

Guar: a potential alternate crop in New Mexico

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What is guar?

- Guar or cluster bean (*Cyamopsis tetragonoloba*) is a drought tolerant legume crop traditionally grown for centuries in south Asia including India.
- The word “Guar” comes from Hindi, meaning “cow food”.



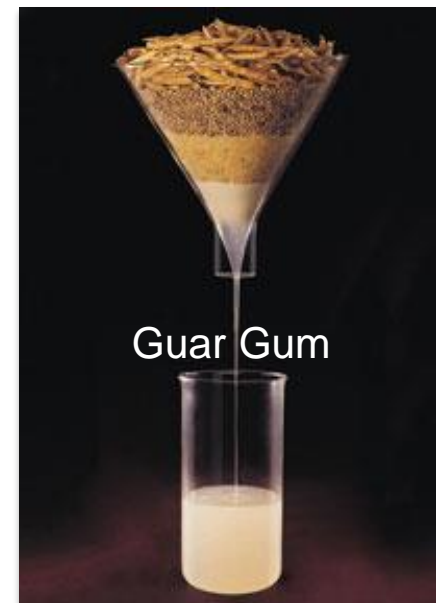
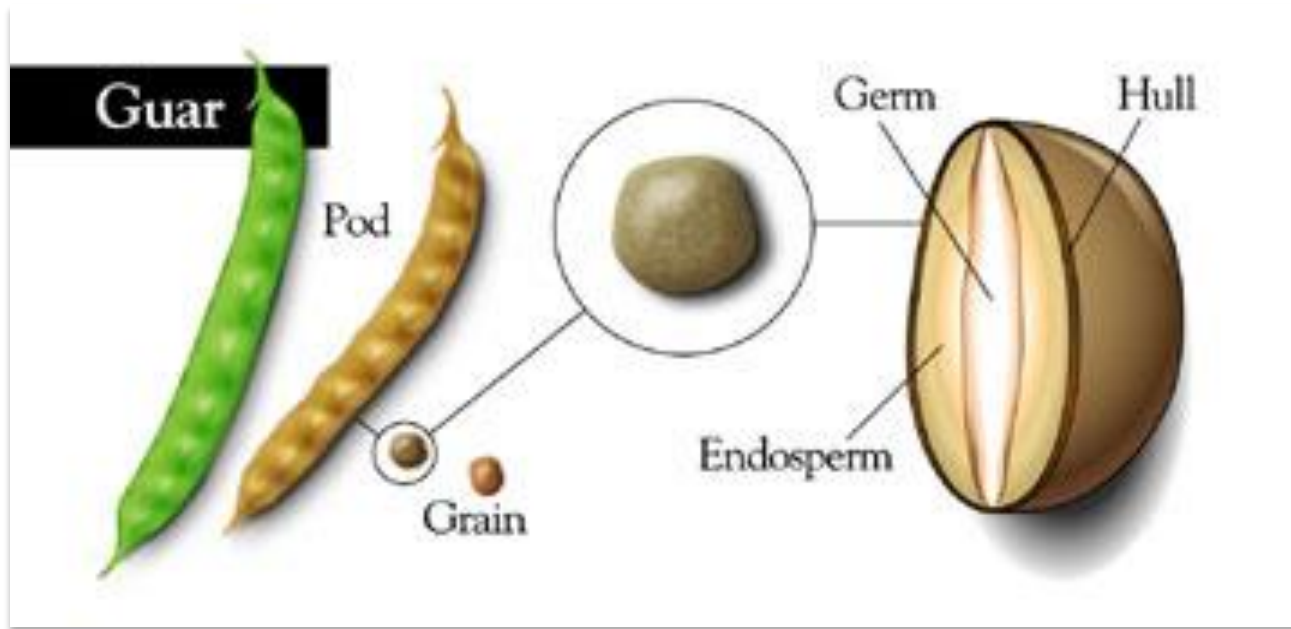
What is guar?

- Guar can be grown for protein-rich high quality forage for animals or
- can be grown for fresh pods for vegetables, or
- for seed to produce guar gum.



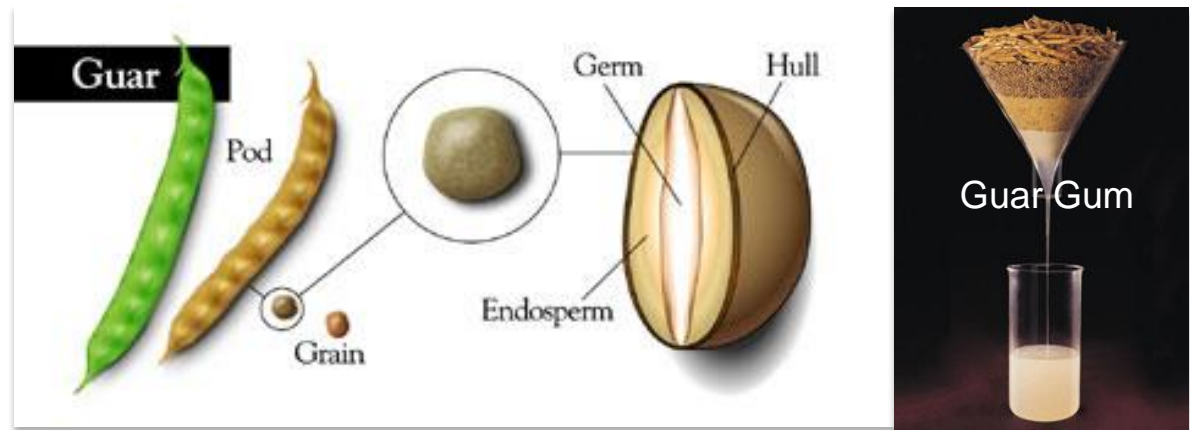
What is guar gum?

- Guar gum is obtained from the powdered endosperm of the guar seed



What is guar gum?

- As a rule of thumb, the seed components are:
 - Embryo, 45%
 - Seed coat, 15%
 - Endosperm, containing the gum, 40%
- About 28% of raw seed weight is net extractable gum



Guar Materials



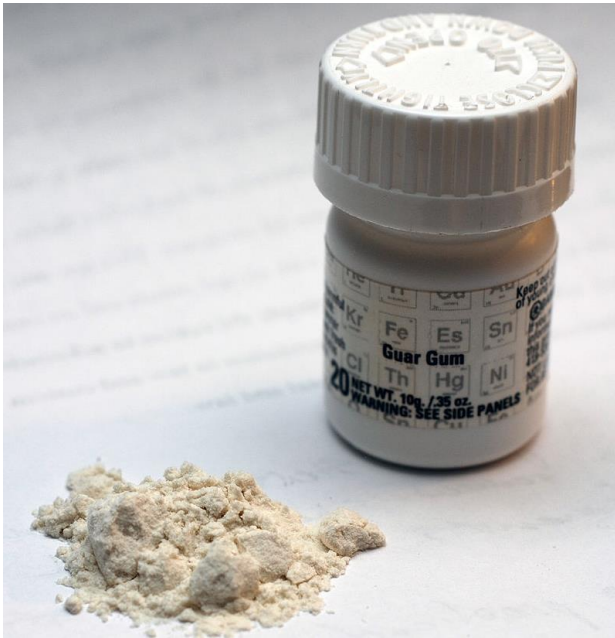
Courtesy: Trostle, 2015



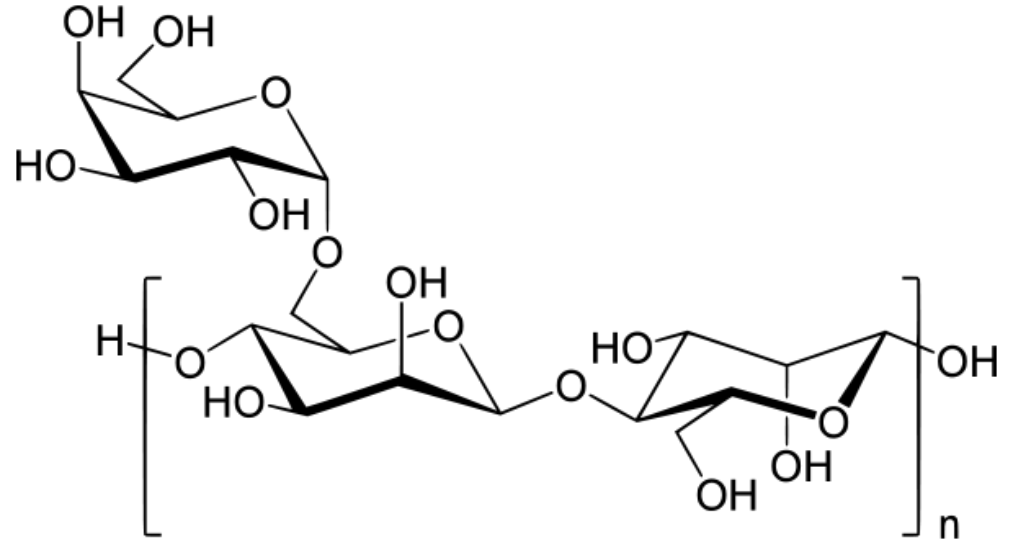
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What is guar gum?

Chemically, guar gum is a polysaccharide composed of the sugars galactose and mannose.



https://en.wikipedia.org/wiki/Guar_gum#/media/File:Guargum.jpg



Why guar gum?

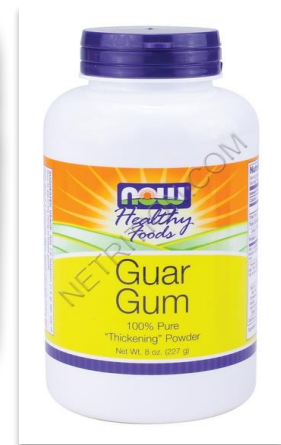
- The high molecular weight polysaccharides of galactomannan give guar gum unique biochemical properties including high viscosity.
- More water-soluble than other gums
- Better emulsifier
- 8 times higher water-thickening potency of cornstarch



https://en.wikipedia.org/wiki/Guar_gum#/media/File:Guar gum.jpg

Why guar gum?

- Guar gum is widely used as an emulsifying or stabilizing ingredient in range of food products and cosmetics (small quantities)



Products containing Guar Gum

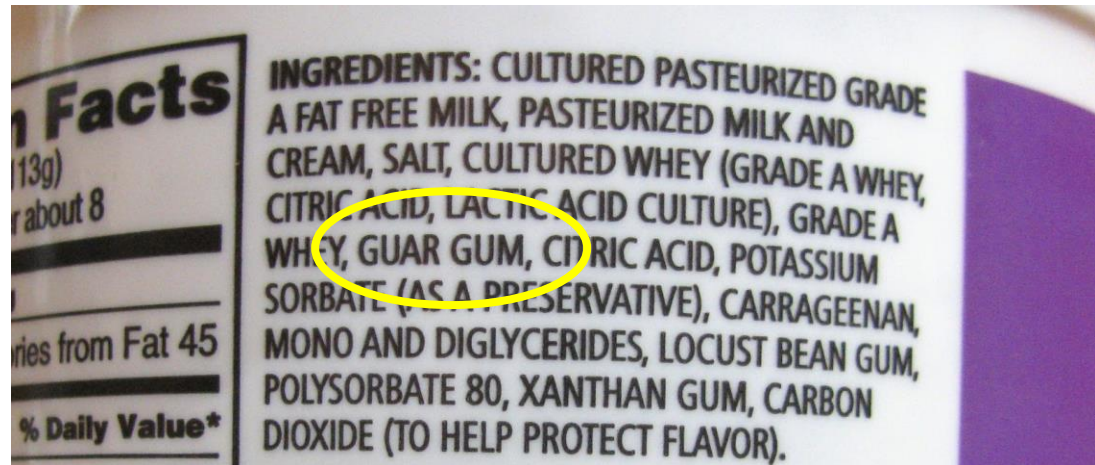
Why guar gum?

- Guar gum retards ice crystal growth
- shows good stability during freeze-thaw cycles
- used in gluten free ice cream



Why guar gum?

- Guar gum is a hydrocolloid, which is particularly useful for making thick pastes without forming a gel
- Used in Cottage cheese, yogurts, soups



proverbsthirtyonewoman.blogspot.com

Why guar gum?

- **Textile industry** – sizing, finishing and printing
- **Paper industry** – improved sheet formation, folding and denser surface for printing
- **Explosives industry** – as waterproofing agent mixed with ammonium nitrate, nitroglycerin, etc.



Why guar gum?

- **Pharmaceutical industry** – as binder or as disintegrator in tablets; main ingredient in some bulk-forming laxatives
- **Cosmetics and toiletries industries** – thickener in toothpastes, conditioner in shampoos (usually in a chemically modified version)

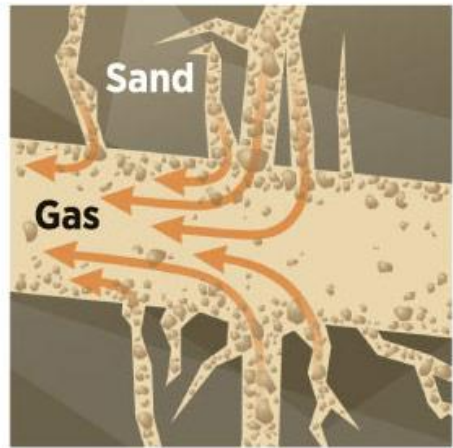
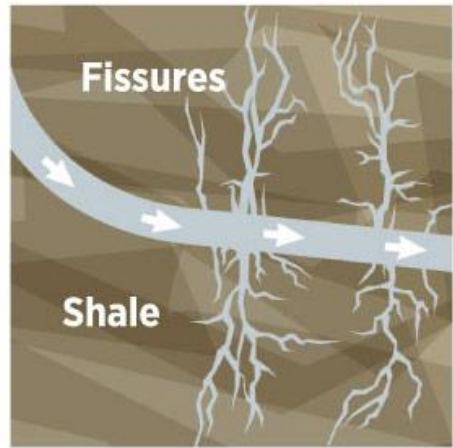
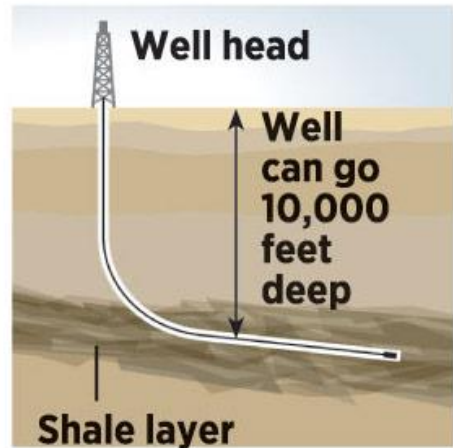
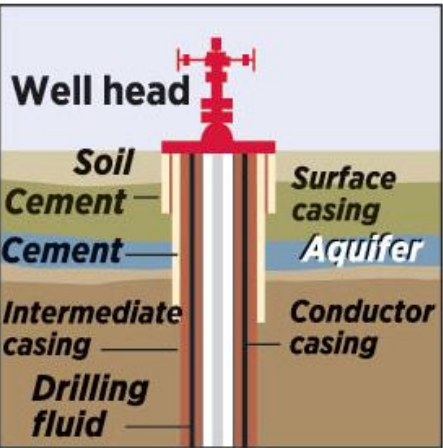


Why guar gum?

- More recently, unique viscosity properties of guar gum have proven effective in stabilizing water and sand mixture in the oil extraction technique of hydraulic fracturing or ‘fracking’ through horizontal oil drilling.

Hydraulic fracturing

The process known as “fracking” has long been used to extract oil from depleted wells. It is now widely used across the country to tap previously unreachable oil and natural gas locked within deep rock formations.



Well is bored using directional drilling, a method that allows drilling in vertical and horizontal directions to depths of more than 10,000 feet.

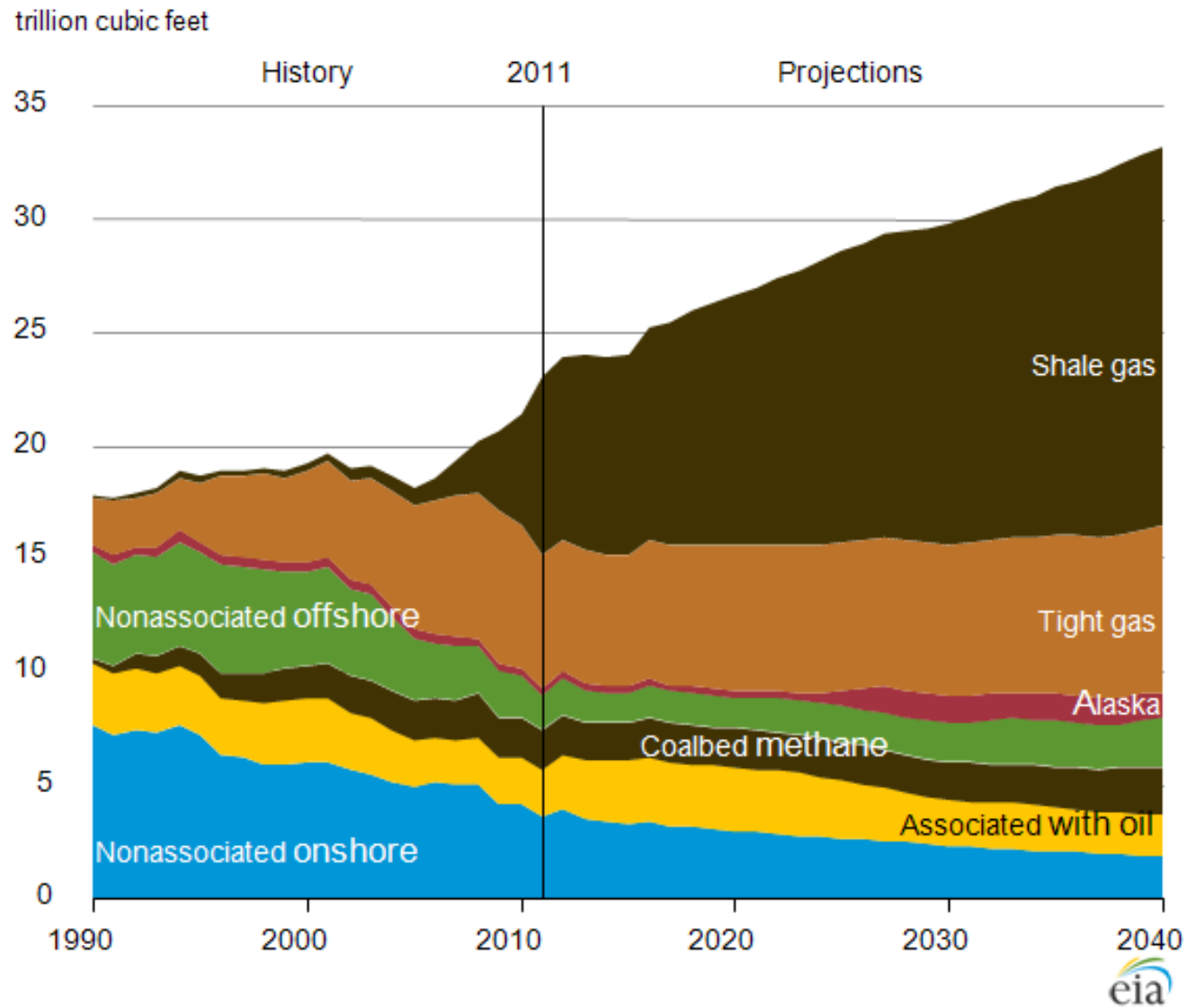
Large amounts of water, sand and chemicals are injected into the well at high pressure, causing fissures in the shale.

Sand flows into the fissures, keeping them open so the oil or natural gas from the shale can flow up and out of the well.

SOURCE:
Los Angeles Times
McClatchy Tribune

www.spokesman.com

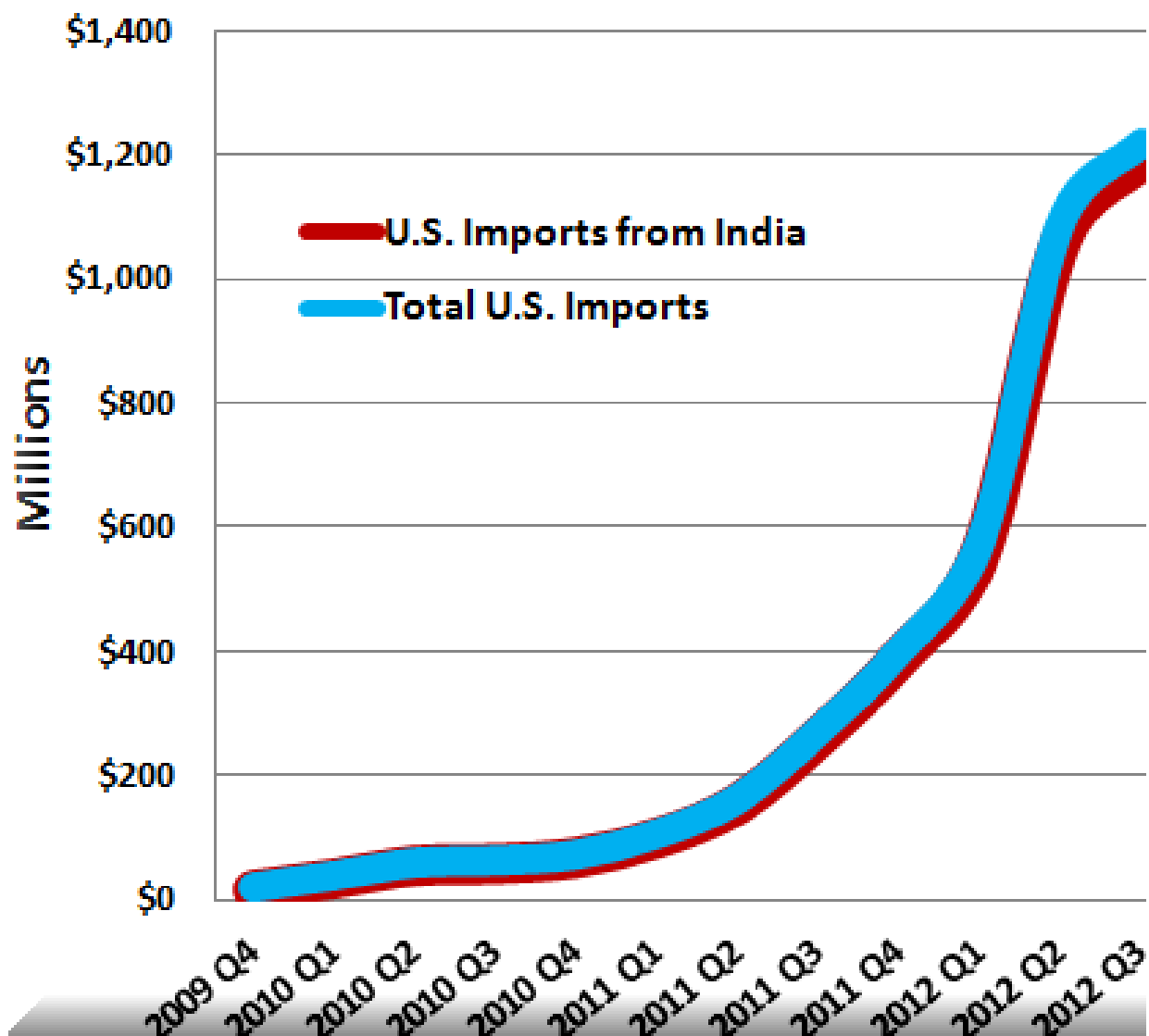
U.S. dry natural gas production: history and projections



Future potential of guar

- Newly found use of guar gum in oil drilling has resulted in an unprecedented increase in demand for guar gum by the US oil industry making the US the biggest user and importer of the guar gum or seed in the world.
- US imported guar gum or seed worth \$1 billion from India in 2011.

Guar gum imports



Source: <http://www.zepol.com/blog/category/General.aspx?page=18>

Future potential of guar

- FTS International- 1700 tons of guar gum a month (3-4 times annual US production)
- Halliburton- guar gum was 30% of material cost to frac a well



Fig. The Orion Drilling Co.'s Perseus drilling rig stands near Encinal in Webb County, TX

Future potential of guar

- To supply the 19,000 wells drilled in 2012 would require in excess of 90,000 tons of guar gum (20,000 lb/well) or
- the equivalent of 500,000 acres of domestic guar production just for the U.S. petroleum industry.



Growing guar in New Mexico

- Low water needs
 - 8.5 inches
- Drought tolerant
- In southern NM, with supplemental irrigation



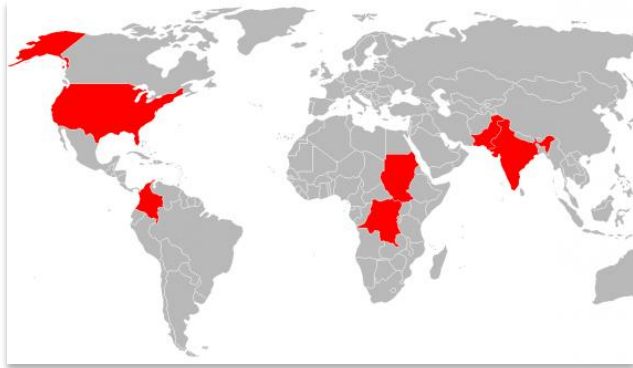
Growing guar in New Mexico

- Legume
- Good rotation crop for cotton, sorghum other non-legumes.
- Low risk, low cost of production



Growing guar in New Mexico

- Guar can be adapted to semi-arid region of desert southwest including New Mexico due to its ability to tolerate heat and water stress.
- Preliminary Research at NMSU shows its adaptability









Guar gum testing in lab



June 16, 2014

May 15, 2014

April 25, 2014

July 1, 2014

Evaluating guar under different planting dates in southern and Eastern New Mexico



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- Singla, S., **K. Grover**, S. Angadi, B. Schutte, D. VanLeeuwen. 2016. Guar stand establishment, physiology and yield responses to planting dates in southern New Mexico. *Agronomy Journal* 108(6), 2289-2300.

Guar at Clovis in eastern New Mexico



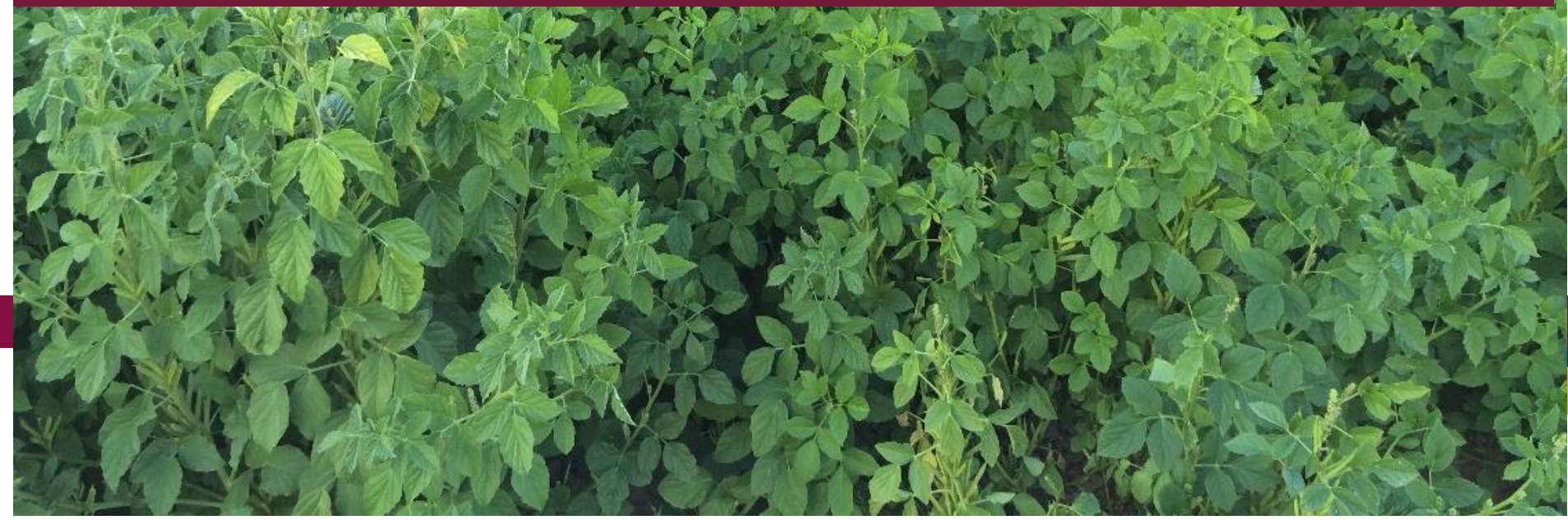
- Singla, S., **K. Grover**, S. Angadi, S. Begna, B. Schutte, D. VanLeeuwen. 2016. Growth and yield of guar (*Cyamopsis tetragonoloba* L.) genotypes under different planting dates in the semi-arid southern high plains. *American J. Plant Sciences* 7(8):1246-1258.

Evaluation of guar under different plantings at Clovis in eastern New Mexico



Summary

- Guar can be grown successfully in New Mexico
 - Seed yield differs from region to region
- Guar planted in June performed better than other plantings under both locations
- Guar genotypes performance differ depending upon planting time



Interest of international researchers in guar



Acknowledgements

- USDA-NIFA
- New Mexico Department of Agriculture
- Graduate Research Enhancement Grant (GREG) Award -Office of Vice President for Research, New Mexico State University.
- Agriculture Experiment Station, New Mexico State University
- Plant and Environmental Sciences Department, NMSU

A photograph of a sign in a field of green plants. The sign is white with a dark border and is mounted on a wooden post. The text on the sign is in a bold, dark blue font. The background shows a clear blue sky and some trees in the distance.

Thanks!
Questions?