Making Climate Projections Useful for Producers

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Contributions to this project:

- Oregon State University
- College of Agricultural Sciences
- Department of Applied Economics
- USDA-NIFA Award #2014-51181-22384
- USDA-NIFA Award #2011-68002-30191
- USDA Northwest Climate Hub

Climate Change Information is Complex

- **EPA has developed a climate science glossary**

  https://www3.epa.gov/climatechange/glossary.html

- **With a variety of metrics**
  - Radiative Forcing (W/m2) – watts per square meter, which is often converted to:
  - Atmospheric CO_2 Concentrations (ppm)
  - Carbon Emissions (Gtc), Tons of CO2, or metric tons of carbon dioxide equivalent (MTCDE)
- **Data presented at various temporal scales** (Past, Present, Future)

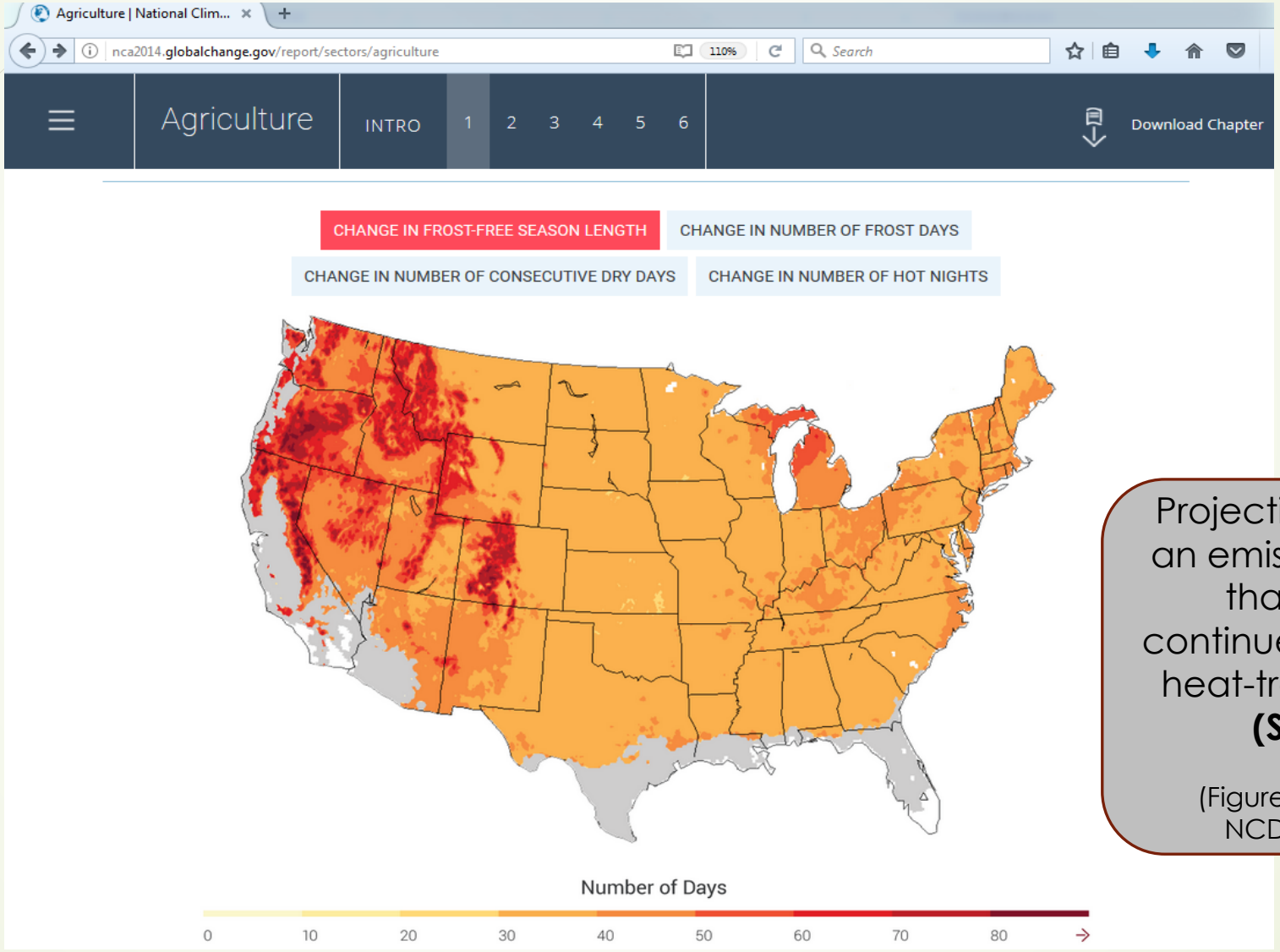
Climate Change Modeling is even more Complex

The IPCC scenarios for future projections have evolved over time

Year	Name	IPCC Assessment Report
1990	SA90	1st (1990)
1992	IS92	2nd (1995)
2000	SRES-Special Report on Emissions and Scenarios (A1T, A1B,A1FI, A2, B1, B2)	3rd and 4th (2001 and 2007)
2009	RCP-Representative Concentration Pathways (RCP2.6, RCP4.5, RCP6, and RCP8.5)	5th (2014)

Changes in key climate variables affecting agricultural productivity (2070-2099) compared to 1971-2000.

Excerpt from the 2014 National Climate Assessment Agriculture Chapter Figure 5.6

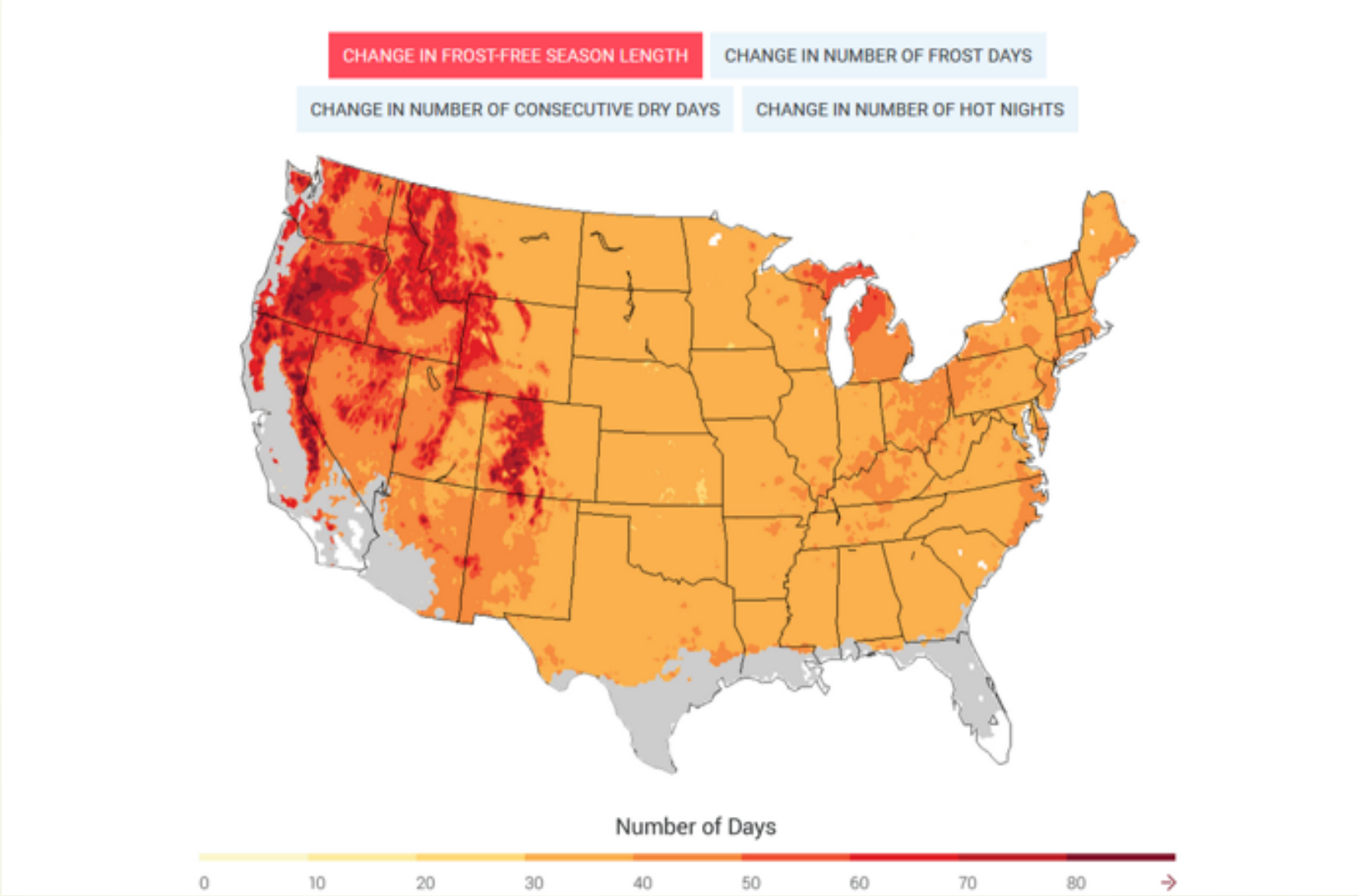


Projections based on an emissions scenario that assumes continued increases in heat-trapping gases **(SRES A2).**

(Figure source: NOAA NCDC/CICS-NC).

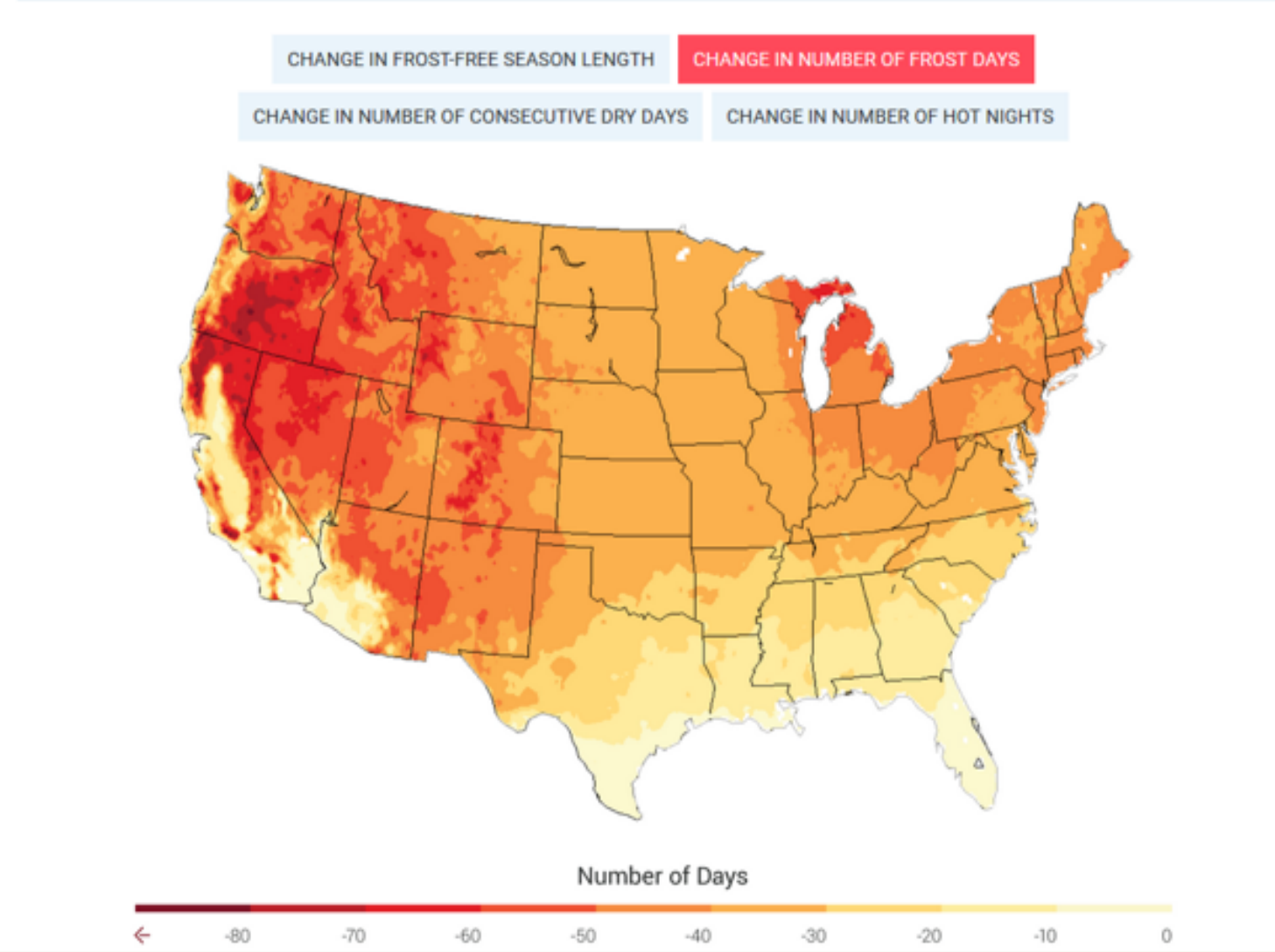
Changes in frost free season length (2070-2099) compared to 1971-2000

Excerpt from the 2014 National Climate Assessment Agriculture Chapter Figure 5.6



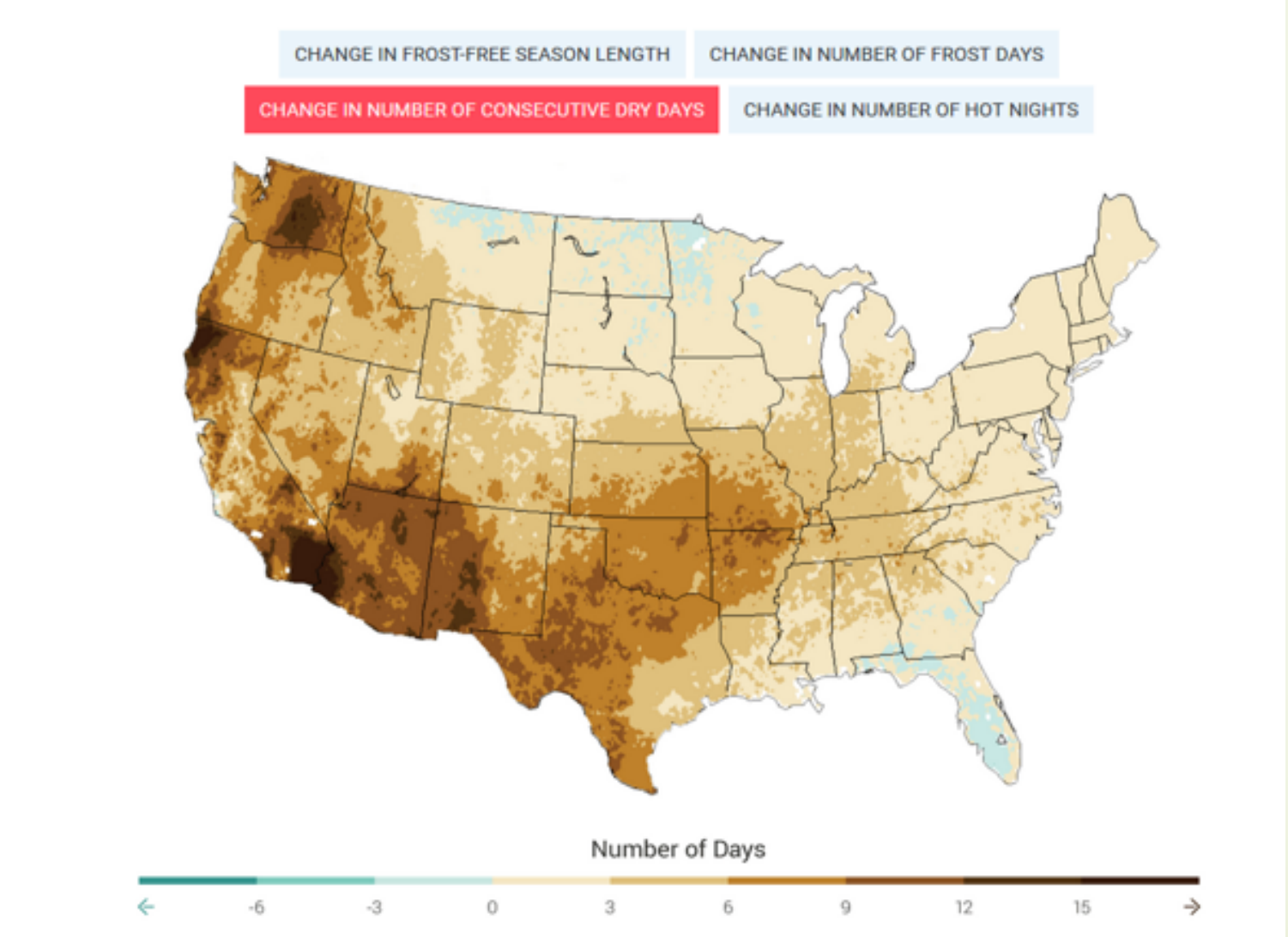
Changes in number of frost days (2070-2099) compared to 1971-2000

Excerpt from the 2014 National Climate Assessment Agriculture Chapter Figure 5.6



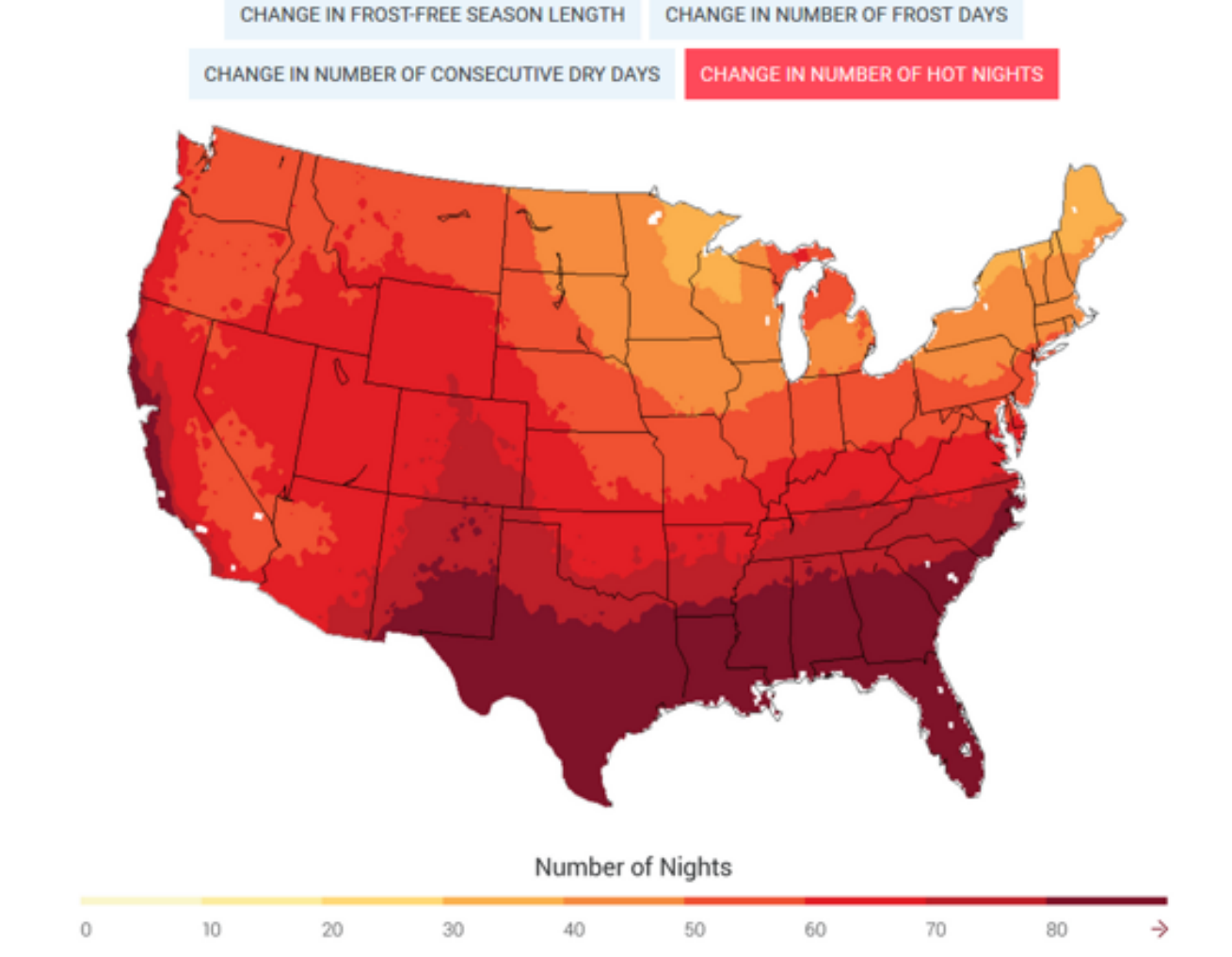
Change in number of consecutive dry days (2070-2099) compared to 1971-2000.

Excerpt from the 2014 National Climate Assessment Agriculture Chapter Figure 5.6



Change in number of hot nights (2070-2099) compared to 1971-2000.

Excerpt from the 2014 National Climate Assessment Agriculture Chapter Figure 5.6



How can we make climate data more useful?

Most climate date isn't in a form that is useful for making management decisions or weighing the benefits of changing practices. **We wanted to change that, so we**:

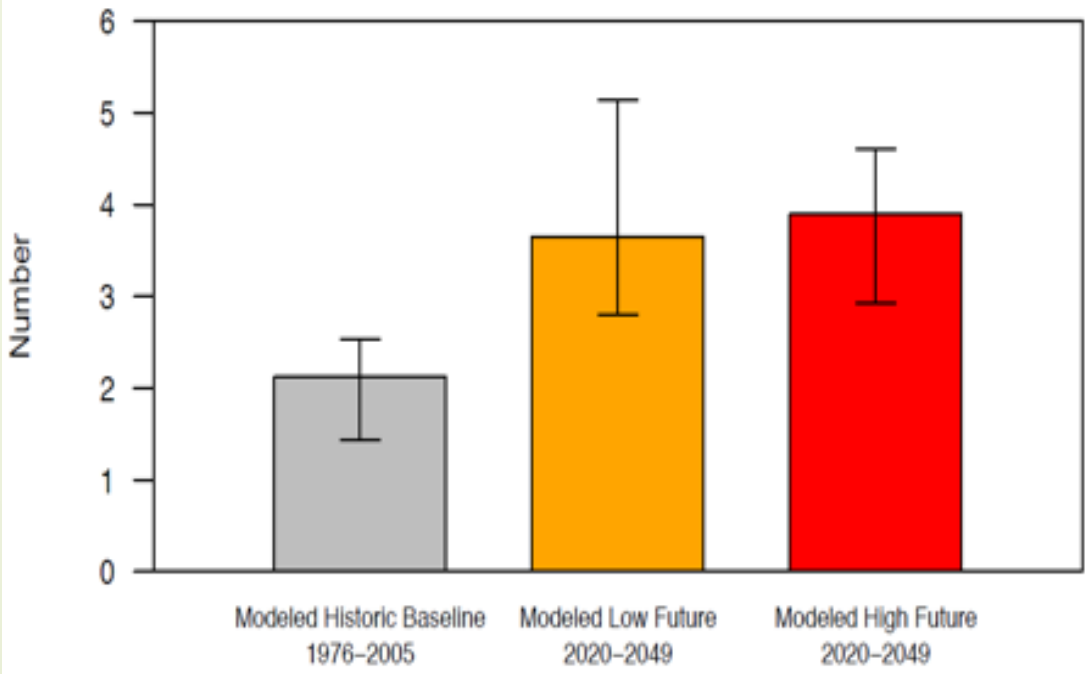
- Consulted with producers and others in the industry to identify:
  - important climate variables (14)
  - possible adaptation strategies
- Worked with climate scientists to develop county level data
- Designed an online tool that incorporates this data and allows producers and researchers assess the farm level impacts

Important Climatic Variables

- Accumulated GDD
- Accumulated chilling hours
- Seasonal minimum temp
- Seasonal maximum temp
- # of nights below freezing/year
- # of warm nights per year
- # of heat wave events per year
- # of cold snap events per year
- Diurnal temp range
- Growing season length
- Accumulated water yr precip.
- Maximum # of consec. wet days
- Maximum # of consec. dry days
- # of very heavy precip. days

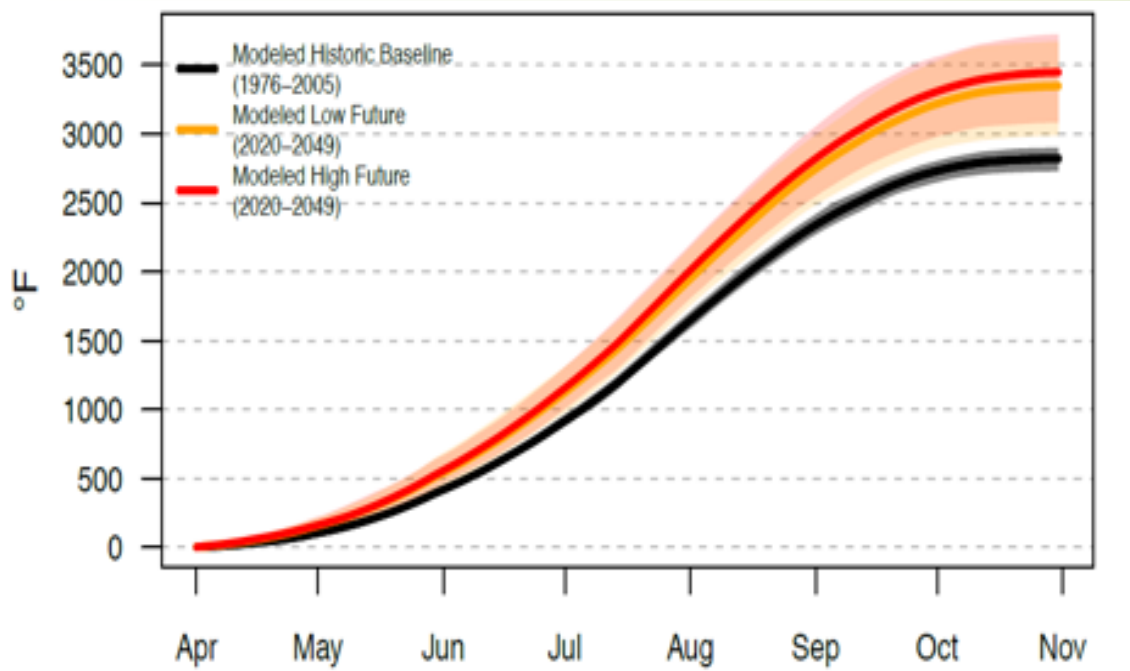
Heat waves and changes GDD can decrease fruit quality and increase chemical costs

Heat Waves/Year Wenatchee



By the 2030s, the frequency of heat wave events (3+ consecutive days above 95°F) per year is expected to increase by 1.5 occurrences for the low emissions future and by 1.8 occurrences for the high emissions future compared with the historical baseline.

Accumulated GGD Wenatchee

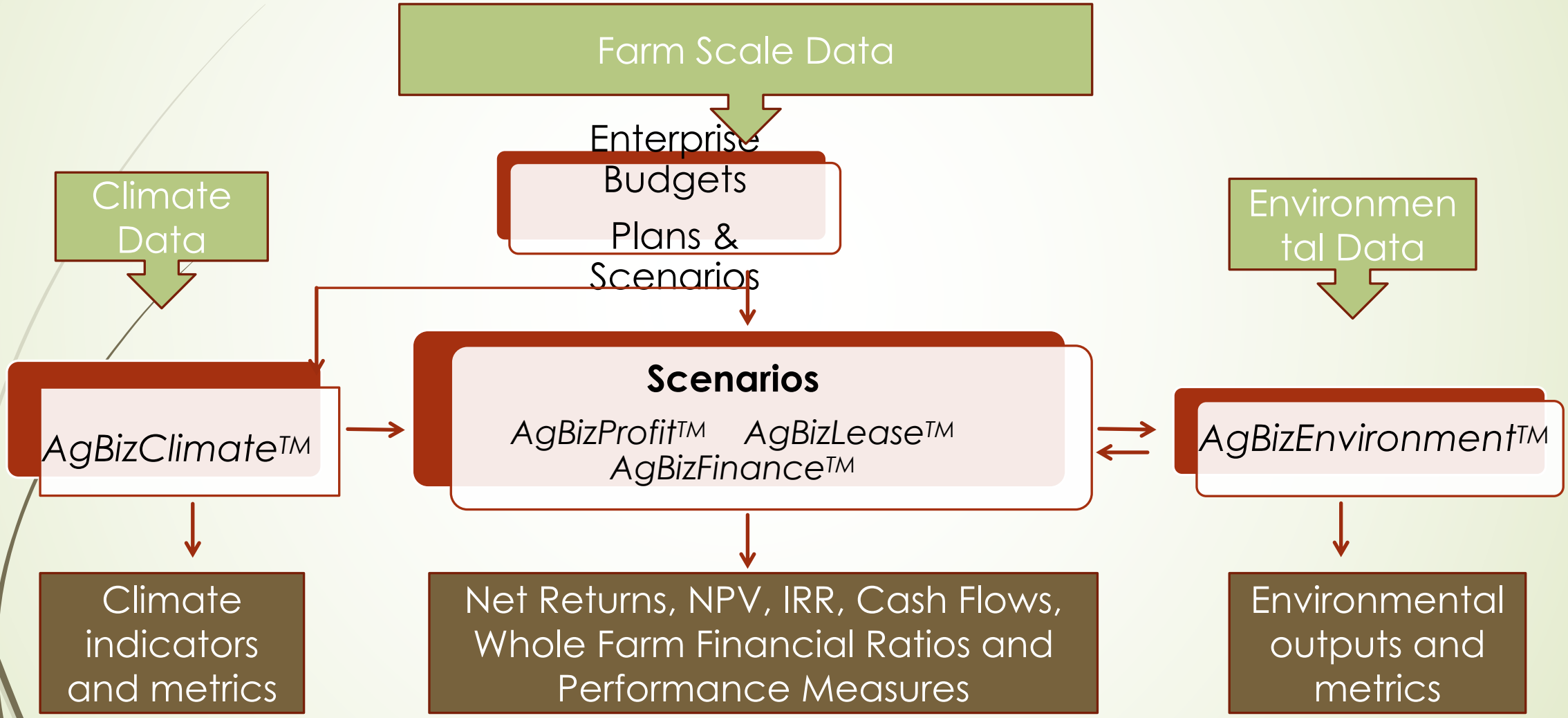


By the 2030s, accumulated growing degree days from April 1 to October 31 is expected to increase by 527 degree-hours for the low emissions future and by 627 degree-hours for the high emissions future compared with the historical baseline.

What is *AgBiz Logic?*

AgBiz Logic (ABL) is a suite of economic, financial, environmental, and climate change decision-support tools that enable producers, researchers, government agencies & NGO's to assess profitability and feasibility of alternative management practices while assessing environmental

AgBiz Logic Platform



How do the *AgBiz Logic* modules integrate with each other?

AgBizClimate: Access local climate data and assess before and after affects of climate change on net returns

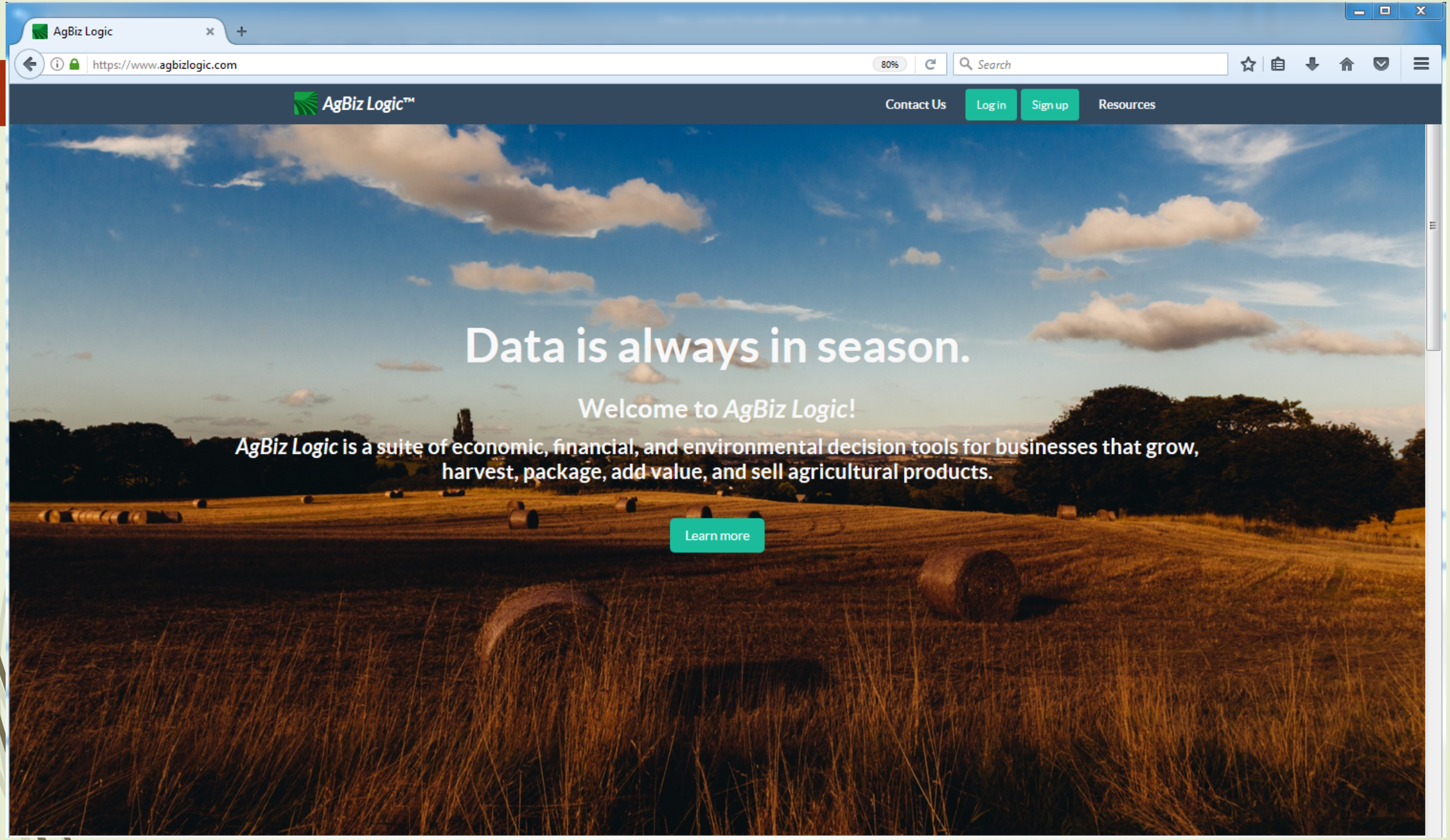
AgBizProfit: Assesses if a grower can make money implementing a particular adaptation strategy

AgBizFinance: Assesses if the grower has the equity or ability to borrow funds to implement an adaptation strategy and how the investment will impact the liquidity and solvency of the business

Consult with growers, assess changes, develop adaptation strategies

- Changes
  - Fruit quality will ↓
  - Pest pressure will ↑

- Adaptation strategy
  - Increase chemical spraying to control pests
  - Invest in shade and exclusion netting


AgBiz Logic
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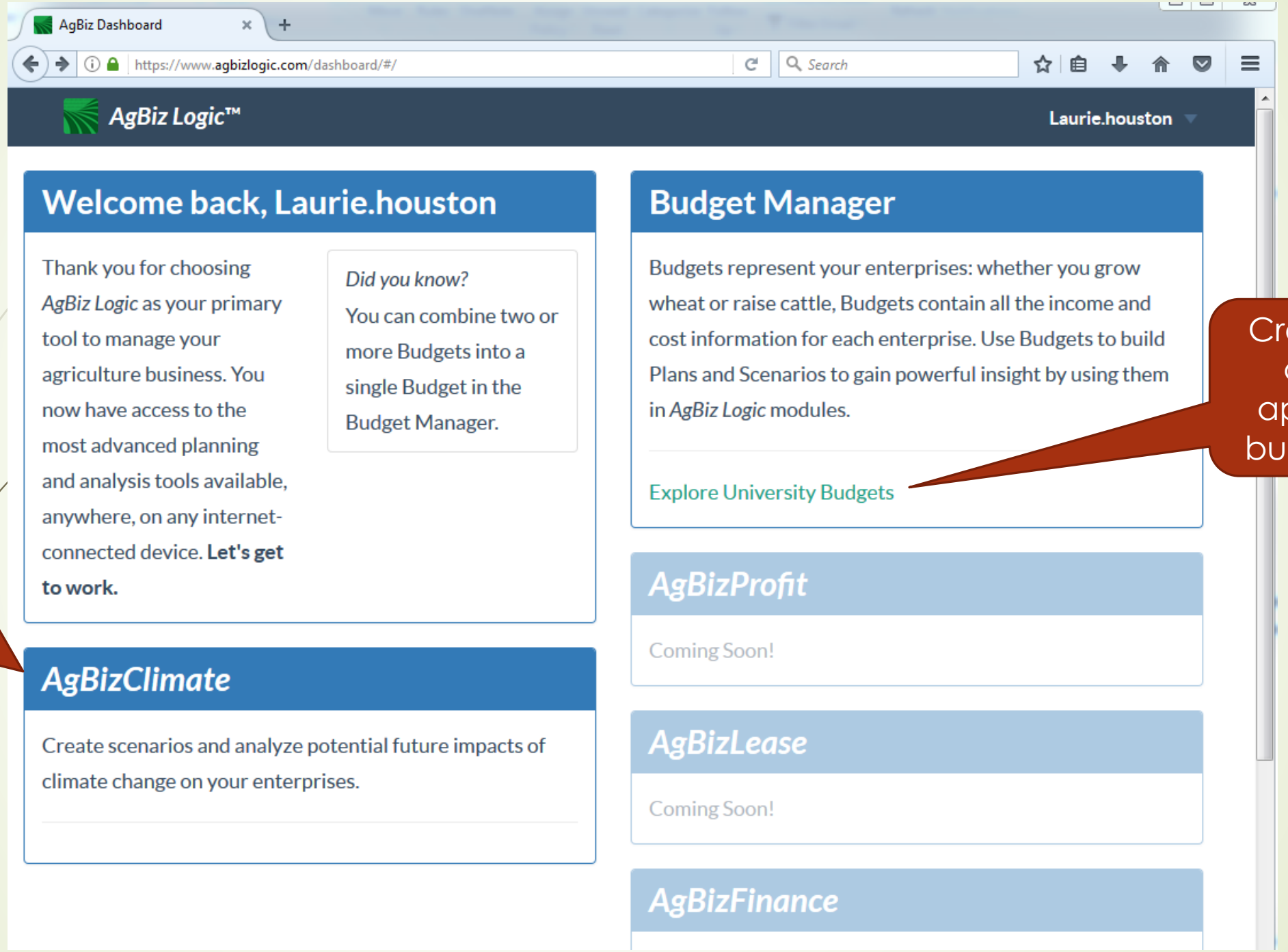
Data is always in season.
Welcome to AgBiz Logic!
AgBiz Logic is a suite of economic, financial, and environmental decision tools for businesses that grow, harvest, package, add value, and sell agricultural products.
Learn more

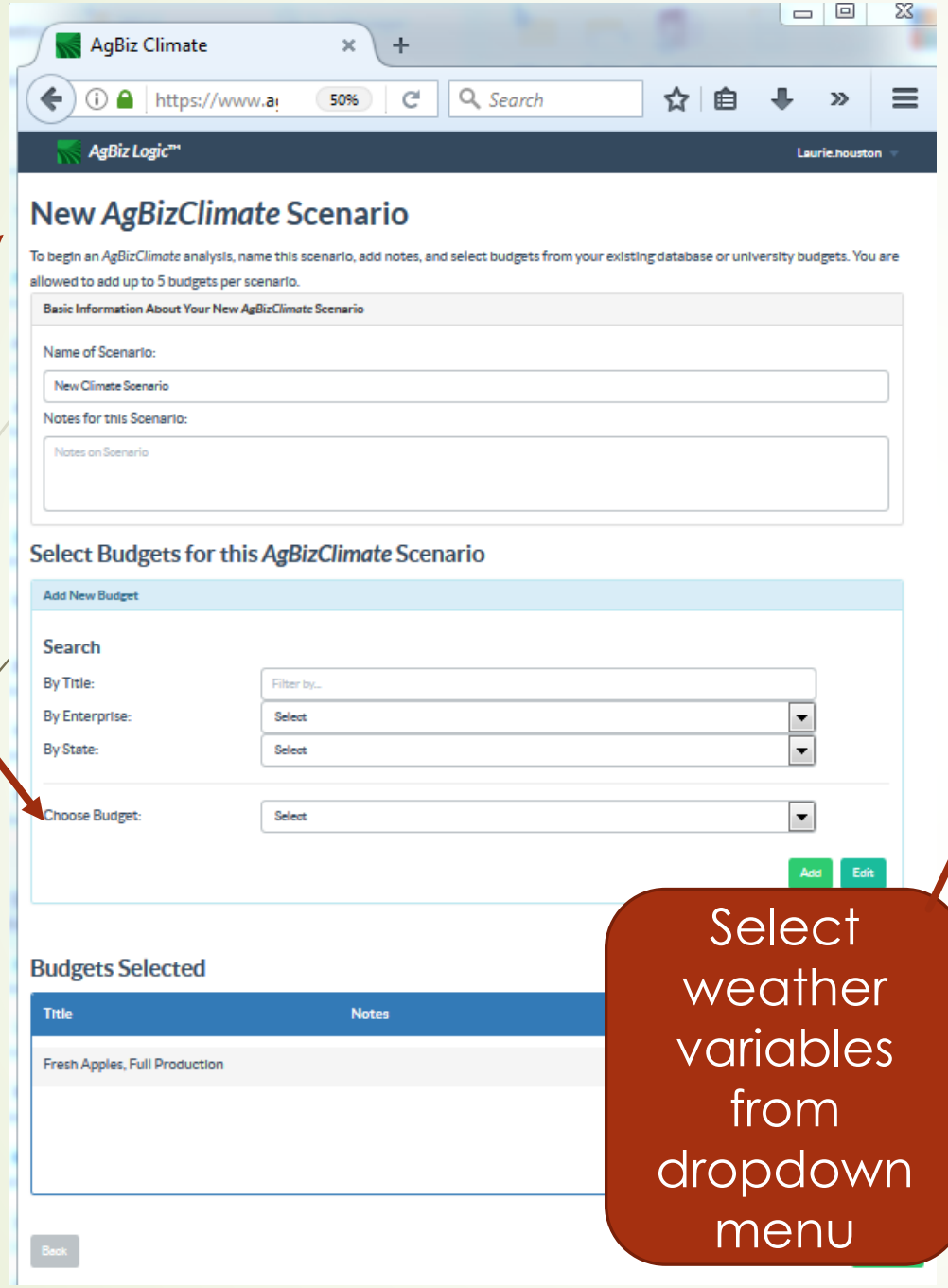


Click here to start looking at Climate variables and create a climate chang e scenario

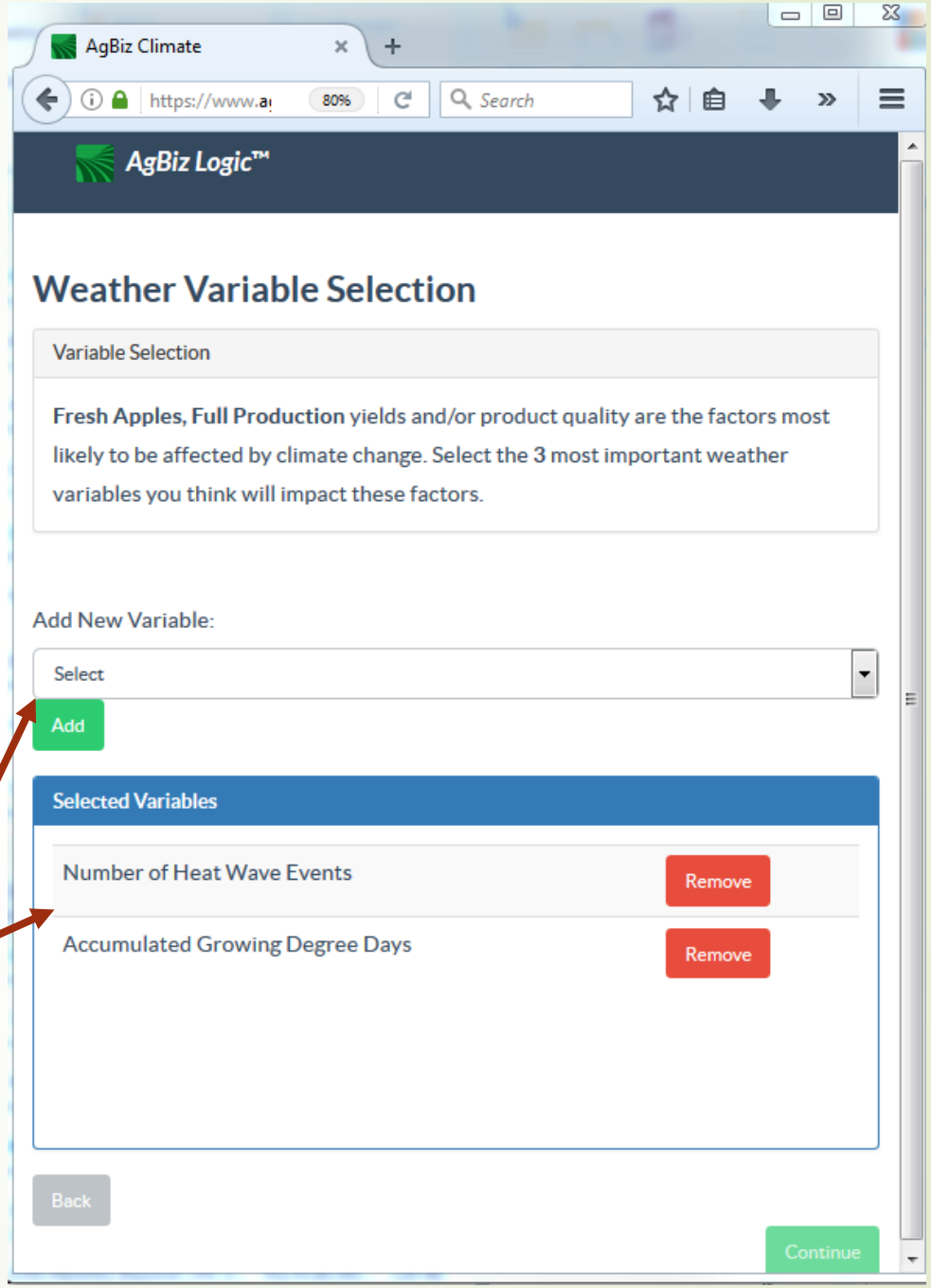
Create an apple budget

Create scenario

Import your budget



Select weather variables from dropdown menu



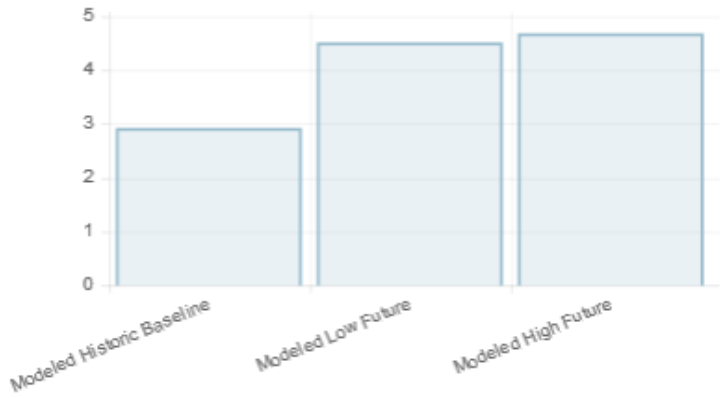
Choose up to three weather variables

Enter a % change in yield or quality for each variable and later for an overall impact

AgBiz Logic™

How will *Number of Heat Wave Events* affect your enterprise?

Number of Heat Wave Events in *Umatilla County, Oregon*



Based on this information, how do YOU think these climate changes will affect your yields or quality?

-10 | % Change

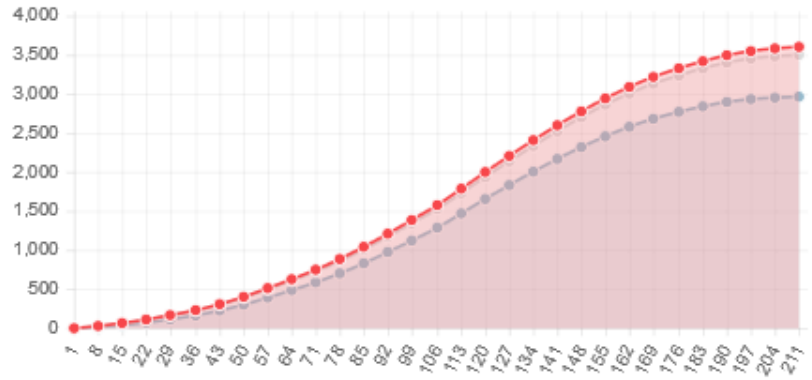
Back

Continue

AgBiz Logic™

How will *Accumulated Growing Degree Days* affect your enterprise?

Accumulated Growing Degree Days in *Umatilla County, Oregon*



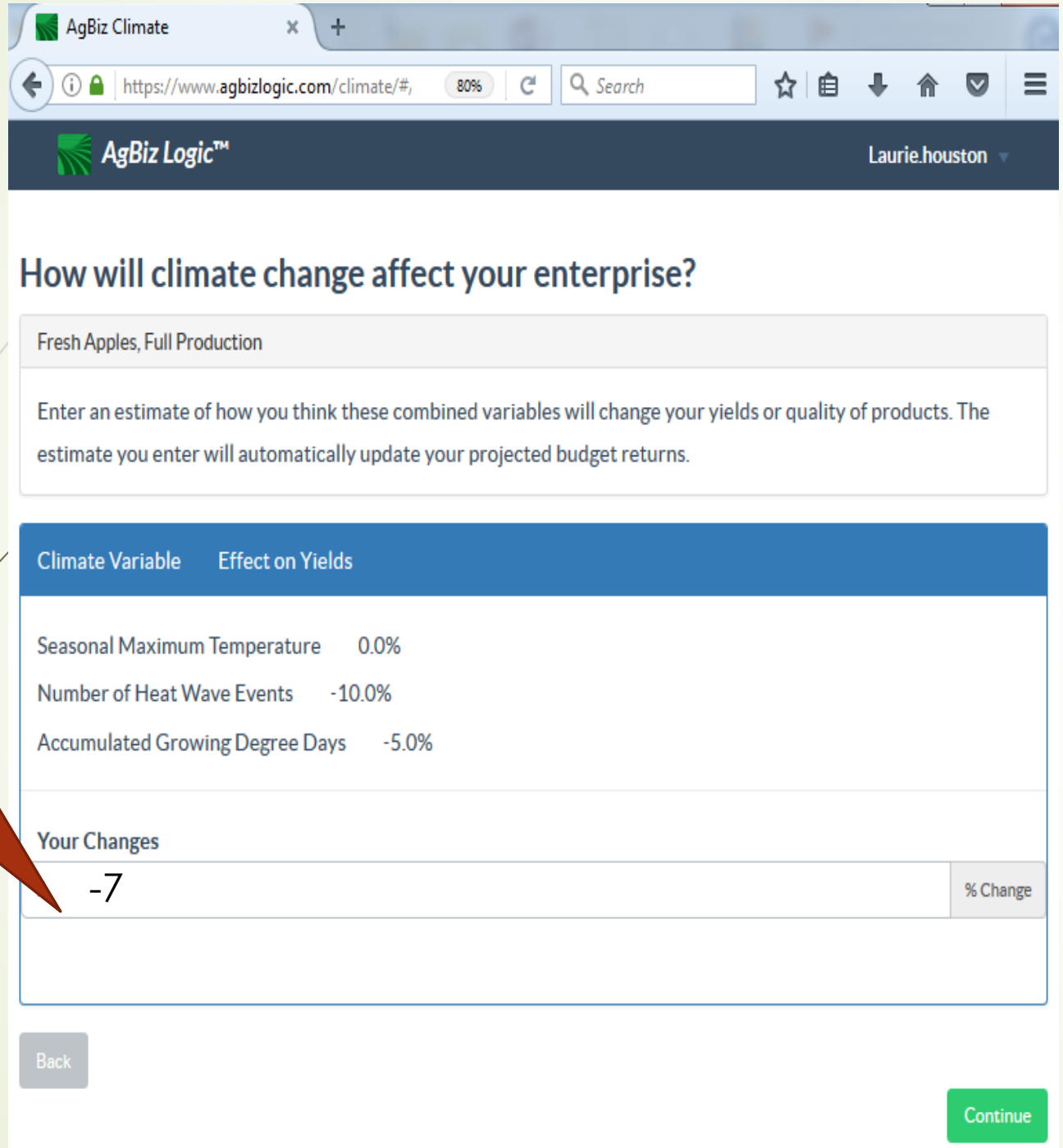
Based on this information, how do YOU think these climate changes will affect your yields or quality?

0 | % Change

Back

Continue

Enter an estimate of how you think these combined variables will change yields



Example of Adaptation Scenarios to be Compared in *AgBizProfit*

- Plan 1: Net Returns **before climate change** Impacts
- Plan 2: Net Returns **After climate change** (no adaptation strategies)- 30% Reduction in No. 1 Grade Fruit
- Plan 3: Net Returns with **increased chemical spraying** – 20% Reduction in No. 1 Grade Fruit, 30% Increase in Chemical
- Plan 4: Net Returns with **shade netting** -15% Reduction in No. 1 Grade Fruit, 30% Increase in Chemical Costs
- Plan 5: Net Returns with **shade netting and exclusion netting** - 10% Reduction in No. 1 Grade Fruit, 5% Increase in Chemical Costs

Sample display of *AgBizProfit* output results

AgBizProfit Results

Name of Scenario:

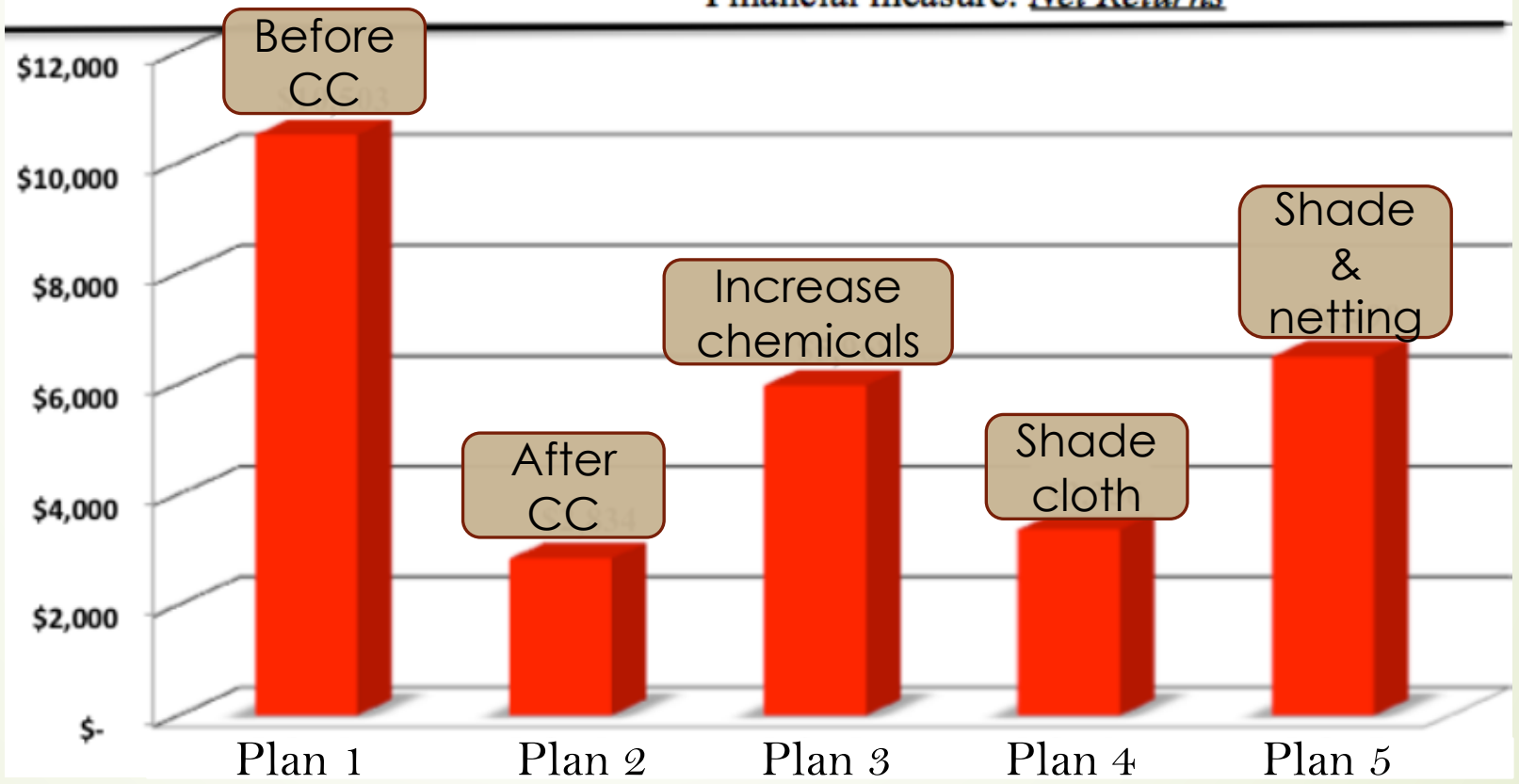
Climate Change Adaptations

Notes for this Scenario:

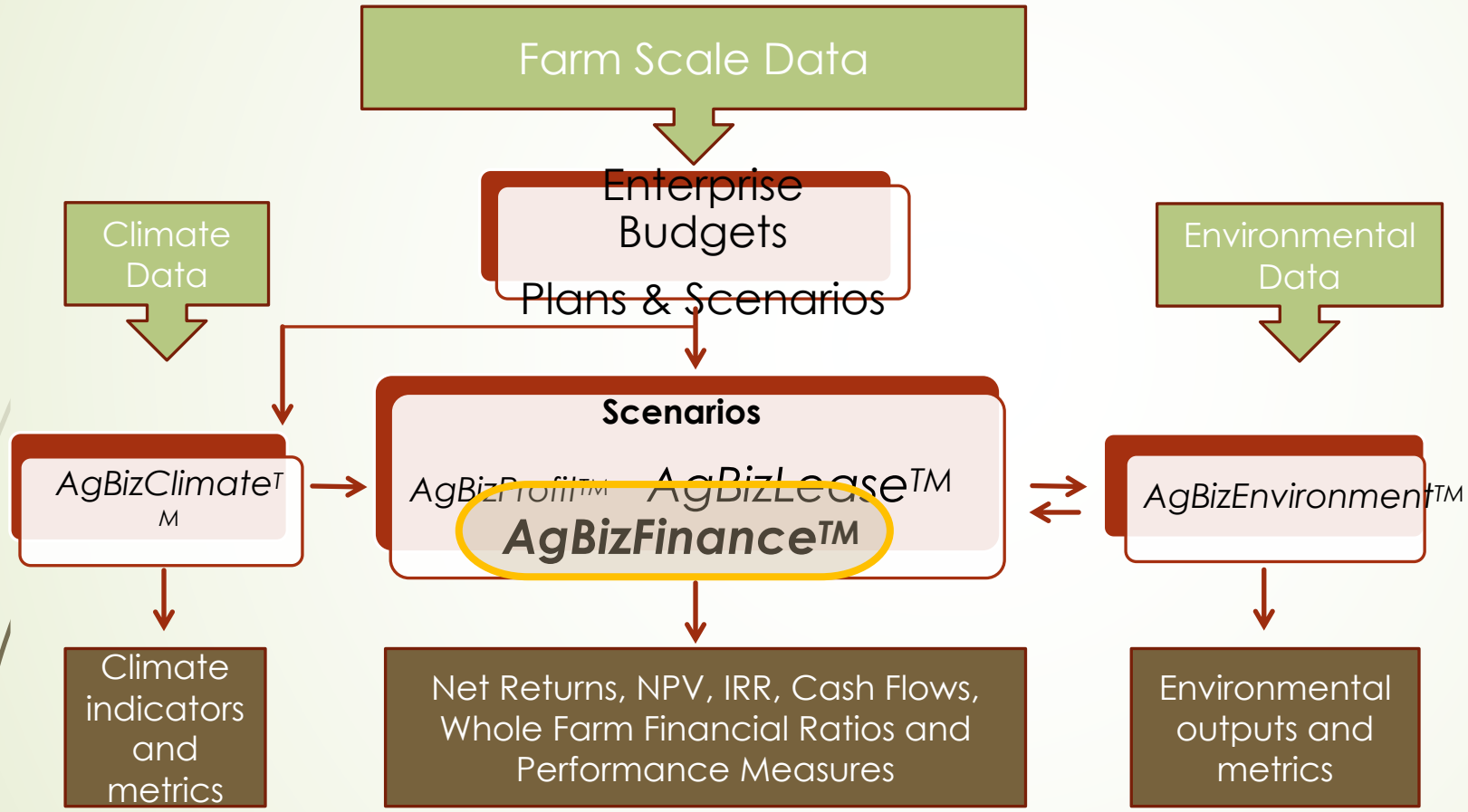
Observing the before and after effects of climate change on current Gala apple crop

View results as a: ○ Table ● Graph

Financial measure: *Net Returns*



AgBiz Logic Platform



AgBizFinance: Assesses if the grower has the equity or ability to borrow funds to implement an adaptation strategy and how it will impact liquidity and solvency

Key Takeaway

To make climate change data useful to producers we must:

- Translate climate data into weather and climatic variables at the field scale
- Provide a tool to assess how these changes will impact yields and net returns
- Provide a tool that will allow producers to look at the tradeoffs and feasibility of investing in adaptation strategies

For questions:
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