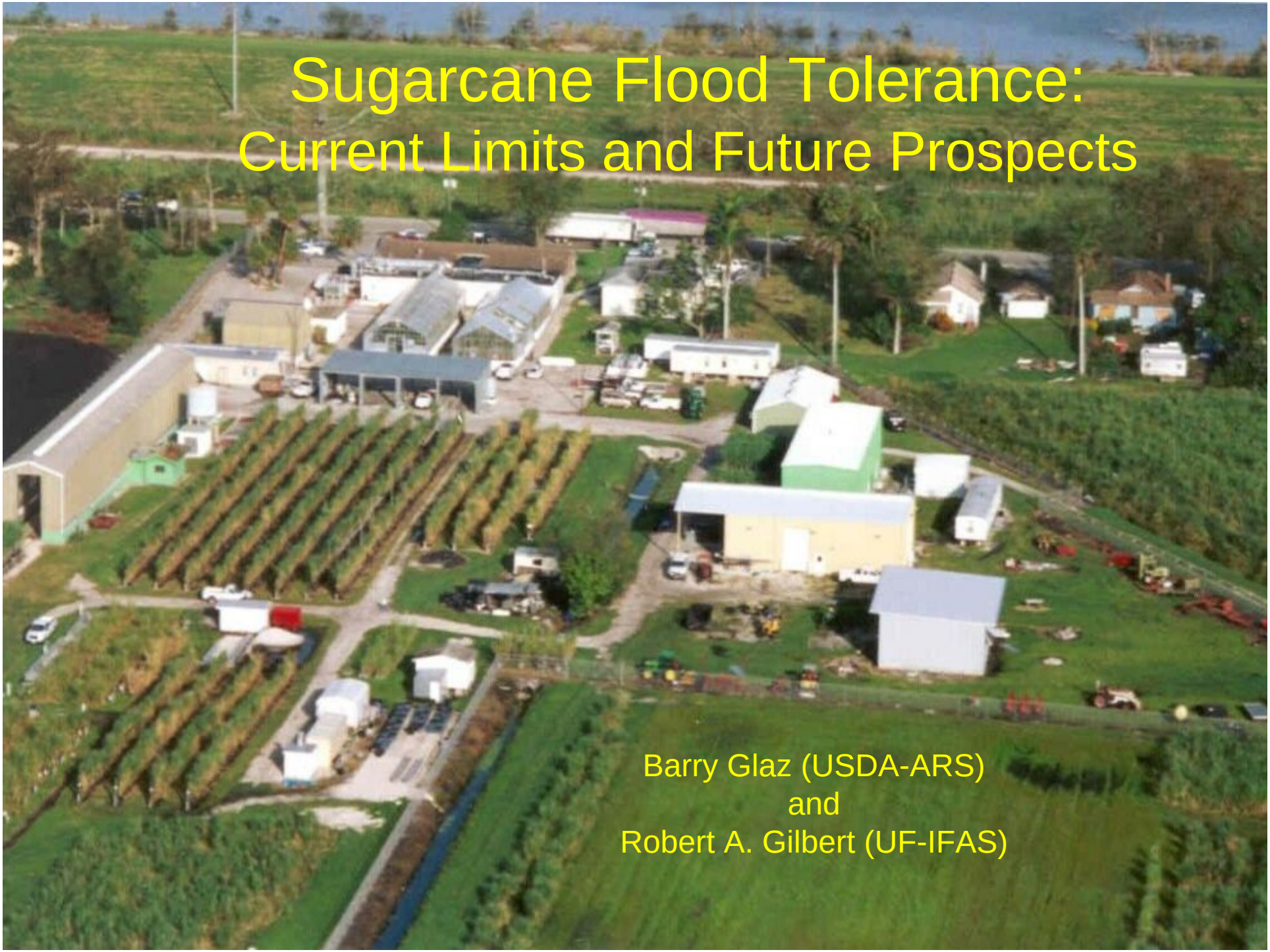


Sugarcane Flood Tolerance:
Current Limits and Future Prospects

Barry Glaz (USDA-ARS)
and
Robert A. Gilbert (UF-IFAS)

Purpose

Discuss Sugarcane Flood Tolerance

Limits

Purpose

Discuss Sugarcane Flood Tolerance

- Physiological and morphological explanations.

- Limits

Purpose

Discuss Sugarcane Flood Tolerance

- Speculate on future gains.

- Limits
- Physiological and morphological explanations.

Purpose

Discuss Sugarcane Flood Tolerance

- Possible ecological and hydrological applications

- Limits
- Physiological and morphological explanations.
- Speculate on future gains.

Sugarcane Flood Tolerance After Planting – Furrow Open

Before November, about 10 days.

B. Glaz. 2001. Sugar Cane International 11-16.

B. Glaz and R. Cherry. 2003. J. of Entomological Science 38(3):449-456.

Sugarcane Flood Tolerance After Planting – Furrow Closed

2 Days Maximum

Except

CP 89-2376 can tolerate 4-6 days

Sugarcane Flood Tolerance During Summer Growth

Upper duration is unknown.

3 months flood causes substantial yield loss.

R.A. Gilbert, C.R. Rainbolt, D.R. Morris, J.M. McCray. 2008. Agric. Water Management 95:283-291.

Periodic Flood Tolerance During Summer Growth

Nine cycles of 2-days flood followed by 12 days drainage resulted in moderate yield improvements.

B. Glaz and R.A. Gilbert. 2006. Agronomy Journal 98:616-621.

Periodic Flood Tolerance During Summer Growth

Nine cycles of 7-day floods followed by 14 days drainage resulted in no effect on one genotype and substantial yield loss in a second genotype.

B. Glaz, D.R. Morris, and S.H. Daroub. 2004. Agronomy Journal 96:832-838.

Periodic Flood Tolerance During Summer Growth

Five cycles of 7-day floods followed by 14 days drainage resulted in no effect on yields of 4 cultivars.

B. Glaz and D.R. Morris. 2009. Agronomy Journal. In Press.

Periodic Flood Tolerance During Summer Growth

20 cm water-table depth caused yield reductions compared with the 45 cm water-table depth in 3 of 4 cultivars.

B. Glaz and D.R. Morris. 2009. Agronomy Journal. In Press.

Flood Tolerance Prior to Harvest

Floods of up to 3 week durations did not reduce yields when applied about 6 weeks prior to harvest.

B. Glaz. 2007. J. of Crop Improvement 20:137-151.

Explanations of Flood Tolerance

Photosynthesis, stomatal conductance, and transpiration not affected by flood or shallow water-table depth.

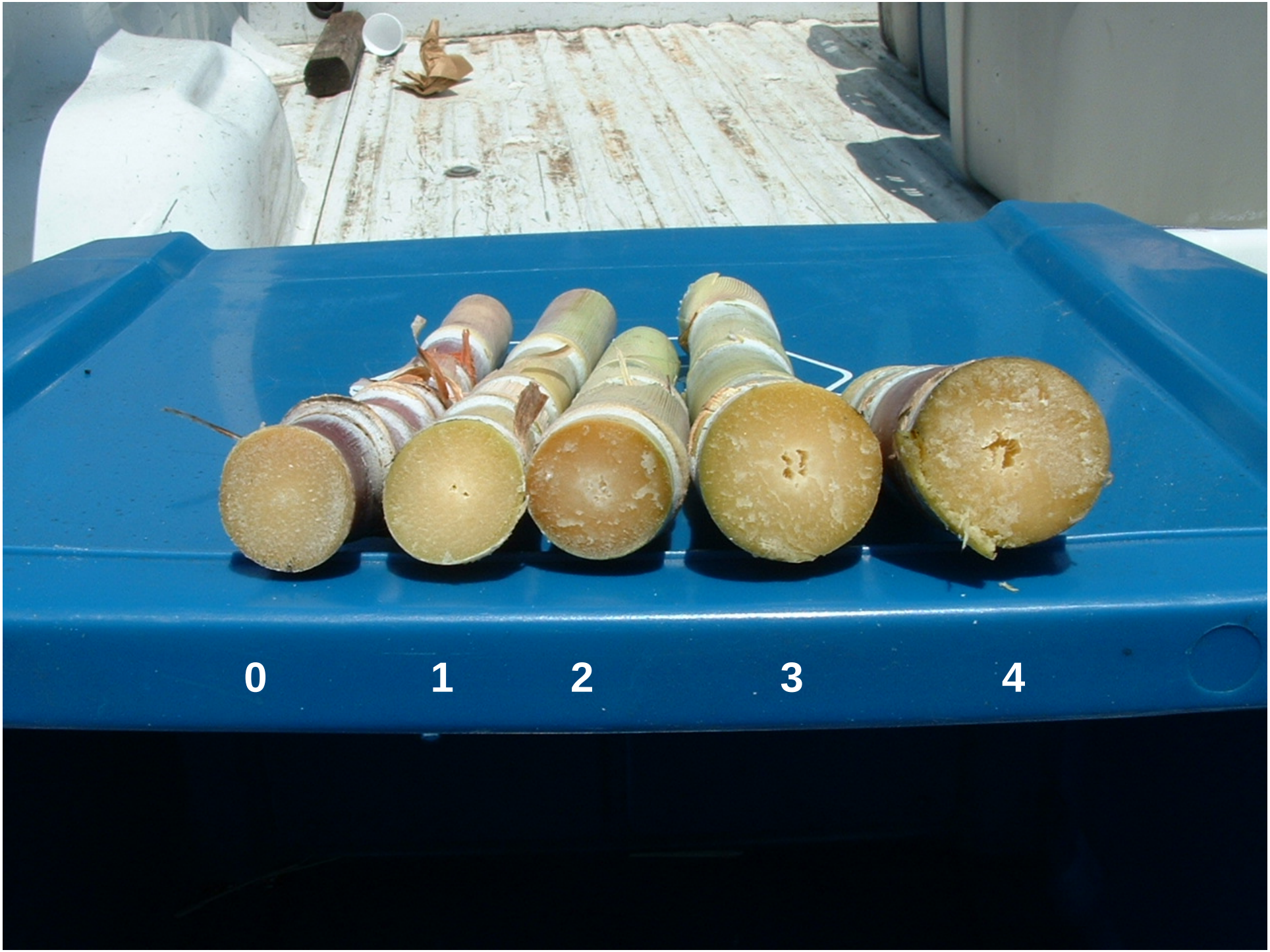
B. Glaz and D.R. Morris. 2004. Crop Science 44:1633-1641.

B. Glaz and D.R. Morris. 2006. J. Sustainable Agric. 28:77-97.

Explanations of Sugarcane Flood Tolerance

Roots of all 40 sugarcane genotypes tested in Florida had aerenchyma.

C. Van Der Heyden C., Ray J.D., Nable R. 1998. *Australian Sugarcane* 2: 28-30.


0
1
2
3
4

Explanations of Sugarcane Flood Tolerance

Stalks of all sugarcane genotypes tested in Florida form aerenchyma after being flooded.

Explanations of Sugarcane Flood Tolerance

However, only some genotypes form aerenchyma in stalks without exposure to flood; this provides extra flood tolerance.

B. Glaz, D.R. Morris, and S.H. Daroub. 2004. Agronomy Journal 96:832-838.

Explanations of Sugarcane Flood Tolerance

Still a theory.

Sugarcane root growth is decreased when roots must grow into water. However, sugarcane roots appear to meet the needs of the plant when flooded for up to 2 weeks.

Conslusions

Most commercial sugarcane cultivars in Florida can tolerate floods for 1 to 2 weeks.

Conslusions

Continuous shallow water tables (15-20 cm) are more harmful to sugarcane than periodic flooding.

Commercial sugarcane cultivars can tolerate floods for 1 to 2 weeks.

Conslusions

Sugarcane has physiological and morphological traits that allow it to respond well to short-duration floods.

Commercial sugarcane cultivars can tolerate floods for 1 to 2 weeks.

Continuous shallow water tables (15-20 cm) are more harmful to sugarcane than periodic flooding.

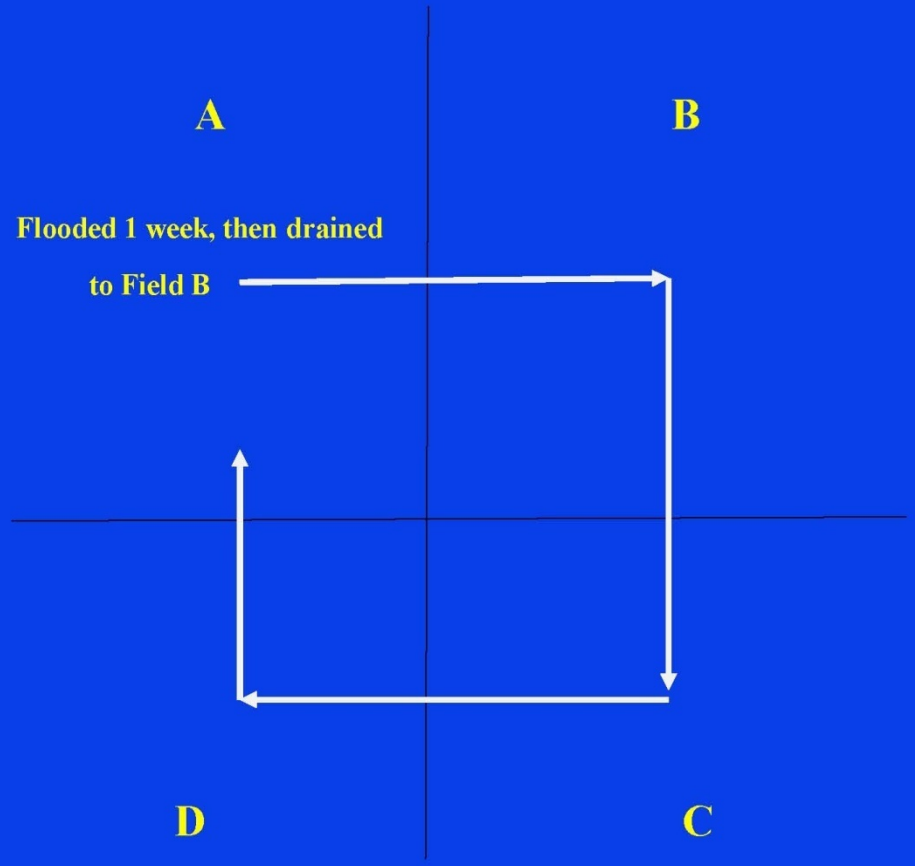
Strategies

- Strategies to store water on sugarcane fields should be based on knowledge that sugarcane can tolerate 1-2 weeks of flood.

- Research should focus on extending this duration.

Strategies

Perhaps sufficient on-farm water storage can be accomplished by movement of water among sugarcane fields.


A
B
Flooded 1 week, then drained
to Field B
D
C


Thank you
Questions?
Comments?