



Plant Growth Chambers

Climate Change Applications

Stories and Case Studies



III Foro Internacional en Cambio Climático: "Impacto en la agricultura del Perú" INIA-MINAGRI







- **Founded in 1973**

- **Markets Served:**

- **U.S.A.**

- **Canada**

- **Europe**

- **China**

- **Australia**

- **South America**

- **Our customers include:**

- **Universities**

- **Private Industry**

- **Government Agencies**

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Environmental Control Options

- Humidity Control
- Dehumidification
- Elevated CO₂ control
- Sub-ambient CO₂
- Extended temperature range
- Drought Tolerance



Story # 1

The Humble Potato

Study conducted at MSU

Dr. Courtney Leisner and colleagues wanted to see how future climate change might affect regional potato productivity.

- **Growing potatoes in projected mid-century CO₂ levels.**
- **Growing potatoes in projected mid-century temperatures.**

Required a chamber that could provide

- **Daily variations in photo-period through-out the growing season.**
- **Daily variations in temperature through-out the growing season.**
- **Robust CO₂ Control.**



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Observations:

- Projected mid-century temperatures and CO₂ levels may increase potato yields.
- Reduced potato quality, measured as a reduction in specific gravity was observed.
- New cultivars may need to be developed to maintain high specific gravities under future climate conditions.

References:

1. International Potato Center. (2019) Potato Facts and Figures.
2. < <https://cipotato.org/crops/potato/potato-facts-and-figures/> >
3. Dahal K., Li X.-Q., Tai H., Creelman A., Bizimungu B. (2019) Improving Potato Stress Tolerance and Tuber Yield Under a Climate Change Scenario – A Current Overview. *Frontiers in Plant Science*, 10, 563.
4. George T. S., Taylor M. A., Dodd I. C., White P. J. (2017) Climate change and consequences for potato production: A review of tolerance to emerging abiotic stress. *Potato research*, 60, 239-268.
5. Miglietta F., Magliulo V., Bindi M., Cerio L., Vaccari F. P., Loduca V., Peressotti A. (1998) Free Air CO₂ Enrichment of potato (*Solanum tuberosum* L.): development, growth and yield. *Global Change Biology*, 4, 163-172.
6. **Leisner C. P.**, Wood J. C., Vaillancourt B., Tang Y., Douches D. S., Robin Buell C., Winkler J. A. (2018) Impact of choice of future climate change projection on growth



Story # 2

Rice

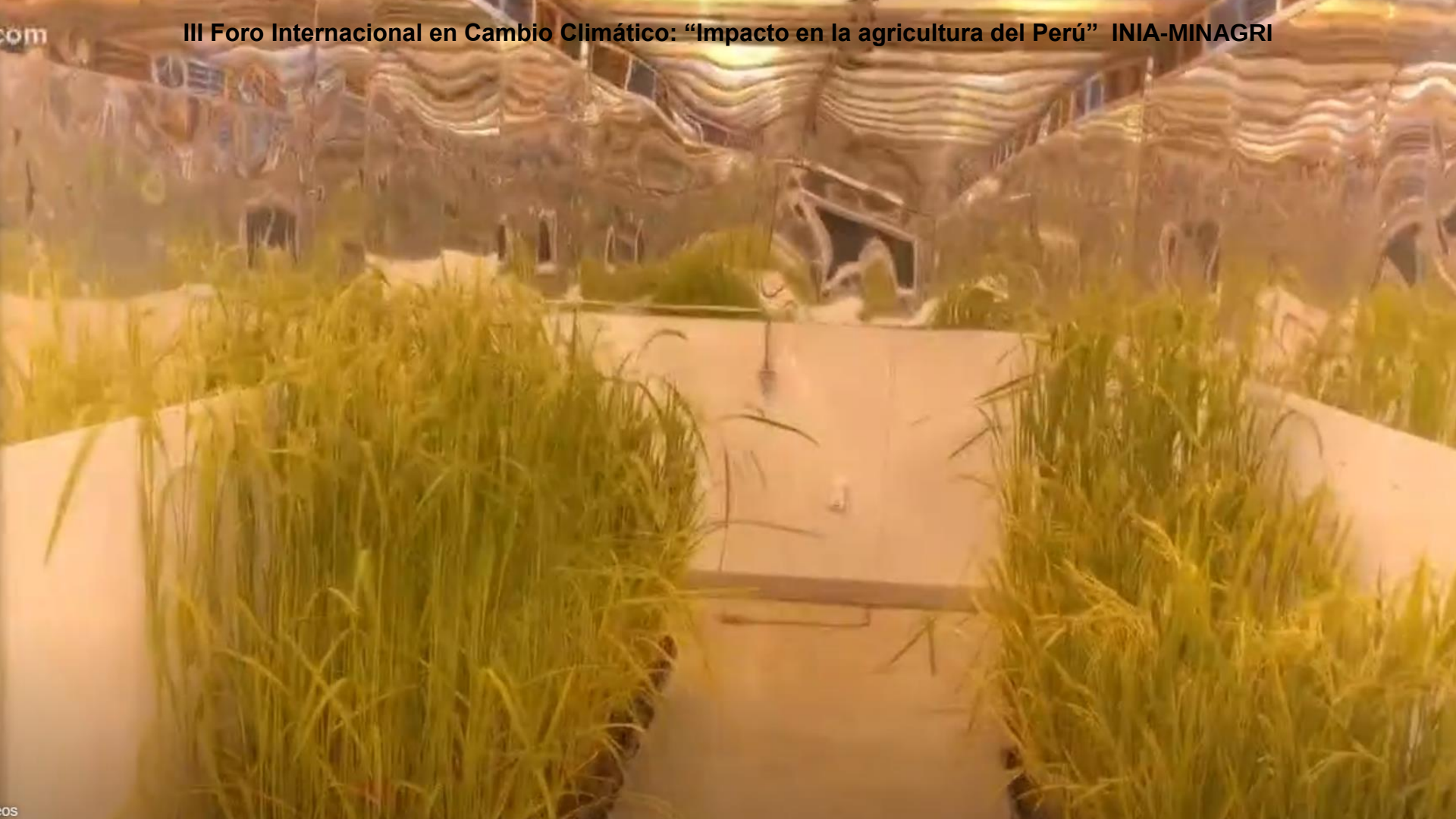
- **½ of all U.S. rice grown in the U.S. comes from the state of Arkansas**
- **1.24 million acres harvested in 2018**
- **Valued at \$1.1 Billion dollars**

Higher night temperature affects.

- **Crop yield.**
- **Quality decreases after milling from chalkiness and kernel fracturing.**

University of Arkansas Rice Research Center in Stuttgart, AR.

- **Received funding from rice growers to develop a variety of rice with a tolerance to higher temperatures.**
- **High light intensity in excess of $1250\mu\text{mol}/\text{m}^2/\text{s}^{-1}$ PAR**
- **Ability to achieve 80%RH at any temperature between 10°C and 36°C with all lights on.**
- **CO₂ control with elevated and sub-ambient capabilities.**



y	Time	Temperature	Humidity	CO2
1	06:00:00	23.0°C	75.0%	
1	08:00:00	30.0°C	75.0%	
1	12:00:00	33.0°C	70.0%	
1	15:00:00	33.0°C	70.0%	
1	17:00:00	30.0°C	75.0%	
1	20:00:00	23.0°C	75.0%	

Results:

Work in progress...

Questions?



Innovative Designs

Low Temperature Chamber

- Ideal for plant cold hardiness research
- Maintains -10°C with all lights on
- Continuous sequential defrost: +/-0.5°C (no defrost "spike")
- Barrired lamps: 1000 μ mol/m²/s

Innovative Designs

NEW!! FXC-10 Chamber

- Equipped with combination of broad spectrum and far red LED light bars
- High Light: $1500\mu\text{mol}/\text{m}^2/\text{s}$ in single tier and $750\mu\text{mol}/\text{m}^2/\text{s}$ in two tier mode
- No center post. Easy access to all your plants.
- Can be set-up in one or two tier configurations

