Decision-making for climate adaptation

The ranch-drought decision model

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The Ranch-Drought decision project is a collaborative effort of the Western Water Assessment, the USDA Northern Plains Climate Hub, and the DOI North Central Climate Science Center, with additional support through Earth Lab (CU-Boulder Grand Challenge)

Drought decision making on the ranch

The basic decision problem is whether to *change management practices in the face of drought*, by:

- Destocking drought-affected range and putting cattle on purchased feed or rented pasture elsewhere
- Weaning calves and selling early (at lower weights)
- Selling part or all of the herd (calves and mother cows) and re-building after the drought

Each decision has different financial and management implications.

Drought decision making on the ranch

Some other factors include:

- Expectations about future drought conditions
- Current market conditions, and potential market response to drought
- Potential insurance payments (e.g., USDA RMA)
- Possible drought aid

A classic case of **decision-making under uncertainty**:

- Will the drought continue, worsen, or improve?
- How will markets respond to adjustments

Plenty of good advice is available from ranch and range management experts

Managing your ranch during drought:
Implications from long- and short-run analyses

Managing Drought Risk on the Ranch
A Planning Guide for Great Plains Ranchers

University of Nebraska - Lincoln
National Drought Mitigation Center

Available Online at:
www.drought.unl.edu/ranchplan

National Drought Mitigation Center

USDA United States Department of Agriculture Risk Management Agency

University of Nebraska Lincoln

en, Christopher T. Bastian, W. Marshall Frasier, Michael

Western Beef Resource Committee — *Third Edition*

Cattle Producer's Handbook

Drought and Other Natural Disasters Section 1130

Drought Management Strategies for Beef Cattle

John Paterson, Rick Funston, and Ron Carlstrom, Montana State University
Greg Lardy, North Dakota State University

Drought develops progressively over time. Management of the ranch during a drought depends on the balance between stocking density and the availability of feed and water.

In the long run, you can help protect your interests by sound planning to make your ranch decisions less sensitive to drought. Early decisions need to be based on what relief measures are potentially available on the ranch. Among the important factors are:

- Guessing the expected duration of the drought,
- The current water and feed inventories,
- The body condition of the cowherd, and
- Financial resources available.

During drought, decisions may often be made on emotion rather than logic. The main goal is to make objective decisions and get skilled help when necessary from your extension educator, beef specialist, range specialist, or agricultural consultant.

Effect of Drought on Range Plants and Management

Drought is a serious obstacle to successful range livestock management. Producers must understand how drought affects plants, grazing animals, and livestock management, and what options exist. Forage production is decreased dramatically, but reductions are less on range in good and excellent ecological condition.

The ability of perennial plants to recover after drought is closely related to their vigor before and during the drought. Excessive grazing (more than 60 percent of current year's growth) decreases the ability of some plants to recover. Moderate use (25 to 55 percent) does not seem to affect the recovery rate.

A drought may require that livestock numbers be reduced according to forage supply. Retaining a rotational grazing system during drought is recommended over continuous grazing because periodic rest helps plants maintain vigor. Concentrating more animals into a single herd is recommended over having several smaller herds because by having more animals in a pasture, the entire pasture will be grazed more uniformly, and more use will be made of the less-preferred plants. Other options include grazing Crested wheat grass earlier and longer than normal, because it is one of the plants most tolerant of grazing.

Another option is keeping cattle on irrigated or sub-irrigated sites longer than usual. Fertilizer could be used to increase forage production on many of these sites. Fertilizer is a cash cost, however, and soils should be tested before fertilizer is applied. Fertilizer needs moisture to be available to the plant, and in times of extreme drought, this may not happen.

Initial Questions

The producers who survive best during drought are those who adopt sound management and financial plans and review them regularly. They make firm decisions, and act quickly and early.

Keep alert for opportunities such as leasing land instead of buying feed. Four factors that affect risk management during a drought include:

1. The total population of cattle in relation to feed availability,
2. How widespread the drought-area is,
3. The time of year and the likelihood of rain and return to adequate feed supplies in your area, and
4. Evaluation of cash flow needs (borrowing your way through a drought to maintain traditional herd size may inhibit long term profitability).

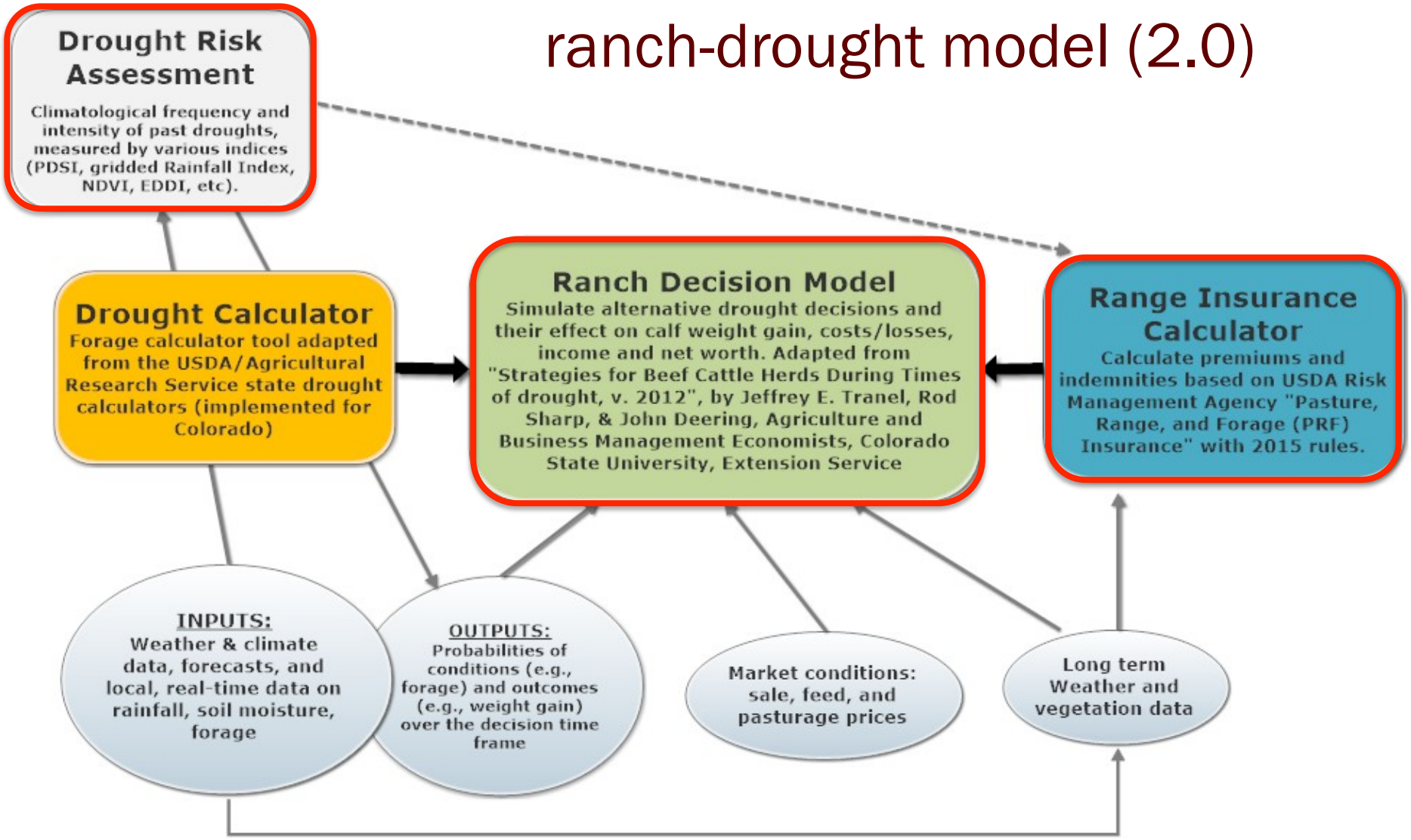
The most common advice is to make decisions earlier, be more adaptive, reduce pressure on the range—which is good for the enterprise *and* range ecology

But what can help ranchers make this choice earlier in a drought? And what if the drought improves or abates?

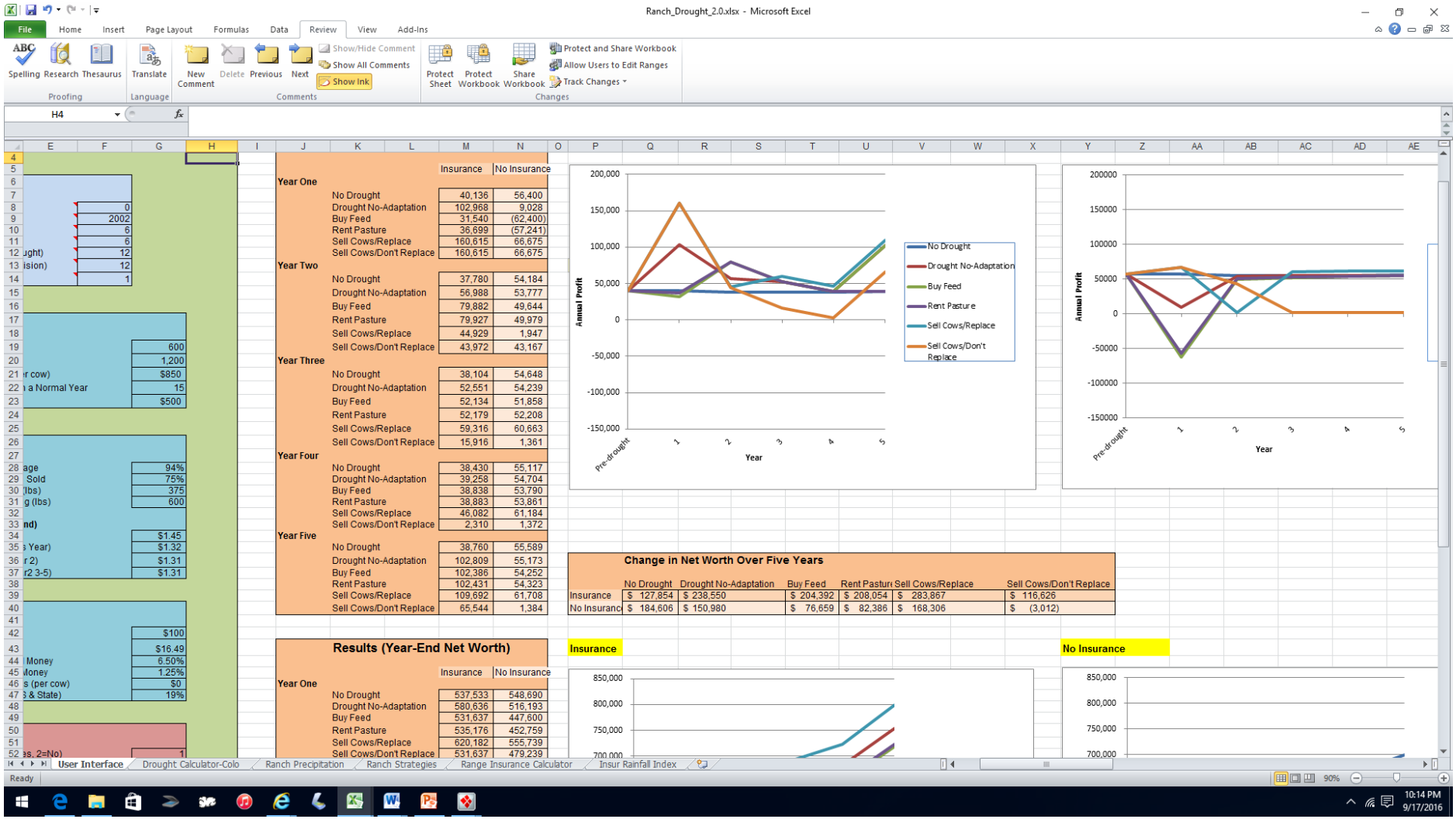
- Better information (on both climate and market responses)
- Efficient decisions and risk management (decision support)
- Risk mitigation tools (e.g., insurance)

We test these with an **integrated ranch-drought decision-model**

The structure of the current ranch-drought model (2.0)

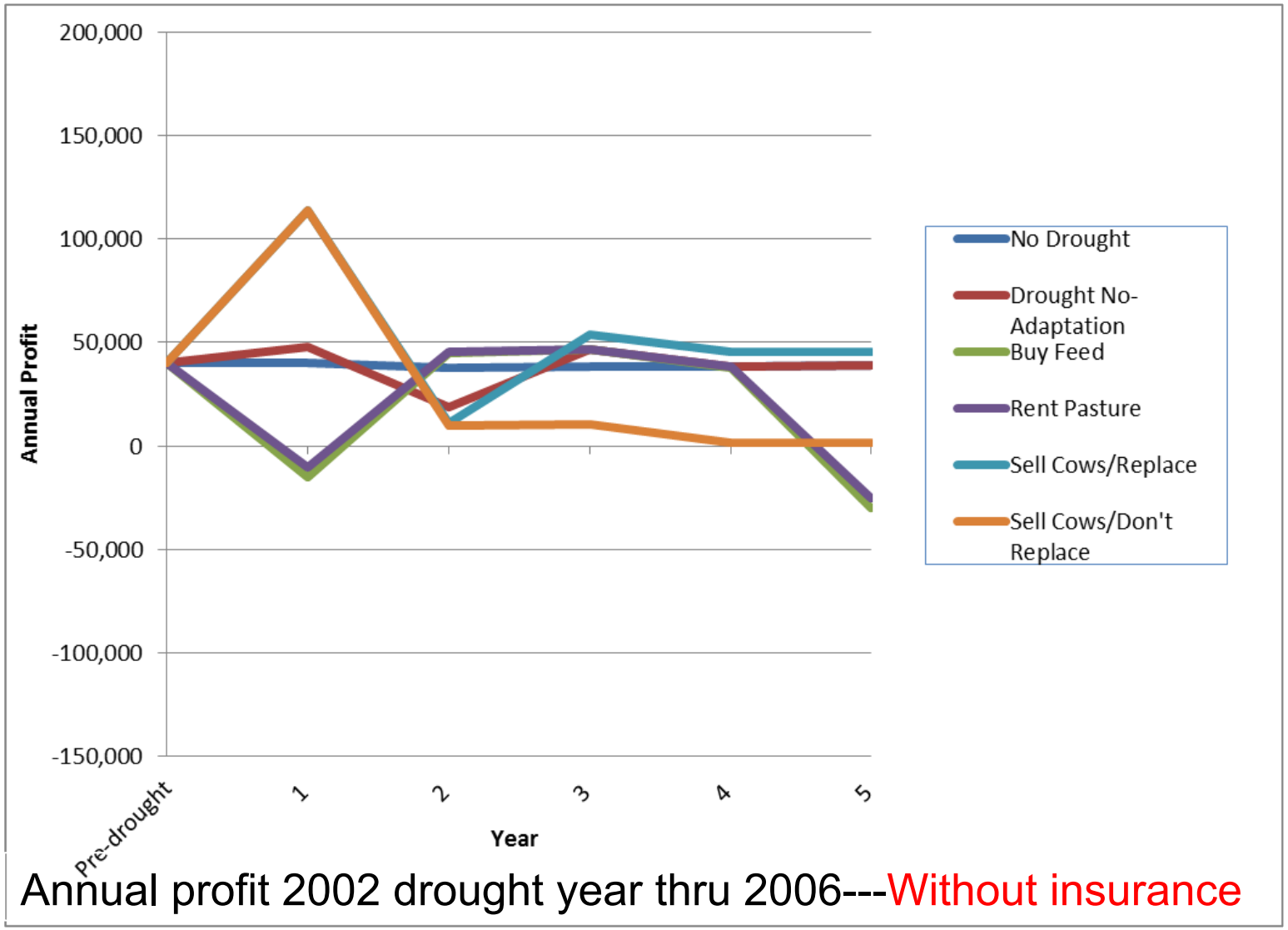


Ranch-Drought Decision Model 2.0 implemented in Excel



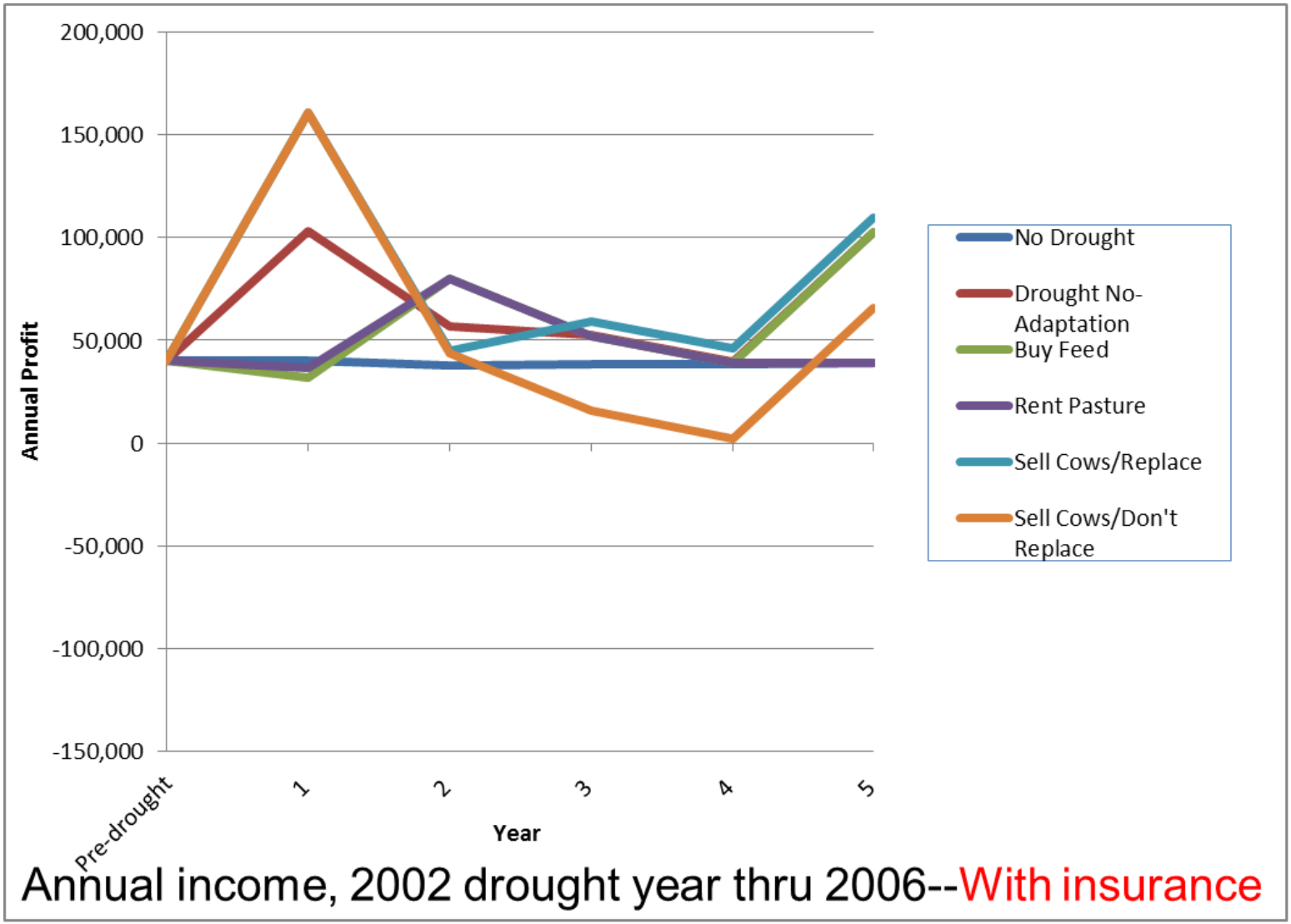
- ***R*** version with more extensive simulation being developed

Five-year runs for a 600-head cow-calf operation accessing 8,000 [insured] acres in eastern Colorado ***without*** *PRF insurance*



Annual profit 2002 drought year thru 2006---Without insurance

Five-year runs for a 600-head cow-calf operation accessing 8,000 [insured] acres in eastern Colorado ***with*** *PRF insurance*



Ongoing and future directions

- Examine the value of additional information (VAI) in decision-making (drought indices, drought forecasts, soil moisture obs)
- Assess the ranch outcomes when the RMA PRF insurance payouts are pegged to different drought indices (USDM, EDDI, NDVI, etc.)
- Invite ranchers to participate in simulation experiments at CSU/NC CSC's RAM visualization studio
- Tune the model for different states/ecoregions?