



# Guar as a Possible Desert Tolerant Legume in the U.S. Southwest

TEXAS A&M  
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Calvin Trostle, Ph.D.

Extension Agronomy, Texas A&M AgriLife—Lubbock

(806) 746-6101, [ctrostle@ag.tamu.edu](mailto:ctrostle@ag.tamu.edu)

Updated June 2020

# Why Guar? Why Now?

Also known as clusterbean

- ◉ Guar is a heat-tolerant, drought-tolerant legume† with modest performance in marginal (but sandy) soils.
- ◉ †Most often not well nodulated so N fixation is low.
- ◉ Better crop performance relative to other crops in hotter, drier climates.
- ◉ Prefers heat?
- ◉ **Worldwide:** 85-90% grown mostly in India and some Pakistan (current guar gum prices are about ½ of historical world import price)

# Why Guar? Why Now?

Also known as clusterbean

- ⊙ Guar gum is highly valued as an ingredient from small quantities in numerous food & personal care products to large scale uses in oil field services (e.g., a component of frac fluids)
- ⊙ Desirable viscosity, a carrier for materials into deep wells, “cleans out” relative well (no residues remaining)



# The (Undeserved) Perception of Guar:

## “Low-Input/Stepchild Crop” (USA)

## “Poor Man’s Crop” (India)



# The Value of U.S. Guar Gum Imports

- ⊙ According to the USDA Agricultural Marketing Service, in 2011 in the Port of Houston (Texas) guar gum imports were ~225,000 metric tons (80% of U.S. total).
- ⊙ At historical guar gum prices of \$2 to \$3/lb., this translates to an import value of \$1.0-1.5 billion
- ⊙ This represents about 2.3 million acres of production (at 800 lbs./acre, which is an average yield in the U.S., but double the average yield in India).

# Guar Materials



Samples courtesy West Texas Guar

# Key Guar Considerations

- ⦿ Indeterminant, annual legume
- ⦿ Good for rotations with cotton, sorghum, etc.
- ⦿ Research in the 1970's at Texas A&M AgriLife—Vernon: 15% lint yield increase the following year; subsequent data from the Texas A&M AgriLife Research station at Chillicothe suggest a lower yield benefit.
- ⦿ As drought tolerant—if not more—than any other crop in Texas (sesame would be similar)
- ⦿ Low risk?

# Guar

- ⦿ With sesame, the most drought tolerant crop in the Texas Rolling & South Plains and Southwest Oklahoma
- ⦿ Low input crop
- ⦿ No insects or disease treated in production since ~1998
- ⦿ Not for your weedy ground!—Few herbicides
  - ⦿ Trifluralin (pre-plant incorporated), and grass herbicides over the top (clethodim)



# Guar Markets

- ⊙ U.S. companies need a stable supply, and appear more willing to pay the needed cost.
- ⊙ Due to volatility in the international market (which is controlled and does not necessarily reflect market conditions), interest rises in investing/establishing U.S. production when prices are high
- ⊙ What about food vs. industrial use debate?
  - Blue Bell ice cream—the 2012 run-up in guar prices amounts to ~10-12 cents higher ingredient cost per half gallon carton which costs \$5-6









# Univ. of Arizona

## Guar Variety Trial (2013)

Shawna Loper– Stanfield & Florence/Queen Creek, AZ

- ◉ Five varieties (four from 1985 or older), planted early June at 10 lbs./A, harvested early December.
- ◉ Irrigation and rainfall levels not reported.
- ◉ Yields and crop grain values:
  - ◉ **Stanfield:** 1,820 to 2,650 lbs./A grain
  - ◉ *Average crop value, 2020/historical: \$377 / \$705 per acre*
  - ◉ **Florence/Queen Creek:** 1,910 to 3,130 lbs./A grain
  - ◉ *Average crop value, 2020/historical: \$382 / \$717 per acre*

# Irrigation Water

## Management for Guar Seed Production

Agronomy Journal 80:447-453 (1988); Maricopa, AZ

- ◎ Three guar varieties, six irrigation levels/timings
- ◎ Planted in mid-June, harvest November

Criteria	1983	1984
Irrigation range	12-24"	12-24"
Seasonal rainfall	5.5"	7.1"
Evapotranspiration	13-18"	16-22"
Yield range (lbs./A)	1,260 – 1,970	1,320 – 1,540
2020 grain value (\$0.16/lb.)	\$201 to \$315/A	\$211 to \$247/A
Historical grain value (\$0.30/lb.)	\$377 to \$591/A	\$396 to \$463/A

**What is cost of 1" of irrigation (water + pumping + application)?**

# Arizona Guar Visit, Nov. 2016

Maricopa, AZ; area farmer/dairyman



- ⦿ Planted mid/late summer; irrigates ~18", harvest November.
- ⦿ Santa Cruz variety (developed in Arizona, released in 1985), also uses Kinman.
- ⦿ **Goal:** Harvest grain then split the seed on-farm, market splits containing guar gum (1/3 of biomass), then use the meal (~30% protein) in dairy feeding.
  - ⦿ Use of meal as cattle feed vs. bioenergy source?: protein is worth more than fuel.
- ⦿ Used a knife rig to cut guar root then windrow for harvest.
- ⦿ The 18" of water, that is much less than other crops he grows, cotton can be 40" in the region, even more.



# Estimates of Guar for Bioenergy?

- ◉ In addition to grain, A) use left over meal after splitting, and B) collect biomass from field.
- ◉ A current Southwest U.S. bioenergy project estimates guar could provide up to 225,000 tons of meal & 1 million tons of dry matter.
  - ◉ About 250,000 acres in an area where little guar is grown
  - ◉ Grain projections used \$0.45/lb., well above historical prices.
- ◉ Current U.S. numbers in the U.S. (TX, OK) based on all acres are 18,000 tons of meal & 50,000 tons of dry matter.
- ◉ These are not likely good energy/chemical sources:
  - ◉ Meal is protein (~30%) for cattle feed rations (**protein is more valuable than fuel**)
  - ◉ Biomass per acre is likely too low to justify removal (and removes nutrients from the cropping system).

# Guar Economics

- ⦿ Guar is a crop that has minimal input costs to grow. Therefore the gross returns (which seem low), must be evaluated in light of actual (low) production costs.
- ⦿ Historically, guar is not a crop of choice if a producer must service a high debt load.
- ⦿ Guar production budgets @ <http://southplainsprofit.tamu.edu>



# Guar Buyer/Processor: TX, OK, NM



- ◎ Guar Resources, Brownfield, TX
  - ◎ Purchased assets of West Texas Guar, whose contracted production 2009-2013 ranged from about 10,000 to 113,000 acres (latter included guar replanted after failed cotton); ~30,000 acres in 2018 & 22,000 acres in 2019.
  - ◎ (806) 637-4662, [www.guarresources.com](http://www.guarresources.com)
  - ◎ **New splitting and powder equipment installed in 2016**
  - ◎ Annual processing capacity is about 50 million lbs. of grain (about 60,000 acres of average production)
  - ◎ Compared to previous markets, half or more of Guar Resources 2019 market is for higher value uses in food, industrial applications, consumer products.

# Guar & Crop Insurance 1

- ⦿ Currently no meaningful crop insurance (not a program crop)
  - ⦿ A viable private crop insurance product was potentially in place for 2014, but the West Texas Guar bankruptcy ended any meaningful crop production for 2014-2015
- ⦿ Lending agencies may not loan money on guar without crop insurance
- ⦿ Currently only NAP insurance is available, and it may be not economical to justify purchase

# Where is Guar Best Suited?

- ⦿ Grows adequately under a wide range of soil conditions
  - ⦿ Clayey soils are not recommended
- ⦿ Performs best on medium- and sandy textured soils
- ⦿ Dryland pivot corners
- ⦿ **Fields without heavy weed pressure**
- ⦿ Humid environments are not desirable
  - ⦿ Alternaria, bacterial blight, other diseases begin to take their toll
  - ⦿ Indi and Paki varieties are exposed to humidity during the monsoon seasons, may handle disease potential better?



# *Rhizobium* Nodules on Guar



Rhizobium nodules on guar roots



# Direct Cut Harvest Air-Reel Headers



Can reduce pod loss  
at the cutter bar, save  
up 5% of the crop.

# Where Must Guar Yields Go? And What Type of Production?

- ⊙ Guar at 50,000 acres in the U.S. vs. 250,000 acres or even 500,000 acres annually?
- ⊙ Large guar gum users need major **consistent** supply to substantially commit to U.S. guar (quality considerations perhaps a different matter)
- ⊙ 200 million pounds of guar gum use in North America? That's about 700,000 acres of production at 1,000 lbs./A.
- ⊙ **We can't reliably achieve this with only dryland**—to make this potential viable and reliable, we have to:
  - ⊙ increase yield per acre (breeding, GMO?, management)
  - ⊙ produce some guar on irrigated land to minimize drought effects on supply

# Guar Seed Supplies

- ⦿ Guar companies normally only supply seed to those who have signed production contracts
  - ⦿ Guar Resources, Brownfield, Texas, [www.guarresources.com](http://www.guarresources.com)
  - ⦿ Also, Brownfield Seed & Delinting, Brownfield, Texas
  - ⦿ Smaller quantities from Texas Foundation Seed Service, a unit of Texas A&M AgriLife Research, <http://tfss.tamu.edu>
- ⦿ Breeding research at Univ. of Arizona has continued for over 30 years on a limited basis (Dr. Dennis Ray, [dtray@Arizona.edu](mailto:dtray@Arizona.edu))
- ⦿ Guar breeding at Texas A&M AgriLife Research, Lubbock, TX (Dr. Mark Burow, [mburow@ag.tamu.edu](mailto:mburow@ag.tamu.edu))



# For Further Information

- ◎ Texas A&M AgriLife—

<http://lubbock.tamu.edu/othercrops/guar>  
([ctrostle@ag.tamu.edu](mailto:ctrostle@ag.tamu.edu), office 806.777.0247)

- ◎ Arizona “SBAR”—Sustainable Bioeconomy for Arid Regions,  
<http://sbar.Arizona.edu> (Dr. Sangu Angadi, NMSU-Clovis,  
[angadis@nmsu.edu](mailto:angadis@nmsu.edu), office 575.985.2292)

