growth and maintenance of the skin was proved by the identification of EGF receptors in cell populations of the epidermis, dermis, and hair follicles. A number of fundamental investigations on the impact of EGF on sheep's skin, wool follicles, and new wool growth served as the foundation for the Bioclip® formulation. A protein generated from bacteria transformed by a synthetic EGF gene is being used to synthesize EGF as a wool-harvesting agent for sheep. This protein has a brief half-life in animals and is completely excreted from the body along with any byproducts.

When prepared EGF is injected into sheep that are developing fleece, it temporarily halts the synthesis of wool fibers, causing the fleece to shed as naturally as in hair sheep breeds. Following the injection, new wool growth starts a few days later and reaches the skin's surface in two weeks. By 28 days later, there is enough wool cover on the sheep to protect them from hypothermia or sunburn. Therefore, it is advised to collect sheep's bio-clipped fleeces four weeks following EGF treatment. The Bioclip® injection's dose rate and formulation have been designed to keep EGF in the physiological system of the sheep at an effective concentration that will operate on wool follicles for 16 hours. After further breakdown, EGF is metabolized by the body into its amino acid substructure and eliminated in urine.

Advantages

- no second cuts
- eliminates skin wounds and some bruising
- reduction in shearing equipment requirements
- use of unskilled labour

Disadvantages

- cost of the drug
- sun-burn and cold exposure problems
- use of coats
- use of drugs

Conclusion

The traditional shearing task is physically demanding and skill-intensive. Shearing is classified as extremely difficult physical labour, with energy costs at the level of elite sport. The shearer must remove the fleece while fully bent over at the waist in an awkward and strained body position. The injury experience of shearers is severe. It is no surprise that this limits the potential workforce and that the industry experiences challenges in attracting younger workers. While the shearing industry explores options for innovation, traditional shearing continues much as it has for decades. We therefore require shearing methods that lessen the work load, physical strain and risk of injuries to the shearers. In addition, we can obtain wool that is of higher quality and more uniformity. Automated sharing methods can be useful in this direction. However, using them could not be cost-effective. But it can aid in addressing the aforementioned flaws.

Bibliography

Sankhyan, V. and Thakur, Y.P. (2019). Migratory sheep husbandry in himalayan state of Himachal Pradesh, India: Status and headway options for improvement and sustainability. *Journal of Livestock Research*, **9**(8); 71-77.

Boyd, L. H. (2019). Limitations and Opportunities. *Emerging Technology And Management For Ruminants*, 42.

Lord, P. R. (Ed.). (2003). *Handbook of yarn production: Technology, science and economics*. Elsevier.

Trevelyan, James P. (1989). "Sensing and control for sheep shearing robots." *IEEE Transactions on Robotics and Automation*, **5**(6); 716-727.

Trevelyan, J. P. (1987). Robots in the shearing shed: Automated shearing of sheep using robots. *Advanced robotics*, **2**(1); 3-8.

Wuliji, T. (2019). Experimental Fleece-Removal with Bioclip® Wool-Harvesting System for Merino-derived Wool Sheep in the US. *Journal of Advanced Agricultural Technologies* Vol, **6**(2).

https://roboticsandautomationnews.com/2019/01/24/australians-developing-robotic-sheep-shearing-system/20695/

https://www.wool.com/sheep/agritechnology/wool-harvesting-innovation/

https://collection.maas.museum/object/123269

https://www.woolwise.com/wp-content/uploads/2017/06/BIOL-900-200-100.pdf