Integrating beef and cotton production reduces irrigation needs in the Texas Southern High Plains

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Introduction
The Texas High Plains is a semiarid agricultural region located in the central south plains of the United States. This area exemplifies semiarid regions where water is becoming scarce. Crop production depends heavily on irrigation primarily from the Ogallala aquifer at non-sustainable rates of use. Irrigated monoculture cotton (Gossypium hirsutum L.) is the dominant crop but grazing livestock in this once vast grassland is re-emerging as the aquifer declines.

Objective
To compare:
- cotton monoculture vs integrated cotton-forage-livestock system
Determine effects on:
- irrigation
- water use
- profitability
- other measures of sustainability.

Materials and Methods
From 1999 to 2008, two, large-scale, subsurface drip irrigated systems (13 ha total area), 3 replications in a randomized block design compared:
- a cotton monoculture
- an integrated 3-paddock system that included cotton in a 2-paddock rotation with
  - grazed wheat (Triticum aestivum L.) and
  - rye (Secale cereale L.) with
- a third paddock of perennial ‘WW-B. Dahl’ old world bluestem [OWB; Bothriochloa bladhii (Retz) S.T. Blake] for grazing and seed production.
- Angus crossbred beef steers (Bos taurus L.; initial body weight = 229 kg; SD = 33 kg) grazed from January to mid-July.

Conclusions
Over this 10-yr study, integrating crops, forages, and cattle:
- Reduced irrigation.
- Lowered chemical inputs.
- Reduced soil erosion.
- Soil organic matter, C, and overall soil health increased.
- Fossil fuel energy inputs lower than cotton monoculture system.
- Grazing reduced negative allelopathic effects in cotton-small grain rotation.
- Integrated system profitable alternative where irrigation restricted, and relative profitability will likely increase as water declines.
- Long-term systems research enables researchers to cooperate by blending areas of expertise.
- Integrating crops and livestock, can conserve water and provide other environmental benefits far beyond economic measures of success.

References