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Background
To compete with ever-improving synthetic fibers, international strategy in the wool industry has been to improve wool quality (i.e., finer wool with less variability and less contamination) and to offer more accurately prepared and measured wool. To ensure US sheep breeders retain the potential to produce the highest quality wool and remain competitive in international markets, it is essential they continue to have access to cutting-edge fiber measurement, management, and genetic selection technology. Significant developments in fiber measurement, wool preparation, and marketing have resulted from research funded by the US Congress and conducted by scientists in Montana, Texas, and Wyoming.

Purpose statement
Research with wool and other animal fibers is conducted to increase profitability of the US sheep and goat industries, provide consumers and the military with high quality animal fibers and meat at internationally competitive prices, and provide important environmental services. Emphasis has been placed on improving wool and mohair quality, increasing production by sheep and Angora goats, and collaborating in projects in which different breeds were evaluated, selected for more valuable production, or used to improve rangeland (see Appendix for list of current collaborations).

Summary of findings
A new method for accurately and rapidly estimating wool base using near-infrared reflectance spectroscopy (NIRS) has been developed (see Figure 1 and Table 1) that in conjunction with a newly developed gravimetric test for vegetable matter base should revolutionize yield testing of wool. Evaluation of the OFDA2000 on US flocks has reinforced producers’ confidence in this valuable selection and marketing tool. Central ram and Angora goat performance tests have produced more productive Rambouillet sheep (see Figure 2) and Angora goats. Intensive production systems

Figure 1.
Near-infrared reflectance spectrometer for measuring wool base of greasy wool core samples.
Table 1. NIRS calibration and validation statistics for commercial greasy wool cores (n = 2022)

<table>
<thead>
<tr>
<th>Constituent</th>
<th>Calibration</th>
<th>Validation (n = 69)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Mean</td>
</tr>
<tr>
<td>WB, %</td>
<td>1291</td>
<td>45.2</td>
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<td>CWFP, %</td>
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<td>VMB, %</td>
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<tr>
<td>AFD, µm</td>
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<td>23.8</td>
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<tr>
<td>SD, µm</td>
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<tr>
<td>CV, %</td>
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<td>22.2</td>
</tr>
<tr>
<td>PF, %</td>
<td>1262</td>
<td>12.4</td>
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</table>

Figure 2. Trends in ram traits in the Sonora, Texas central ram performance test
for lambs and kid goats were developed and evaluated for concurrent production of high quality fiber and meat. Cooperation in long-term selection programs for more productive range sheep (the multi-breeder Texas Rambouillet Superior Genetics [TRSG] program assisted by NSIP) and Angora goats with a greater appetite for consuming juniper (Super Juniper Eating Goat [SJEG] program) is ensuring that fiber production and quality are either being improved or are not being compromised by the selection criteria. Extending the research of Snowder et al. and Glimp, Merino X Rambouillet crossbred sheep that are well adapted to Western ranges are currently being evaluated for wool and lamb production. Australian genetic databases were used to identify suitable rams for this artificial insemination program. Sires were selected with the goal of producing crossbred sheep that will grow significantly more and more valuable (finer) wool than the dam breed without undermining lamb production.

**Conclusions**

Funds appropriated by the US and State legislatures for wool (and other animal fiber) research during the past 25 years have helped to produce and evaluate technology that is being used to benefit the US sheep industry. To maximise the beneficial impacts of these technologies and small ruminant grazing in general on rural income and the ecology of range sites, the size of the national flock must be increased.

**Applications**

The greatest impact of NIRS will be for the commercial estimation of wool (and mohair) base at reduced cost. In addition to the obvious benefits to the rural workforce, farm and ranch owners, and users of public lands, the other projects described will benefit the US general public by providing more competitively priced, domestically produced, high quality animal fibers and meat while producing a safer, healthier, and more productive environment. Ensuring the supply of domestically produced wool of the required grades for military use is another important consideration.

**Appendix**

**Current collaborations**


**Other institutions**