Improving Sheep Carcass Quality through the Development of a Range Ram Index Utilizing Ultrasound Genetic Measures Grant Project Final Report

Submitted by California Wool Growers Association

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Overview

In an effort to improve lamb carcass consistency and quality and increase production efficiency, California Wool Growers Association (CWGA) developed the Range Ram Index (Ram Index) utilizing ultrasound carcass measurements collected at the 2016 California Ram Sale (Sale). The Ram Index is designed to provide an indication of the expected value return of the heritability of carcass characteristics of a range ram through its progeny. The Ram Index was calculated using the following carcass characteristics: loin eye area, fat thickness, and ram weight and is intended to provide an estimate of the potential carcass merit of the progeny sired by range rams with superior carcass characteristics. The intended purpose of the Ram Index is to provide a tool for producers to use in selecting range rams that do not have established genetic information.

Many commercial range operations do not focus on Estimated Breeding Values (EBVs) due to a various factors. Largest among them is record management given operation size, production practices such as lot vs. individual animal tracking, ram breeding practices (i.e. two rams in one lot), etc. In addition, collecting consistent ultrasound data can be either a challenge or a virtual impossibility for many commercial operations (e.g., due to lack of facilities, access to ultrasound equipment, changes in grazing locations, cost, etc.). The Ram Index is designed as an alternate method for producers to use when evaluating range rams that do not have EBVs in an effort to improve progeny carcass characteristics, supply a consumer-desired product, and increasing producer returns.

In the industry's effort to improve lamb product characteristics, particularly to reduce fat content and improve consistency, ultrasound measurements can help identify those rams that will sire progeny with carcass traits for more desirable fat thickness and a higher yielding carcass or a carcass with a larger, more uniform loin eye size. There is a financial incentive for producers to incorporate such genetic information, particularly to terminal sire breeders and those producers that market on a carcass/value based pricing system. These incentives will benefit the industry as a whole in producing a more desirable product for the consumer.

Range Ram Index

The Ram Index is calculated using ultrasound technology which has been used extensively in the cattle and swine industry but has not been applied much in the sheep sector. This technology provides an objective measurement of carcass traits in live animals and has proven to be an important means for the improvement of beef and swine carcass characteristics. Carcass traits are highly heritable and in utilizing range rams with highly desirable carcass traits, a producer can implement changes in progeny carcass traits, such a larger loin eye size, in a relatively short period of time. This ability contributes to increased production efficiency as

improvements in lamb carcass qualities can be accomplished more quickly than relying on traditional selection methods that focus on phenotypic characteristics.

The Range Ram Index (Ram Index) is calculated using the following variables: loin eye area (LEA) and fat thickness (BF) gathered from ultrasound measurements and body weight (BW). As described in the previous section, there lack thereof any genetic information on the rams consigned to the Sale to serve as a normalized base for the Ram Index. To account for this issue, the variables used to calculate the Ram Index are standardized based on the average carcass traits of the 506 rams sold in the Sale (refer to Table 1 and Table 2).[1] This allows each ram's carcass traits to be measured in relation to a normalized base or average value. Each ram's Ram Index is then calculated using the genetic variables of the individual ram relative to the average all of the rams.

The Ram Index is presented as a numerical value relative to the average meaning those rams with more desirable carcass characteristics are assigned a positive Ram Index value and those with less desirable a negative Ram Index value. Those rams with average carcass characteristics are assigned a zero Ram Index value. There was much discussion among project collaborators regarding calculating the Ram Index as either a positive/negative value or a more common weighted average 100 index. In reviewing industry literature related to ultrasounding and carcass characteristics, as well as current genetic tools (i.e. EBVs) it was decided that a positive/negative value relative to an average approach would be better understood and consistent with other genetic tools utilized in the livestock industry.

Table 1. 2016 Ram Ultrasound Statistics

	BF (in)	LEA (in^2)	BW (lbs)
Minimum	0.11	3.00	185
Average	0.24	4.71	278
Maximum	0.4	6.56	415

Table 2. 2016 Breed Ultrasound Statistics

	BF (in)	LEA (in^2)	BW (lbs)
Suffolk	0.23	4.56	259.00
Crossbred	0.23	4.65	267
Hampshire	0.20	4.58	265
White Face	0.23	4.89	270

An objective of utilizing genetic information is to improve certain heritable traits, in this case carcass characteristics. Therefore, to account for rams with less desirable carcass characteristics for fat thickness and body weight, boundaries were established on the each of the variables, with deductions applied to the Ram Index for outlier rams (see Table 2). The bounds and deductions can be adjusted to reflect for changes in the industry regarding carcass and product characteristics. The bounds and deductions incorporated into to the Ram Index were based on industry research regarding premiums and discounts on carcasses with desirable and less desirable carcass characteristics, and discussion among project collaborators. A boundary and deduction was not placed on loin eye area due to a greater focus on current issues associated with the other two carcass traits (fat thickness and body weight).

[1] The Ram Index and statistics are calculated on the total number of rams sold (506 rams). A total of 523 rams were ultrasounded at the Sale, of which 17 were sifted.

These adjustments are similar to the computations for EBVs which result in the positive or negative values or carcass based pricing which imposes premiums (positives) or discounts (negatives) for certain traits.

Table 3. 2016 Ram Index Variable Bounds

	BF (in)	BW (lbs.)
Minimum	0.20	225
Maximum	0.40	385
Deduction	5.0%	5.0%

As evidenced in other livestock sectors that utilize value based pricing systems, there is an inherent financial incentive for producers to incorporate genetic information that will help in producing a carcass with desirable carcass characteristics. Of the total rams sold, 197 rams or 47 percent had a positive Ram Index value, compared to 226 rams or 53 percent with a negative value. The average sale price for those 197 rams was $690.00, $50.00 higher than the average sale price for those rams with a negative Ram Index value. Blackface rams with a positive Ram Index value averaged $32.00 higher than those rams with a negative value, while Whiteface rams averaged more than $150.00 higher (see Table 4).

Table 4. 2016 Ram Index Sale Averages

	POSITIVE INDEX		NEGATIVE INDEX	
	Head	Average	Head	Average
BLACKFACE	181	$691.00	210	$659.00
WHITEFACE	16	$677.00	16	$523.00
ALL RAMS	197	$690.00	226	$649.00

It can be implied from the average sale prices above, buyers appeared to be willing to pay more for those rams (or pen of rams) with a positive Ram Index versus those with a negative Ram Index. While the price differential might not be as large as some might have anticipated, overall rams with a positive Ram Index value did return a higher value than those with a negative Ram Index value. It is presumptuous to infer that the higher prices were a direct result of the Ram Index based solely on the sale data, as buyers purchase rams based on a number of factors (i.e. phenotypic traits, prior purchases, buyer-seller relationships, budget constraints). Nevertheless, those rams with more desirable carcass characteristics did return a higher value at the Sale.

As mentioned, a Ram Index was calculated for each ram in the Sale and since the rams are sold in pens, an average Ram Index was then calculated for each pen based on the individual Ram Index values for those rams in each pen. As expected, the average statistics for pens

resembles those on an individual ram basis as presented above. The majority of pens include four rams. However, this year there were a number of smaller pens with one, two, or three rams. In calculating a pen Ram Index average, the Ram Index for pens with one or two rams does not align well with those pens with three or four rams. This was not anticipated and was of concern regarding the potential misperception by buyers and consignors when comparing pens of differing sizes. This issue will be further addressed at next year's Sale.[2]

Buyer & Consignor Educational Efforts

Information on the Ram Index, how to improve profitability through the use of genetic information (i.e. Ram Index, EBVs) and resources available for producers was provided to CWGA members, Sale participants, and industry stakeholders. Outreach efforts were initiated in December 2015 and continued post-Sale reaching approximately 500 individuals. The information was provided through articles in the CWGA *Herd the News* newsletter, a Ram Selection Resources page on the CWGA website, pre-sale buyer letters, and the Sale Catalog.

During the Sale consignor dinner an interactive educational program session provided an overview of the development of ultrasound in the livestock industry, the practical application of ultrasound techniques in a range/commercial setting for carcass evaluation, benefits of the quantitative data of ultrasounding in a value based pricing system, and how the data can be utilized producer breeding programs. Consignors received all the raw ultrasound data on their rams prior to this educational session, with the Ram Index and carcass trait information provided to buyers via the Sale catalog and stall card signs above each pen of rams.

In addition, surveys focusing on the Ram Index were sent following the Sale to all buyers and consignors. The surveys were designed to gather input on the understanding and adoption of the Ram Index and genetic selection among these stakeholders. Feedback on the information and resources provided to members on genetic selection varied among the respondents, ranging from strong interest and support to hesitation and uncertainty.

Twenty-six surveys were sent to buyers, of which eight (one-third) were returned. Based on the responses, it seems the surveys were returned mostly by buyers who utilize genetic selection in their operations. According to the surveys, the buyers raise both traditional meat (i.e. blackface) and wool breeds of sheep, but purchased only traditional meat breeds at the Sale. Most indicated they read the outreach materials on the Ram Index and for the most part understood the concept of the Ram Index and the genetic information provided.

Many buyers indicated they are currently utilizing genetic information when selecting range rams and place a higher value on those rams with more desirable genetic characteristics. Of those that responded, most indicated they utilize primarily loin eye area data and body weight in selecting range rams. Those buyers that utilize genetic information indicated they are willing to pay a higher price for rams with more desirable carcass characteristics and did pay more for rams with more desirable loin eye areas and higher Ram Index values. Many buyers plan to continue to incorporate genetic selection into their operations and would prefer to have information on loin eye area, body weight, wool quality, as well as ram longevity at future Sales.

[2] The Sale Committee provided an award for the highest Range Ram Index Pen. Because of the issues with lot size and the objective to award on a pen basis, the award was based on pen minimum of four rams.

Other buyers via the survey and in discussions at the Sale, do not utilize any type of genetic selection in their operations and select rams based on phenotype and prior purchases from consignors. These buyers are reluctant to utilize genetic information until data consistently reflect actual performance in progeny and the benefits or market value exceeds the additional costs of purchasing rams with more desirable genetic traits. In regards to the Ram Index, some buyers noted there was not enough evidence to indicate those rams with a higher Ram Index values would pass those traits onto their progeny as the Ram Index was just a snapshot of carcass characteristics and did not account for age, breed, and management programs. Many buyers repeatedly indicated the cost in paying more for rams with desirable genetic traits is greater than the current benefit (i.e. feeder lamb price) received and is not justifiable at this time.

Similar results and comments were submitted by those consignors that returned their surveys. Of the 28 consignors, only seven (or one-third) returned the survey. The survey in hindsight was too long as it addressed not only the understanding and adoption of the Ram Index and genetic selection, but also allowed for comment on factors pertaining to consigning at the Sale. According to the surveys, most raise traditional meat breeds (i.e. blackface) and consigned only such at the Sale. Many consign rams as it provides an outlet to provide high quality rams to California and Western sheep producers.

Those that responded and in conversations, indicated they read the outreach materials on the Ram Index and for the most part understood the concept of the Ram Index and the genetic information provided. However, consignors believed that the buyers did not understand the concept of the Ram Index, nor had any interest in applying it in their purchasing decisions. Some consignors recognized the positive correlation between prices received and the Ram Index value, while other consignors did not see any difference in the prices received for those pens with positive and negative Ram Index values. According to the surveys, consignors indicated the buyers were not willing to pay more and did not pay more for rams with more desirable carcass characteristics, others were unsure, while some consignors suggested that buyers might be willing to pay five to ten percent more. However, as stated by one consignor “my highest selling pen was also my highest Ram Index value pen” would suggest that some buyers were willing to pay higher value for rams that have the potential to sire progeny with more desirable carcass characteristics.

Many of the consignors do not collect genetic information nor select rams using genetic information. Those that do use genetic information focus on bodyweight and phenotype, with some referencing the genetic markers for Scrapie. Comments mirrored those by buyers in regarding the confidence and credibility in genetic information of either the ultrasound data or EBVs. One consignor commented, “I use big thick rams and all my rams ultrasounded just as good as everybody else’s at the sale.” Similarity, consignors noted the cost of collecting genetic information currently exceeds the benefit (i.e. higher price received) at this time. Many consignors suggested buyers are interested in having loin eye area and bodyweight information on rams more so than EBVs. Consignors indicated they are willing to provide genetic information (some even stated wool data) on future ram consignments if demanded by buyers and the information will help in netting a higher return. Overall, consignors also recognize that market dynamics factor into the prices paid at the Sale, despite the genetic information provided on the rams.

Concluding Comments

The objective of this project was to improve sheep carcass quality and increase the practice of genetic selection in commercial range operations through the development of a Ram Index that utilizes ultrasound technology focusing on carcass quality characteristics. It is rather difficult in a range operation to collect the data required to develop EBVs, which is a challenge in an industry that is focusing on genetic selection and improvement. The Ram Index is designed as an alternative for producers to use when evaluating range rams that do not have established EBVs.

Regardless of the buyers or consignors use of genetic selection tools such as the Ram Index, it was apparent during the Sale that consignors and buyers were actively engaged and interested in the carcass performance provided on the rams sold. In reviewing the Sale data, survey responses, and conversations with stakeholders there was a positive correlation between the value paid for rams and the Ram Index, suggesting that some buyers may have been willing to pay more for rams with more desirable carcass traits. It can also be concluded that as a result of this project, all parties became aware of the industry's efforts in utilizing genetic improvement tools to produce a more consistent and desirable product and improve producer profitability to ensure the economic viability of the sheep industry.

Looking Ahead

This project established a dataset and baseline for which to continue to develop and refine the Ram Index as a reliable tool for producers in selecting range rams without any genetic information. In preparation for next year's Sale, project collaborators plan to review and assess the data, survey results, related educational materials, and the components of the Ram Index calculation (i.e. breed variable, variable bounds and standardization). CWGA as part of its educational objective, plans to continue to ultrasound rams and provide buyers with genetic information on the rams consigned at future Sales. This will contribute to the development of a more robust dataset for analytical purposes by CWGA staff, project collaborators, and industry stakeholders and further the objectives of this project.

In addition to carcass information, a question that respects further discussion is how to utilize ultrasound techniques and genetic data to determine the longevity of an animal. This information would be greatly useful not just to Sale buyers and consignors, but to all those in the sheep industry. The project collaborators plan to discuss how to transform data gathered from ultrasound techniques to determine the longevity of a ram and if this information could be incorporated into the Ram Index or if in another tool such as Ram Longevity Index is warranted and how it would benefit producers in selecting range rams, while contributing to the industry's goals and objectives.

Appendix 1: 2016 California Ram Sale Pictures