Breeding climate smart cattle for sub-tropical and tropical zones

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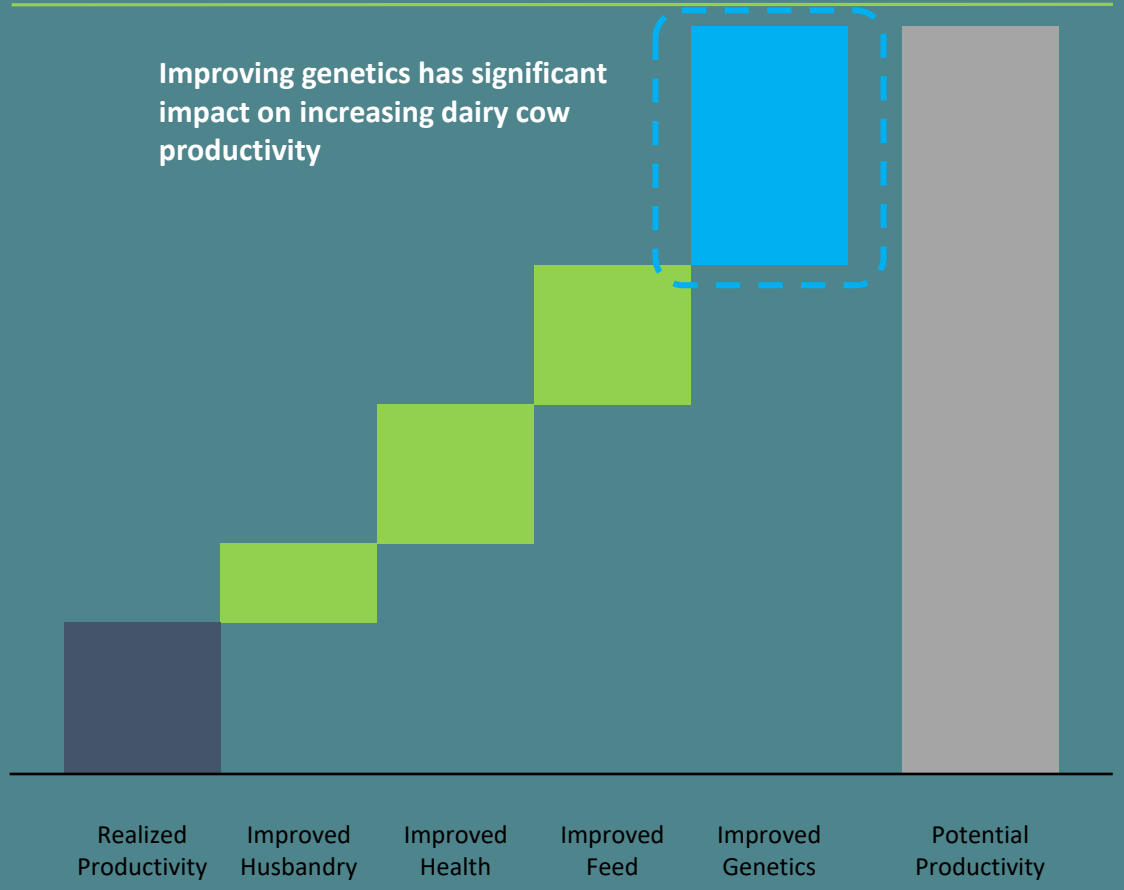
4th International Workshop on Regulatory Approaches for Agricultural Applications of Animal Biotechnologies

Climate smart dairy cattle means no heat stress…

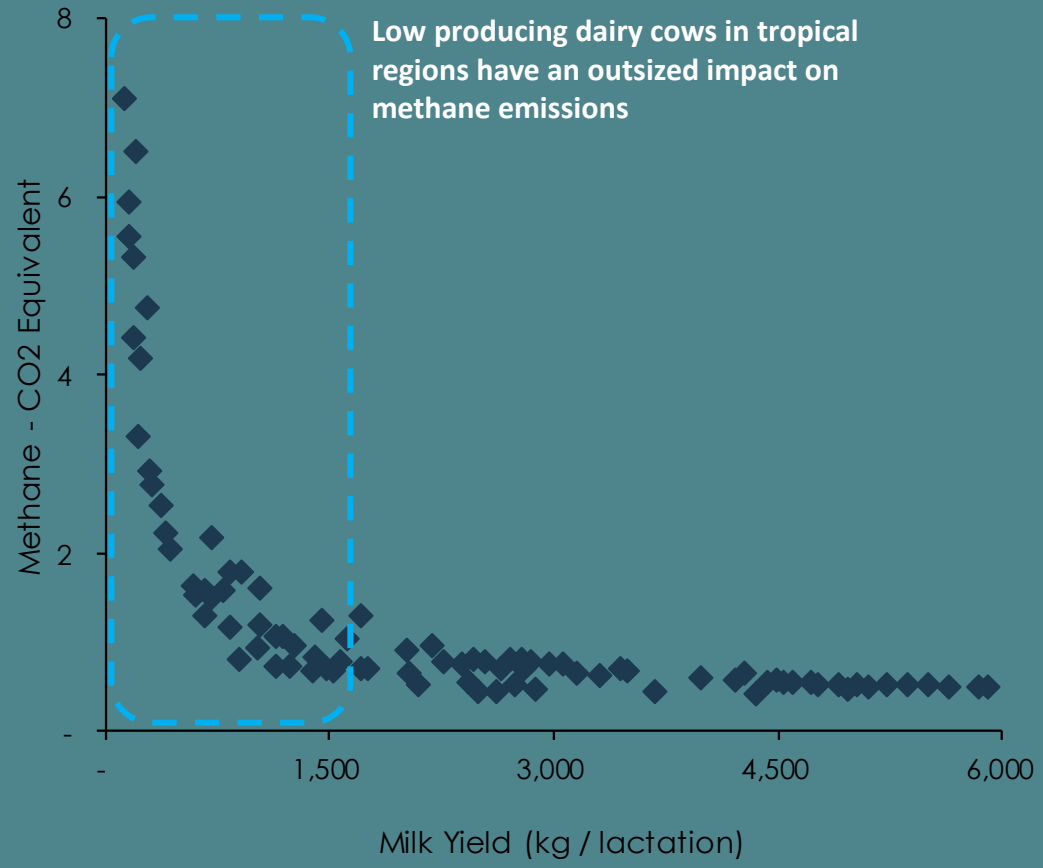
LEVERS FOR DAIRY COW PRODUCTION AND PRODUCTIVITY

Improving genetics has significant impact on increasing dairy cow productivity



METHANE ($CO2_{EQ}$) / KG MILK

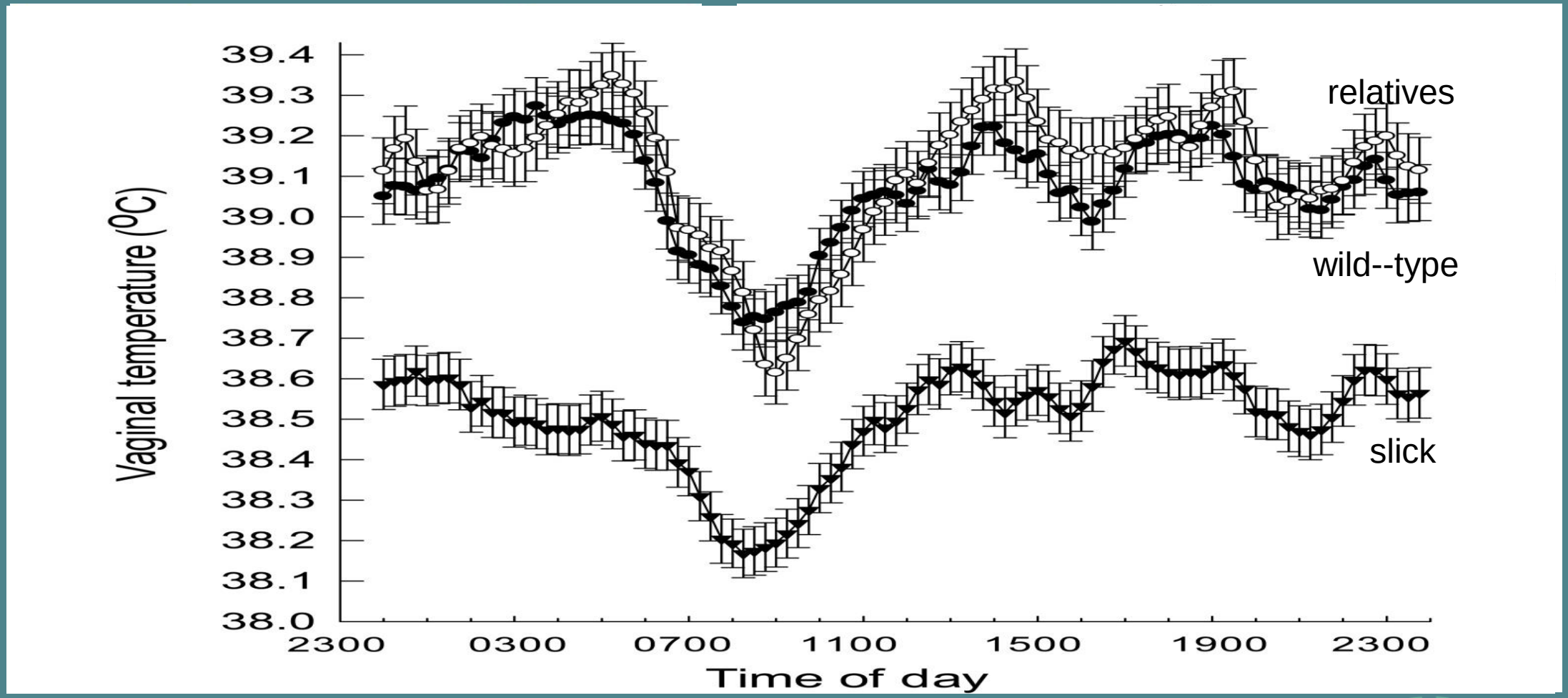
Low producing dairy cows in tropical regions have an outsized impact on methane emissions



Largest improvements can be made in low producing animals

Sources: United Nations Food and Agricultural Organization (FAO)

Change the heat load index through genetics



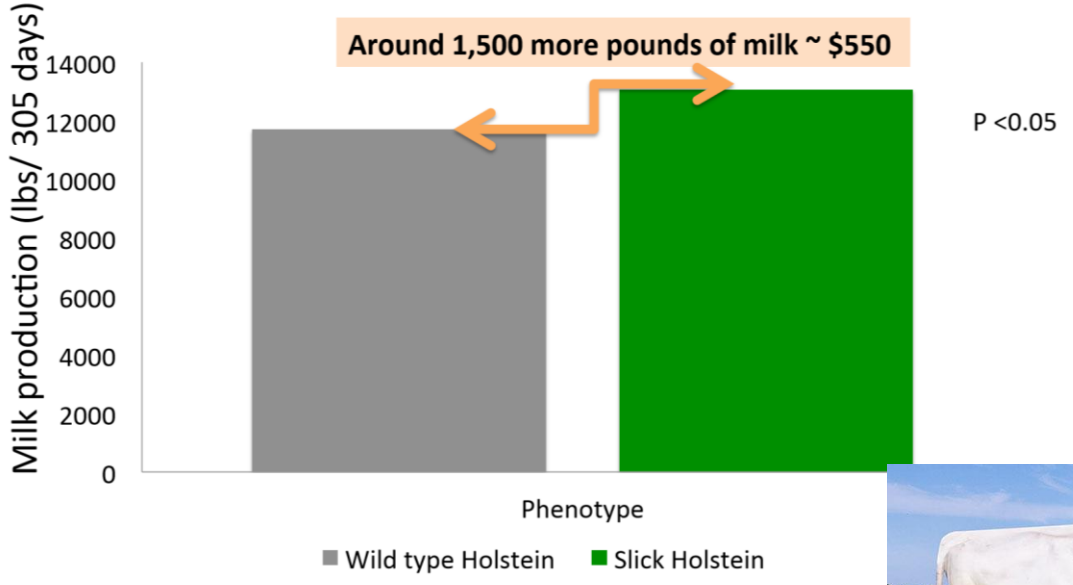
Heat Stress – Convergent Adaptations

Slick causing mutations come in many forms – all in the same gene
Nature found a way to adapt animals to the tropics

Breeds of Criollo cattle in the Caribbean Basin that transmit PRLR mutations for the dominant SLICK trait

SLICK Effects on Milk Yield & Fertility

Figure 3. Milk production of Puerto Rican Holstein cows with different hair coat



USDA United States Department of Agriculture National Institute of Food and Agriculture This work is supported by the USDA National Institute of Food and Ag
Hatch projects H-444 (AN:100450), H-452 (AN: 1003628), and H-453 (

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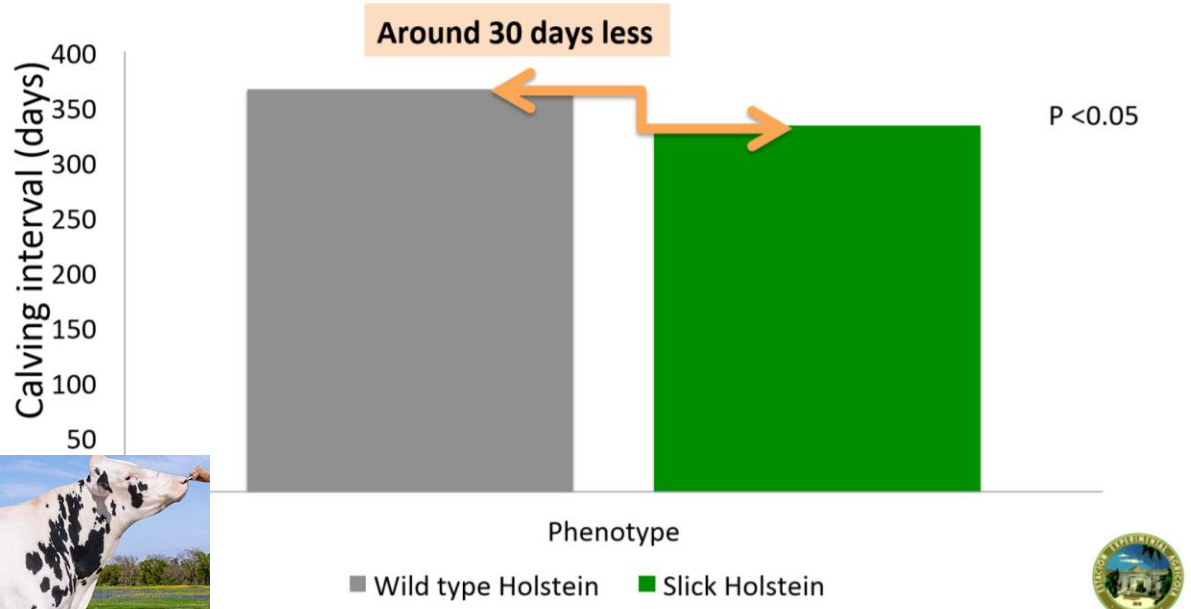
Figure 4. Calving interval of Puerto Rican Holstein cows with different hair coat



National Institute of Food and Agriculture This work is supported by the USDA National Institute of Food and Agriculture,
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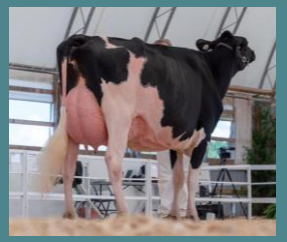
Acceligen

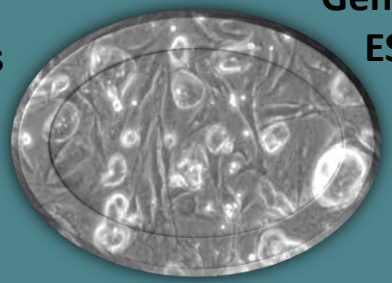
Acceligen's breeding platform for Tropical Dairy



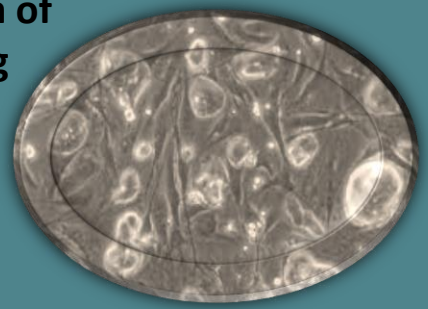
High Value Matings

IVF Embryos

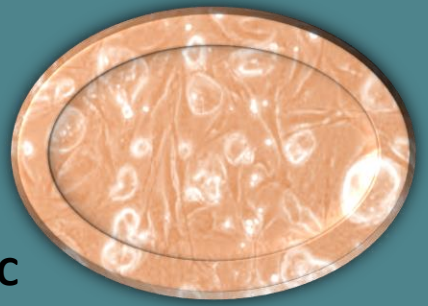
Make ESCs



Genome selection of ESCs for cloning



Gene edit for traits



Cloning high genomic slick ESC (edited)

Precision breeding done in a dish using ESCs of predicted genetic value

- Longevity in culture for selection & multiplex gene editing
- Use next generation genetics




Thamani Holstein

- **Thermal tolerant in the Tropics (PRLR)**
- **Trypanosome Resilience (FDX2 & DHRS4)**
- **First Multiplexed – bovine ESC derived clone**
- **Made for Tropical Markets**

The most feed efficient US Breeds are not adapted for heat stress

- Angus and Red Angus – 87% market share for seedstock genetics
- Both have branded programs for high quality beef
- Neither breed is well-adapted to sub-tropical or tropical conditions
- There is a solution available to adapt these animals to heat stress without loss of performance
- SLICK Angus would also replace less efficient and desirable crossbred animals not eligible for branded programs

Use of Angus Genetics in the Tropics

Adapted cows

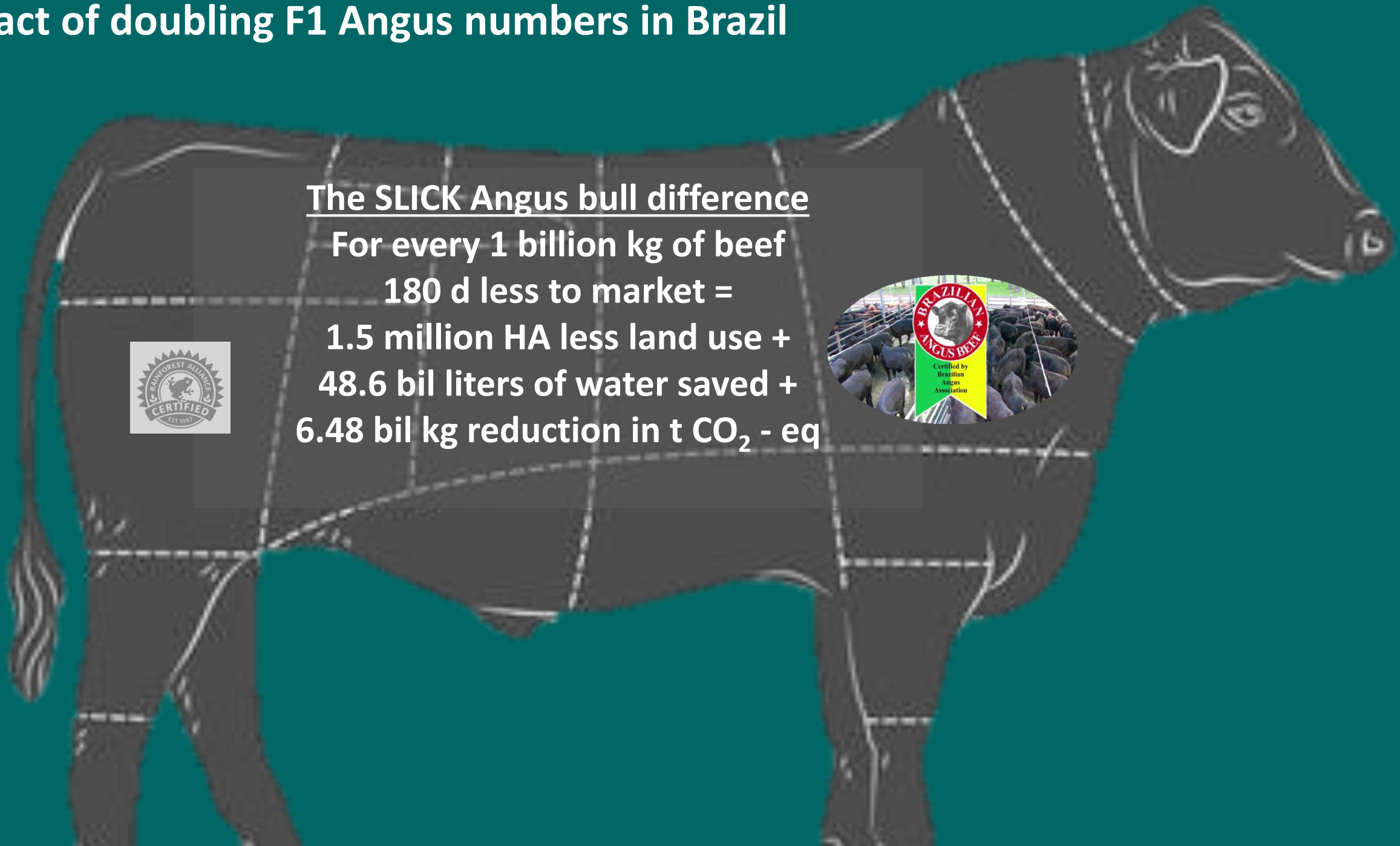
x

Carcass Quality sires

F1 – “Brazil’s Brangus” produced by FTAI

Acceligen

Impact of doubling F1 Angus numbers in Brazil



The SLICK Angus bull difference

For every 1 billion kg of beef

180 d less to market =

1.5 million HA less land use +

48.6 bil liters of water saved +

6.48 bil kg reduction in t CO_2 - eq

Commercial Decisions for SLICK Angus in Brasil & USA

- Applicant: Acceligen do Brasil Biotecnologia e Pesquisa Cientifica Ltda. Decision in Dec. 2021: the product does not meet the definitions of organism genetically modified contained in article 3 of Law 11.105/2005 of March 24, 2005

- In March 2022, FDA-CVM made a low-risk determination of the same animals – meaning these individuals would be treated like conventional animals for breeding and eating. Currently, no BE food label required by USDA-FSIS

Thank You

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