Version 1.3 printed 2/18/2015

The Economics of Raramuri Criollo (RC) Versus British Crossbred Cattle Production in the Chihuahuan Desert

Jose Diaz[1], L. Allen Torell[1], Alfredo Gonzalez[2], Rick Estell[2], Andres Cibils[1], Dean M. Anderson[2]

[1] New Mexico State University [2] USDA-ARS, Jornada Experimental Range

Introduction

Preliminary research indicates Raramuri Criollo (RC) cattle may range further and forage in areas where traditional breeds rarely venture. These small-frame animals are well adapted to harsh environments and maintain productivity with minimal husbandry and supplementation. RC cattle are potentially an ideal cow for arid environments. These cattle are being successfully marketed in the Southwest grass-fed meat market with positive consumer acceptance of meat quality and flavor.

Objectives

The objective of this research was to compare the economics of RC cattle range-fed beef production with Angus x Hereford (A x H) cattle typically found on Chihuahuan Desert ranches.

Key production and economic differences include:

- ❖ Foraging behavior
- ❖ Extended foraging time
- ❖ Production and live weight
- ❖ Market and sale price
- ❖ Production costs

Methods

The USDA-ARS Jornada Experimental Range (JER) introduced RC cattle from Mexico in 2005 (Anderson et al. in press). Production and marketing experiences from the JER herd provided the basis for this case study. An enterprise budget was developed for a 150 AUY A x H cow/calf ranch based on previously published budgets (Bevers 2014, Hawkes and Libbin 2014). For economic comparison the representative budgets were modified to reflect production of RC cattle.

A foraging behavior study conducted on the JER in spring and fall of 2005 compared movements of mature A x H and RC mature cows (Peinetti et al. 2011). The study results formed the basis for calculating breed-specific water reduction factors and potential increases in forage harvest efficiency because RC cows dispersed further from drinking water and more fully used the pasture.

Two levels of carrying capacity were considered for RC cattle:

Scenario 1: No Increase in AUY - 150 AUY capacity.

The number of mature cows was the same as A x H.

Scenario 2: 50% increase in AUY- 226 AUY capacity.

Production costs were estimated for the 2013 production year. Discounting was used to adjust revenues and costs to December 2013.

Two different beef price scenarios were considered:

Scenario 1: Average real 2009-2013 beef prices

Scenario 2: Record 2014 beef prices

On-the-hoof sale prices for RC cattle were discounted by about 20% based on JER marketing experience.

RC cattle on the Jornada Experimental Range near Las Cruces, NM

Assumptions

Grazing Practices

A x H

- Continuous season-long stocking; limited water availability resulted in poor animal distribution

RC

- Continuous season-long stocking but with improved distribution
- Travel further from water; with improved distribution carrying capacity was increased by 50%

Beef Prices Scenarios

Animal Class	Weight (cwt)	Units	Price factor[1]	2009-2013 Avg	2014
A x H					
Steer (7 mos of age)	4.75	$/cwt		$162	$271
Heifer (7 mos of age)	4.50	$/cwt		145	250
Culled replacement heifer	8.50	$/cwt		119	176
Cull cow	10.00	$/cwt		64	109
Cull bull	13.50	$/cwt		84	130
Brood cow investment value	1	$/head		1,192	1,700
Bull investment value	1	$/head		2,384	3,400
RC					
Steer (30 months of age)	9.50	$/cwt	0.83	95	183
Bred 2-yr old heifer	1	$/head	0.80	986	1,360
Cull cow	8.00	$/cwt	1.00	64	109
Cull bull	11.00	$/cwt	1.00	84	130
Brood cow investment value	1	$/head	0.80	954	1,360
Bull investment value[2]	1	$/head	0.83	1,979	2,822

[1] *RC price discount relative to New Mexico market prices by CattleFax ™.*

[2] *The supply of RC bulls is very limited at this time.*

Foraging Distribution

Peinetti et al. (2011) used 5 minute GPS fixes to track foraging distribution from collared A x H cattle compared to RC cattle in a 5,992 acre pasture on the JER. Movement velocity was used to characterize foraging. Forage was uniformly available in the spring and animal foraging patterns were similar for A x H and RC. However, under low forage (fall) the RC distributed themselves much further from the single drinking water source compared to the A x H cows.

ARCGIS raster maps were developed by Peinetti el al. (2011) for periods of foraging and were used to estimate percent grazed pixels (20 x 20m) within the pasture by zone representing distance from water.

❖ 1, 2, and 3 miles from a single source of water.

Percent of grazed pixels within each buffer zone was expressed in terms of relative use (% of maximum use) and was used to estimate the reduction in carrying capacity within each zone by season and cattle type. Mean grazing capacity reduction values for each group were compared to guidelines recommended by Holechek et al. (2004) for stocking rate calculation adjustments.

The mean reduction in foraging values were used to calculate group specific water correction factors (WCF) using the equation from Holechek et al. (2004):

❖ WCF = [(% area 0 -1 miles from water)*(relative use)
+ (% area 1-2 miles from water)*(relative use) +
(% area >2 miles from water)*(relative use)]

Breed specific WCF for A x H and RC cattle were 0.29 and 0.47, respectively.

- Computed WCFs imply:
  - ❖ 71% and 53% reduction in estimated carrying capacity for poor water distribution in the pasture for A x H and RC, respectively.
  - ❖ 62% increase in carrying capacity for RC catte relative to A x H

Reduction in carrying capacity (%) depending on distance (miles) from water:

Distance	1	2	> 2
Holechek et al. (2011)	0	50	100
A x H cattle (this study)	0	48	97
RC cattle (this study)	0	27	78

Marketing

A x H

- Conventional marketing through sale yards, cattle buyers, and video auctions
- Cull animals sold in November
- Calves weaned and sold in November at 7 months of age

RC

- Limited direct sale market and added marketing effort
  - ❖ Steers discounted 17%
  - ❖ Heifers discounted 20%
- Cull animals sold in November
- Steers grass-fed to 30 months of age
- Heifers sold as bred heifers at 24 months of age

Forage Use

- Relative forage use between animal classes and type was computed monthly based on metabolic weight ($W^{0.75}$)

$$AUF = \frac{W^{0.75}}{\cap}$$

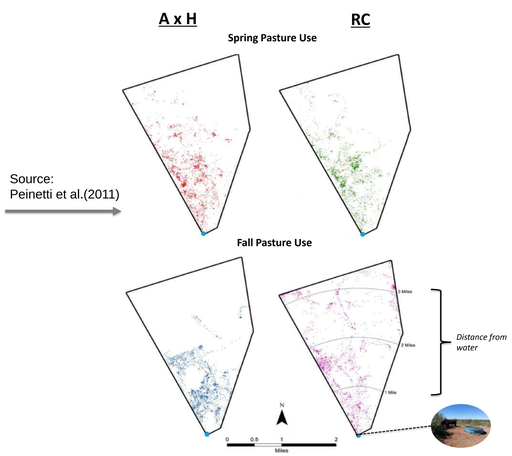
- Forage demands from RC cattle are less per animal but more in total because of the extended period of foraging required

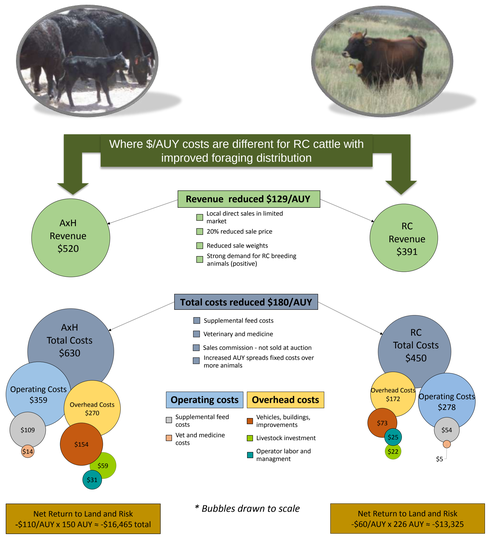
Animal Class	A x H	RC
Total AUY per mature cow	1.34	2.01
Mature cows	1.00	0.85
Replacement heifers (13 -24 months)	0.71	0.50
Bulls	1.25	1.07
Weaned calves (6 - 12 months)	0.57	0.47
Growers (13 - 24 months)		0.66
Finishing (25 - 30 months)		0.88

Production

Description	A x H	RC
Mean cow culling age[1]	10	18
Mean bull culling age	7	12
Calving month	April	June
Calf crop at weaning	85%	91%
Cow-to-bull ratio	16:1	30:1
Mean calf birth weight	75	26
Steer sale weight	475 @ 7 months	950 @ 30 months
Heifer sale weight	450 @ 7 months	700 @ 24 months
Average cow weight	1,000	800
Average bull weight	1,350	1,100
Cow, bull and heifer death loss (%)	1%	1%
Sale animals death loss (%)	2%	1%

[1] *age in years; weight in lbs*





Results

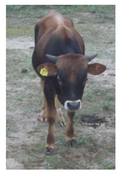
If equivalent herd sizes are assumed between A x H and RC cattle, selection of the desired production enterprise is a toss-up when 5-year average beef prices are received. With the budget assumptions, the typical A X H enterprise only nets $1,327 more than the RC enterprise, a small amount when compared to total livestock sales for the enterprise ($78,014). The improved grazing distribution of RC cattle would need to add only 17 AUY (11% increase in carrying capacity) before net returns would be equivalent. By comparison, the Peinetti et al. (2011) study and re-evaluation suggest a 62% increase may be possible. The added grazing capacity from improved livestock distribution is the major benefit of RC cattle production. Another price factor is the strong demand for RC breeding animals.

Foraging distribution benefits included

5-Yr Avg Beef Prices	150 AUY			226 AUY	
Revenue/Cost	A x H 150 AUY	RC 150 AUY		RC 226 AUY	RC Difference
$/AUY					
Revenue	$520	$391	-$129	$391	-$129
Costs:					
Operating	359	278	-81	278	-81
Overhead	270	232	-38	172	-98
Total	630	510	-120	450	-180
Net Return to Land & Risk	-$110	-$119	-$9	-$60	$50
Ranch Total					
Revenue	$78,014	$58,701	-$19,313	$88,258	$10,244
Costs:					
Operating	53,915	41,650	-12,265	62,612	8,697
Overhead	40,564	34,842	-5,722	38,970	-1,594
Total	94,479	76,492	-17,987	101,582	7,103
Net Return to Land & Risk	-$16,465	-$17,792	-$1,327 (-8.1%)	-$13,325	$3,140 (19.1%)
Breakeven % increase in carrying capacity			167 AUY (11% increase)		

2014 Avg Beef Prices	150 AUY			226 AUY	
Revenue/Cost	A x H 150 AUY	RC 150 AUY	RC Difference	RC 226 AUY	RC Difference
$/AUY					
Revenue	$874	$648	-$226	$648	-$226
Costs:					
Operating	370	278	-92	277	-93
Overhead	317	258	-59	198	-119
Total	687	536	-151	475	-212
Net Return to Land & Risk	$186	$112	-$74	$172	-$14
Ranch Total					
Revenue	$131,042	$97,193	-$33,849	$146,383	$15,341
Costs:					
Operating	55,532	41,650	-13,882	62,612	7,080
Overhead	47,569	38,737	-8,832	44,800	-2,769
Total	103,101	80,387	-22,714	107,412	4,311
Net Return to Land & Risk	$27,942	$16,806	-$11,136 (-40.2%)	$38,971	$11,029 (39.5%)
Breakeven % increase in carrying capacity			192 AUY (28% increase)		

10-years of production observations on the JER confirm what are considered to be desirable traits of RC cattle (Anderson et al. In Press).



Traits of economic importance:

- Improved distribution and efficiency during foraging
  - ❖ Good for the landscape
  - ❖ Reduced quantity and lower cost supplements
- High fertility and longevity
- Hardy, self-reliant and suited to arid environments
- Quality carcass from forage diet
- Mild temperament
- Good mothers and small calves
  - ❖ Reduced calving problems
  - ❖ Potential for cross-breeding
- Healthy with minimal vaccination, parasite and fly control

Study Limitations

- **Peinetti et al. (2011) Grazing Distribution Study**
  - ❖ Not repeated in multiple years and multiple pastures
  - ❖ Summer and winter periods not included
- **Direct Market Sales of RC Cattle**
  Grass-fed producers market directly to health and environmentally conscious consumers. They spend time at farmers markets, delivering to specialty restaurants, grocery stores, and other direct marketing efforts. Coordinating slaughter and processing is also time consuming. By comparison, A x H producers deliver to an auction, pay a commission and their marketing and processing efforts are over. The net on-the-hoof price is unknown without detailed analysis of direct sale marketing and processing costs.
  - ❖ In this study we based RC cattle prices on the experiences of JER researchers that net on-the-hoof prices have been about 80% of reported market prices.
- **Ecosystem Values**
  Grass-fed producers are often motivated as much by ethics as economics. They embrace grass-fed methods because they believe them to be the best for animals, humans, and the land (Lozier et al. 2004).
  - ❖ We compare profit potential but do not estimate other ecosystem values that might result from better livestock distribution and grass-fed production.

Forage demand per cow (AUY/cow):

- ❖ A x H ⟶ 1.34 AUY/cow
- ❖ RC ⟶ 2.0 AUY/cow

Forage used by sale animals (%):

- ❖ A x H 7% of forage
- ❖ RC 52% of forage

Selecting cattle that are suited for arid environments may be the least-cost way to improve livestock distribution.

Cost savings with the RC enterprise occur in three major areas:

1. **Economies of Size**
   - ❖ Overhead costs are spread over more animals
2. **Supplemental feed costs are reduced by about half**
   - ❖ Supplements fed only to steers
   - ❖ Lower cost supplements fed
3. **Veterinary and medicine costs**
   - ❖ Reduced fly and parasite control

The extended grazing period for RC sale animals changes forage use

Cost Definitions

Costs are classified following guidelines set by the American Agricultural Economics Association (AAEA 2000).

- Opportunity costs of invested funds and the value of operator labor and management are included.
- Operating costs are those costs that are expendable in nature and fit closely the standard variable cost designation.
- Overhead costs are annual capital recovery charges or the annuity cost needed to replace long-term assets.
- Discounting was used to adjust revenues and costs to the same production month (December).
- A negative return to land and risk suggests that all opportunity costs were not covered and that the "next best" investment would have yielded a higher rate of return.

Literature Cited

AAEA. 2000. Commodity Costs and Returns Estimation Handbook. A report of the American Agricultural Economics Association (AAEA) Task Force on Commodity Costs and Returns, Ames, IA, USA.

Anderson, D. M., Estell, R. E., Gonzalez, A. L., Cibils, A. F., Torell, L. A., (in press). Criollo Cattle - Heritage Genetics for Arid Landscapes. Rangelands.

Bevers, S., 2014. Beef Cow-calf SPA Ranch Economics and Analysis. URL http://agrisk.tamu.edu/beef-cow-calf-spa-ranch-economics-and-analysis/

CattleFax 2014. CattleFax website, state-level beef price data obtained from CattleFax research staff, Denver, CO. URL http://www.cattlefax.com/

Gwin, L. 2009. Scaling-up Sustainable Livestock Production: Innovation and Challenges for Grass-fed Beef in the US. Journal of Sustainable Agriculture, 33(2), 189–209.

Hawkes, J., Libbin, J. D., 2014. Cost and Return Estimates for Farms and Ranches 2001-2013, Southwest Region, Medium Cow/Calf Budget 2013. URL http://costsandreturns.nmsu.edu/

Holechek, J., Pieper, R. D., Herbel, C. H. 2004. Range Management : Principles and Practices, 5th ed. Prentice Hall, Upper Saddle River, NJ, USA.

Lozier, J, Rayburn E., and Shaw, J. 2004. Growing and Selling Pasture-Finished Beef: Results of a Nationwide Survey. Journal of Sustainable Agriculture 25 (2): 93–112.

Mathews, K. H., and Johnson, R. J. 2013. Alternative Beef Production Systems: Issues and Implications. USDA-ERS, Report LDPM-218-01.

Peinetti, H. R., Fredrickson, E. L., Peters, D. P. C., Cibils, A. F., Roacho-Estrada, J. O., Laliberte, A. S., 2011. Foraging Behavior of Heritage Versus Recently Introduced Herbivores on Desert Landscapes of the American Southwest. Ecosphere 2, 1–14.

Conclusions

Added rangeland grazing capacity from superior foraging habits is a major potential economic benefit of RC cattle production. Yet, even with minimal assumed foraging benefits, the budget comparison suggests higher net returns for RC cattle when compared to traditional A x H enterprises. A 19% increase in net returns over A x H was estimated if rangeland carrying capacity increases by the 50% to 60% level suggested to be possible by preliminary grazing distribution studies conducted on the JER. The grass-fed market is a limited but growing market and the corresponding strong demand and sale prices for breeding animals is another major factor contributing to the favorable economic profile for this heritage breed. Reduced supplemental feed costs, less fly and parasite control, and the economies of size that arise as more animals utilize the fixed land resource are the main reasons why total production costs per AUY were estimated to decrease by nearly 30% for RC cattle.