

Keys to Upright Posture Shearing Platform Development

Technical lessons learnt from Australian Wool Innovation Limited's Upright Posture Shearing Platform Research and Development program.

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Introduction

Following a technical search and review of wool harvesting technologies Australian Wool Innovation commenced a research and development program to bring to the Australian wool industry an alternative to traditional shearing of sheep.

This document is a short account of the technical lessons that have been learnt from the Upright Posture Shearing Platforms (UPSP) development projects.

How to start?

One of the clear questions that developers needed to ask at the beginning of the project is what comes first? The table or the blow pattern? The reason why this is so important a question is because the development of one determines the development of the other.

AWI progressed a number of different approaches with six initial developers. Several of these developers had existing technology; initially AWI and the developer focused on developing their existing technology as best we could.

The result of this was that the blow pattern, the way in which the sheep was shorn, had to fit in with the platform design - this was a significant limitation to ensuring the maximum productivity of platform shearing.

Key lessons:

1. The blow pattern is the key to shearing quickly on a UPSP. The key principles of shearing (see below) need to be applied in order to determine how the sheep needs to be presented to the shearer. It is then that the table/platform can be configured to manipulate the animal.
2. The more successful developers focussed on the shape, access and surfaces required to maximise productivity.
3. Once the core pattern and table concept are confirmed the development of both runs concurrently and is not divorced from restraint development.
4. Keep things simple - The time taken to shear and the overall cost of the UPSP are critical and relate to the choice of technology.

The Developer

There are a number of key lessons that AWI discovered that relate to the management of the R&D component of a UPSP project.

Key lessons:

1. Don't keep chasing the perfection of the concept and neglect the commercial imperatives of getting an appropriate product to market. Many developers/inventors often keep chasing the "best idea" rather than focusing on the commercialisation of an appropriate concept.
2. The developer must have a route to market and capability to manufacture.
3. The developer must have project management skills and access to technical skills – both shearing and engineering expertise.
4. Project "ownership" is an important motivator for completion of a successful project - The developer must be in a position to fund part or all of the project and to allocate funds critically.
5. The owner of a UPSP concept needs to look critically at whether they should take on all of the responsibility for the development or licence their idea to a developer with appropriate expertise.

The lack of project management skills can be the downfall of any promising project and care needs to be taken as there is always a possibility that the direction will be hijacked by third parties.

The Blow Pattern

There is no "one" pattern that can shear a sheep quickly on a UPSP. However there are a series of rules that can be defined which will minimise the time spent when shearing.

Key lessons:

1. Identify the key principles of shearing: Position of the sheep and shearer, grip on and movement of the handpiece, use of the freehand to manipulate and condition the skin/fleece, head and legs to facilitate bows, the entry points for the handpiece must be clearly defined at all stages. The application of these core principles will determine the optimal pattern for the concept.
2. Minimise time between blows - transitions between blows take up time. If the shearer has to move from the crutch of the sheep to its head and then back to the back leg significant time will be wasted.
3. The blow with the handpiece needs to be logical and flow from one place to another in a sequence.
4. Where possible follow the natural flow of the shearer to move the handpiece from right to left.

5. The entry points need to be thought out so that areas of the sheep and its fleece are “open” for the entry of the handpiece. The shearer must have the ability to use his free hand to “condition” the fleece to facilitate better entry.
6. The neck of the sheep must be able to be “bent” to open up the wool staples and to allow the handpiece to move up from a front shoulder to the jaw. This means that table design must cater for this and allow this movement. For the shearing of Australian Merino sheep the opening up of the neck will determine the success or otherwise of being able to shearing on a platform.
7. Shanks/hocks of the animal need to be shorn, if possible, before they are placed in a restraint. If a leg needs to be taken out of a restraint, shorn, then reinserted significant time will be wasted.
8. Short “jabby” blows should be limited. They waste time. The shearer needs to be able to develop a rhythm to the blows, similar to on the board shearing.
9. Blows should, where possible, be long and flowing with the teeth of the comb on the skin. Over extending to get longer blows should be avoided.

The Table

The table or platform is that which is used to present and support the sheep in a raised position for shearing and thus limit bending by the shearer while shearing.

Because the shearer needs to access the entire body of the sheep the table has to move to allow this access.

The developers of the various platforms tried different approaches to manipulating the sheep. These were from simple table approaches through to a “chair” concept and two stage transfer arrangement that supported the sheep on its belly/brisket. All of these had some problems with some being more problematical than others.

The key lessons were:

1. The table/platform needs to be relatively open forward of the front shoulder of the sheep to allow access for opening up and shearing of the sheep’s neck. The neck generally needs to be bent in a backward arc so the table needs to be open to the shearers left forward of the sheep’s shoulder. This means that the table/platform is relatively short in length.
2. On tables/platforms that rely on rolling the sheep on its side to shear the undermine and long blows and then rolling it over onto its opposite side to shear the other side requires good access. This is because it is important to shear well over the backbone on each side, as the wool and skin will move in the opposite direction making it very difficult to finish the sheep quickly and efficiently.
3. The table needs to be adjustable for length to suit various weights and length of sheep.
4. The table in some circumstances needs to be adjustable for width to cater for sheep of different weights and sizes, eg rams vs lambs.

5. Two stage tables or systems that rely on a transfer of the sheep from its back to its belly/brisket waste too much time if shearing is interrupted for the transfer to take place.
6. Controlling the movement of the table/platform so that there is little need for the shearer's free hand to leave the sheep is important - foot controls appropriately placed appear to be better.
7. The table/platform must hold the fleece and then allow the fleece to be moved away intact to the wool preparation area. Tables/platforms that break up the integrity of the fleece are not satisfactory in an Australian Merino context.
8. OH&S issues need to be considered at all stages of the development and addressed. Pinch points in particular should be identified and eliminated.

Restraining the sheep

There are some significant lessons that have been learnt regarding restraining the animal on the platform. One of the principal reasons that the sheep needs to have some restraint on the table/platform is that the shearer needs to be able to use his/her free hand. With traditional shearing the sheep is manipulated by the shearer's feet and legs as well as guided by the free hand. With UPSP the table/platform takes the place of the shearer's legs and feet.

The sheep can be restrained either on its hocks or on pressure points such as the stifle joint. However with some forms of restraint the sheep will struggle against the restraint making shearing more difficult. Time is also taken in placing the animal in a restraint.

Key lessons:

1. Sheep will kick if restrained by the leg or hock.
2. There needs to be a level of restraint to allow safer shearing and to free the shearers freehand. "Kick and run free" of the handpiece is a concern when shearing on a UPSP.
3. Restraint design needs to allow quick and easy engagement and disengagement.
4. Design needs to prevent injury to the sheep's leg - very important.
5. Leg restraints can be used to position the animal's legs, hips and shoulders for shearing.
6. If possible, restraining the front legs should be avoided as doing so generally results in poor shearing surfaces and access around the shoulders and neck.
7. Alternatives to leg restraints may prevent sheep struggling however they often are clumsy to manipulate.
8. If a sheep feels as though they can get a toe-hold on any part of the restraint, table or loader, they will struggle significantly more than if they don't.

The Catching Race

The catching race or system and the transfer of the sheep to the table/platform is important in that it plays a significant role in determining the overall productivity of the system. Many types of system were tried within the AWI program with each having problems and benefits.

Some key lessons:

1. The table/platform catching race relationship is critical with the distance between the two of important significance. The sheep should not be able to gain a “purchase” with its legs on the edge of the catching race. It was this finding that prevented pull through catching races from being used as the reach of the shearer was too great when the catching race was positioned appropriately. The height of the catching race to the table/platform is also critical and should be minimised so that the sheep does not fall to the table with excessive force.
2. The sheep needs to be presented to the table in the transfer process in a controlled way and released when instigated by the shearer.
3. Productivity is measured in “cord to cord” time which has to contain the catch, transfer and release process. The quicker the process occurs the greater the productivity. Systems that have the sheep ready to be transferred can lead to greater productivity.
4. Sheep flow is critical to the movement of the sheep into the catching race. The greater the productivity of the platform the easier sheep will move up the race and into the catching race. When platforms are put in multiples being feed by a common race sheep will flow better.
5. Sheep should be allowed to walk into the catching race and not be lifted, conveyed or tipped in. Adding these technologies over complicates the UPSP with no benefit being added.
6. The interior of the race should preferably be black or dark coloured with no shadows. The end of the race should show day light in the distance to give the illusion of escape to the sheep. Decoy sheep in an end pen will help sheep flow with backing bars in the lead up races.

The let go

While not as important, the let go of the sheep from the table platform does have to be thought of. It is necessary for the sheep to be let go in a controlled manner and to exit the restraints without being caught up. Injury can occur at this stage with the productive life of the sheep ruined if damage is done to the sheep’s legs.

Key lessons:

1. Leg restraints need to be released while the sheep is under the control of the shearer.
2. Sheep need to travel away from the shearing area without the assistance of the shearer - this limits shearing time.

3. In trailer mounted UPSPs, the chute should be positioned so as the sheep drops off the platform and straight down the chute without having to be manually pushed out.

Wool away

For the Australian Merino market the integrity of the fleece is vitally important. Therefore the fleece needs to be kept “whole” as it is shorn and to leave the table/platform in one piece. Fleece handling and the use of low tech conveyor systems are one way to reduce operating cost of multiple platform units by making wool handler labour more efficient.

Key lessons:

1. The table/platform architecture needs to be relatively smooth and free from obstruction to prevent the break up of the fleece.
2. The table needs to support the fleece during the shearing process in most cases.
3. Where the fleece exists under the table/platform there should be adequate clearance between the table/platform and the conveyor belt/wool retrieval system.
4. Provision needs to be made to segregate the crutch, stains and shanks from mixing with fleece wool.
5. The direction of the fleece to the wool retrieval system needs to be easy for the shearer. Too much time directing the fleece away from the table reduces overall productivity.
6. The wool away system needs to present the wool to the wool handler in a location where there is no danger to the wool handler as a result of being in close proximity to the shearer.

Appropriate Technology - the cost equation

The more technical advanced the operating technology on a UPSP the greater the cost of that unit to manufacture, retail and maintain. This higher cost is expected to be offset by higher productivity by uses and purchases. This expectation can significantly undermine the credibility of a UPSP concept when its productivity is significantly lower than on the board shearing.

During the AWI UPSP program most developers first used reasonably complicated technology to manipulate the table. Program logic controllers (PLCs) and electro-hydraulics add significantly to cost but can simplify progression of table movements. To reduce cost simple air actuators with manual controls are often better and cheaper.

Key lessons:

1. Keep the technology simple and appropriate.
2. Technology utilised needs to be of agricultural type. That is, it can maintained and repaired by using the resources and skills available on the average wool growing property.

3. The greater the cost the higher the expectations of greater productivity.
4. Higher technology does not necessarily the result in higher productivity.

Controls

To operate controls to progress the movement of the table the shearer, until the shearing pattern has become intuitive, will need to divert his/her concentration. This will reduce shearing time. Hand controls will result in the loss of control of the sheep to some degree because the freehand will leave the sheep. Foot controls can overcome this but need to be appropriately placed often with more than one location for the same control function.

Key lessons:

1. Foot controls are better than hand controls because they allow total freedom of the shearer to use his freehand to condition the skin/fleece and control the sheep.
2. Controls need to be intuitive and appropriately placed and should not restrict/confine the shearer to a position that is out of step with the blow pattern.
3. The movement of the wool retrieval system should be able to be operated by both the shearer and the wool handler.

Conclusion

There is no “right” or “wrong” in developing and designing an upright posture shearing platform. There is simple statement that says: “*There are many ways to skin a cat.*” Likewise there are many different approaches that can achieve shearing in an upright position. AWI’s view is that the second wave of innovation will explore these options and that these builders should have access to the major lessons that have been learnt in the AWI UPSP program. This document articulates these major lessons.