

Classing Lattice for Wiltipoll Ewes and Rams

CHS Dolling

Sheep Breeding Consultant,
PO Box 74 McLaren Vale,
South Australia 5171, Australia

Introduction

A ram classing procedure has been developed in the form of a lattice which embraces all types of selection decisions which a ram breeder is called upon to make in a breed for which wool is a major objective (Dolling et al. 1993). The lattice is developed here in a manner which would service Wiltipoll breeders in the classing of individual rams and ewes, both during the back-crossing phase from Wiltshire Horn to Wiltipoll and once the Wiltipoll breed is established.

Back-crossing to the Wiltshire Horn

After the Wiltshire Horn has been crossed with a polled breed, a series of four back-crosses to the Wiltshire Horn yields ewes and rams which are 96.87% of Wiltshire Horn blood yet which are carriers of the gene *polled*, that which produces polledness.

The subsequent inter-breeding of sheep each of which is at least 96.87% of Wiltshire Horn blood is an important objective of a breeder developing a Wiltipoll flock. The Australian Wiltipoll Association Inc. has determined that for a sheep to be eligible for classing as a Wiltipoll it must have at least 96.87% Wiltshire Horn blood (Australian Wiltipoll Association Inc. 1998).

The horn types encountered during the back-crossing phase in the development of the Poll Dorset are likely to be seen again in the current back-crossing programmes to the Wiltshire Horn. Photographs of these horn types are in *Poll Dorset Breeding* (Dolling 1964).

In both the back-crossing phase and the interbreeding phase, the types of characters encountered - upon which selection is based - are similar. Within any given generation of the back-crossing phase, and at any stage of the inter-breeding of Wiltipolls, the classing lattice described here can be employed, irrespective of the fact that no sheep will appear in the back-crossing phase which are homozygous for the *polled* gene, Ho^P .

The Four Groups of Characters

Each character which may be used as a criterion for selection falls into one of four groups:

- Group (G)** Characters controlled by identified **G**enes.
- Group (I)** Characters used as selection criteria in compiling a selection **I**ndex.
- Group (M)** Non-index characters which are **M**easured.
- Group (V)** Non-index characters which are appraised **V**isually.

Classing on a selection index, compiled from two or more characters, is undertaken with the characters in group **(I)**. Independent culling levels (Lush 1945) are applied to each of the characters which the breeder chooses to consider in groups **(V)** and **(M)**. In group **(G)** each sheep is subjected to independent culling levels in relation to each gene considered. Tandem selection is not practised.

In each of the groups (**V**) and (**M**), a sheep's degree of expression of a character against which selection is practised is weighted by the heritability of the character and/or the genetic correlation between it and any undesirable character. The sheep is classed accordingly. The weighting is similar in principle to that made in the calculation of an Estimated Breeding Value in which a ram's deviation from the mean of the flock is weighted with the heritability of the character in question.

The Four Questions for the Breeder

The questions which are posed to the breeder for characters in all four groups are:-

1. Is the character important?
2. To what degree is it expressed in the sheep under consideration at the moment?
3. What is the likelihood that it will be passed on to the next generation?
4. Is the character correlated genetically with other desirable or undesirable characters?

Breeding Objectives and Selection Criteria

The breeding objectives for a flock are those traits which a breeder wants in the sheep. The selection criteria are those characters used by the breeder in choosing the rams and ewes for mating (see Ponzoni 1979; and Walkley 1987).

Breeding Objectives for the Wiltipoll

The broad aim of breeding the Wiltipoll is to produce a Wiltshire Horn without horns. The breeding objectives in the Wiltipoll breed are taken here as being:

1. Wool shedding - the ability to shed the fleece each year.
2. Polledness - the absence of horns in rams and ewes.
3. Meat quality - the production of superior quality meat as prime lamb or prime mutton.
4. Growth rate - the ability of young sheep to grow well.
5. Reproduction rate - the ability to have twins.
6. Efficiency - the ability to convert even second rate grass to prime meat.
7. Spider syndrome - the absence of this physical disability.
8. Soundness - freedom from faults of feet, mouth and testicles.
9. Pigmentation - the absence of black body spots carrying black fibres.

Objectives 1, 2 & 3 are essentially those set out in Volume One in the Flock Register for Wiltipoll sheep in Australia (1996), 4, 5 & 6 are taken from a Wiltshire Horn advertisement, 7 is from Wiltipoll Flock Regulations, 8 is a normally accepted objective in sheep breeding, while 9 has been agreed upon by Wiltipoll breeders (Australian Wiltipoll Association Inc. 1998).

Selection Criteria for the Wiltipoll

The selection criterion appropriate to each of these objectives, the criterion to use in practice, could well be:

Breeding Objective	Selection Criterion	Group
1. Wool - shedding	Shedding score of 1 - 7 at 12 months of age	V
2. Polledness	Culling of Ho^+/Ho^+ ewes and rams during the back-crossing phase. Selection for Ho^P/Ho^P ewes and rams during the interbreeding phase, but not to the detriment of maintaining or improving merit in the other selection criteria	G

3. Meat quality	By fat and muscle scanning	M
4. Growth rate of young sheep	By observation or By body weights at a standard age, say six months	V M
5. Reproduction rate	Fertility - whether or not a ewe lambs	M
6. Efficiency	Fecundity - the number of lambs born to a ewe Not easy for the breeder to assess	M
7. Spider syndrome	Knowledge of the prevalence of the gene $SD2^{spi}$ in relatives $SD2$ is the symbol for the locus <i>Skeletal Defect 2</i>	G
8. Soundness (feet, mouth, testicles)	By observation, palpation	V
9. Pigmentation	By observation	V

During the backcrossing stage of the Wiltipoll development it could well be that a selection index is not used – ie, there is no criterion in group (I). The selection criteria would fall in the other three groups. After the backcrossing stage, when interbreeding between Wiltipolls is practised, a selection index could well be considered as a criterion for selection - LAMBPLAN, for example.

Scoring for Shedding - A system for use in selection.

Management

Assume the following management and shedding pattern of young sheep:

March - April joining August - September lambing.

Lambs begin to moult in approximately November.

Some lambs loose all of their wool in the first summer.

Wool grows back in the autumn.

Wool is lost again from the spring onwards.

Score sheep for degree of shedding in September at 12 months of age.

Suggested class for lattice selection	Score	Description
A	1	Wool shed from all of Wool Growing Area (WGA)
	2	Wool shed from over $\frac{3}{4}$ of WGA (but some wool still present and not shed)
	3	Wool shed from $\frac{1}{2}$ to $\frac{3}{4}$ of WGA
B	4	Wool shed from $\frac{1}{2}$ of WGA
	5	Wool shed from $\frac{1}{4}$ to $\frac{1}{2}$ of WGA
C	6	Wool shed from less than $\frac{1}{4}$ of WGA
	7	No wool shed from WGA

Shedding normally takes place from the belly first, then up the sides, then along the topline.

Should more detailed descriptions be needed, a score could be given for each of, say, three regions of, say, the WGA namely:

1. In front of the shoulder
2. From shoulder to hipbone
3. Behind the hipbone

A classing lattice for a drop of ewes in the back-crossing phase

Body weight at six months (adjusted for type of birth)

		→								
		Lightest 20%	Middle 20%			Heaviest 20%				
		5	4	3	2	1	SHEDDING	POLLEDNESS		
Increase in merit of shedding & polledness ↑	Good					1AA	A { ¹ ₂	A Depressions		
	Med								B { ³ ₄ ₅	B Depressions with a small bone knob or keratin scur
	Poor									

“1AA” ewes would be those chosen first for breeding, if available

“5” ewes could be considered for mating if “AA” or “AB” elsewhere

“C” ewes (on shedding) and “C” ewes (on polledness) would not be useful in a backcrossing programme.

Other breeding objectives may be included with advantage

Scoring for Polledness

To increase the frequency of the *polled* gene, Ho^P , in the inter-breeding phase, one would select ewes which have depressions in the bone of the skull on the horn sites; one or both depressions may contain a small bone knob or a short keratin scur. This group of horn sites would be expected to embrace all Ho^P/Ho^P ewes.

Some ewes with small bone knobs in depressions would be expected to be Ho^P/Ho^P , but most such ewes would be expected to be Ho^P/Ho^+ , Ho^+ being the gene for *horned*.

Ewes with small scurs in depressions would be expected to be Ho^P/Ho^+ .

For rams, one would select those which have depressions in the bone of the skull on the horn sites. One or both depressions may contain a small bone knob or a short keratin scur not more than 12 mm long.

Such a group of horn sites would be expected to include all Ho^P/Ho^P rams. It would include also a number of Ho^P/Ho^+ rams.

Rams with depressions and a scur more than 12 mm long would be expected to be Ho^P/Ho^+ .

Rams without depressions and with short scurs, long scurs or aberrant horns will be Ho^P/Ho^+ .

Photo 1. A two year old Wiltipoll ram. A depression in the bone of the skull on each horn site. In the left depression, a keratinous scur 10 mm long and 18 mm in diameter (in a dorso-ventral line). In the right depression, an S- i.e. a scur of a piece of keratin less than 2 mm long and not removable by rubbing. The depression in front of the left scur is shallow. The genotype of the ram would be either Ho^P/Ho^P or Ho^P/Ho^+ .



Photo 2. (left) A two year old Wiltipoll ewe. A depression on each horn site. In the left depression a scur 5 mm long, loose and thin (the scur is difficult to discern in the photograph). The genotype of the ewe would be either Ho^P/Ho^P or Ho^P/Ho^+ . On the right ear of the ewe is a pigmented skin spot of the type seen on the ears and/or body of some Wiltipoll sheep.

Photo 3. (right) The same ewe with a ram lamb. The lamb has on the left horn site, a scur 14mm long and 15 mm in diameter: and on the right horn site a scur 15 mm long and 15 mm in diameter. There is a small depression lateral to each scur. The genotype of the ram lamb would be Ho^P/Ho^+ .



Suggested Class for lattice selection	Ewes	Rams	The genotype expected
A		Depressions	Ho^P/Ho^P
A	Depressions		Ho^P/Ho^P or Ho^P/Ho^+
B	Depressions with small bone knobs or short keratin scurs in the depressions.	Depressions with small bone knobs or with keratin scurs not over 12mm long in the depressions.	Ho^P/Ho^P or Ho^P/Ho^+
		Depressions, with scurs longer than 12mm in the depressions.	Ho^P/Ho^+
		Short scurs Long scurs Aberrant horns	Ho^P/Ho^+
C	Female horns	Male true horns	Ho^+/Ho^+

Not considered in this table is the *hornless* gene, Ho^{hl} . Ho^{hl}/Ho^{hl} ewes have bone knobs or short scurs, without depressions; rams have male true horns. Ho^{hl} is recessive to both Ho^P and Ho^+ , while Ho^+ is recessive to Ho^P .

Polledness is a character which the breeder can readily control. Experience in the interbreeding phase of the Poll Dorset was that one is unwise to cull out-of-hand rams with short scurs, long scurs or aberrant horns. They carry the *polled* gene, Ho^P . Such rams could be well worth using if they were to display great merit in other criteria of selection.

Definitions of Wiltipoll Ewes and Rams

The definitions of the Australian Wiltipoll Association (2002) are these.....

Ewe

For a ewe to be considered eligible for registration as a Wiltipoll ewe it must:

1. Have at least 96.87% Wiltshire Horn blood.
2. Shed all of its wool annually.
3. Have depressions in the bone of the skull on the horn sites. One or both depressions may contain a small bone knob or a short keratin scur.

Ram

For a ram to be considered eligible for registration as a Wiltipoll ram it must:

1. As for the ewe.
2. As for the ewe.
3. Have depressions in the bone of the skull on the horn sites. One or both depressions may contain a small bone knob or a short keratin scur. Any such scur should not be more than 12mm long.

The corresponding measurement in the definition of a Poll Merino ram is half an inch which equals 12.7 mm.

The Features of the Classing Lattice

- a. All characters in a selection programme are embraced.
- b. The main character retains its own identity in the lattice - on the horizontal axis.
- c. The breeder chooses:
 - the characters in the breeding objectives;
 - the main character; and
 - whether to take note of heritabilities in assessing measured characters which are not in a selection index and in assessing characters which are visually appraised.
- d. The lattice is an aid in the selection of animals for breeding and in the description of animals for sale.

The Classing Lattice for the Wiltipoll

In the back-crossing phase, the characters falling in groups (V), (G) and (M), may be integrated into a lattice whereby one is able to grade each ram and ewe giving a grade such as 1AA, 2BA and so on. Figure 1 is a classing lattice for ewes.

The most important single criterion is assessed and rated along the horizontal axis. In the example, body weight at six months has been chosen and each animal is graded 1 to 5 according to its ranking in the drop in which it is born. The other criteria of selection are assessed and each is rated along the vertical axis. In the example shedding and polledness are chosen, each sheep being graded A, B or C on each criterion. Should any of the other selection criteria be considered in the backcrossing stage, sheep could be graded accordingly on the vertical axis.

It has been determined (Australian Wiltipoll Association Inc. 1998) that interbreeding between two sheep each of at least 96.87% Wiltshire Horn blood may produce sheep eligible to be registered as a Wiltipoll. In the backcrossing programme in which the Poll Dorset was developed, a similar requirement was implemented - that interbreeding commenced only after the fourth backcross to the Dorset Horn after the original outcross to introduce the *polled* gene.

One would reconsider the components of the classing lattice once the interbreeding starts.

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GENE NOMENCLATURE

The nomenclature for the genes relating to hornedness has changed since 1970, when "Breeding Merinos" was published.

Following are the old and new symbols.....

As in "Breeding Merinos"

P

p'

p

As on the present diagrams

Ho^P

Ho⁺

Ho^{hl}

Two points are worth noting :-

1. A ram with a long scur or an aberrant horn is just as useful as a transmitter of *Ho* in the back crossing phase as is a ram with depressions and a, say, 20 mm scur.
2. The explanation which I have given for hornless ewes appearing in Wiltshire Horn flocks is represented in the bottom right-hand corner of the ewe diagram, "HORNEDNESS IN EWES"

Scott Dolling
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