The growth rate of CO2 is very high. There was no reduction in emissions in recent years as the skeptics predicted, in function on the economic crisis.
Global Climate Scenarios for South America

Projections of temperature anomalies (°C) to South America for the period 2090-2099 (scenario A2) over the base period 1961-1990 for 15 different global IPCC climate models.
Global Climate Scenarios for South America

Projections of precipitation anomalies (mm/day) to South America for the period 2090-2099 (scenario A2) over the base period 1961-1990 for 15 different global IPCC climate models.
Global Warming Scenarios in Brazil

Tmax (Precis-A2)
2010 – average 1960-1990

[°C]
- 8 a 6.5
- 6 a 5
- 4.5 a 3
- 2.5 a 1.5
- 1 a 0
- 0.5 a -2

Global Warming Scenarios in Brazil

Tmax (Precis-A2)
2020 – average 1960-1990

[°C]
- 8 a 6.5
- 6 a 5
- 4.5 a 3
- 2.5 a 1.5
- 1 a 0
- 0.5 a -2
Global Warming Scenarios in Brazil

Tmax (Precis-A2)
2050 – average 1960-1990

[°C]
- 8 a 6.5
- 6 a 5
- 4.5 a 3
- 2.5 a 1.5
- 1 a 0
- 0 a -2

Global Warming Scenarios in Brazil

Tmax (Precis-A2)
2060 – average 1960-1990

[°C]
- 8 a 6.5
- 6 a 5
- 4.5 a 3
- 2.5 a 1.5
- 1 a 0
- 0 a -2
**Observed Temperatures**

11 out of 12 years (1995-2006) are warmest ever measured.

Ranking 12 warmest:
- 1999
- 2000
- 2001
- 2002
- 2003
- 2004
- 2005
- 2006
- 1995
- 1999
- 1999
- 1999

\[ y = 0.0091x - 17.804 \]

\[ R^2 = 0.3843 \]

**Temperature Variation Pelotas-RS**

\[ \Delta T_{min} = 1.6^\circ C \]

Figure 15 – Maps of annual precipitation (mm) and mean air temperature (°C) according to the CRU TS 2.1 dataset. A – precipitation from 1901-1934; B – precipitation from 1935-1968; C – precipitation from 1969 – 2002; D – temperature from 1901-1934; E – temperature from 1935-1968; F – temperature from 1969 – 2002.

Campinas - SP

From CEPAGRI/UNICAMP-2008
Conditions to simulations

- Air Temperature
  - Average Annual:
    - 18°C and 22°C - Good
    - Greater than 23°C - Chance to floral abortion
  - Min. absolute annual:
    - Less than 1°C: Frost probability > 30%
    - Water deficit < 150 mm/y (80%)
From: Embrapa Cerrados- Brasilia-2009
Impacts Simulation to *Coffea Arabica* Risks Zoning

**Arabica Coffee**
**Actual Zonning**

- need irrigation
- Low risk
- Irrigation recommended
- Frost risk
- High temperature Risk
- High climatic risk
Arabica Coffee
2020 Year

Área de baixo risco
↓ 9,48%

Prejuízo em milhões
↓ R$ 882,6

need irrigation
Low risk
Irrigation recommended
Frost risk
High temperature Risk
High climatic risk

Arabica Coffee
2050 Year

Área de baixo risco
↓ 17,15%

Prejuízo em bilhões
↓ R$ 1,6

need irrigation
Low risk
Irrigation recommended
Frost risk
High temperature Risk
High climatic risk
In the others Countries - Colombia and Vietnã

Scenarios to Climate Change
Temperature 2020-2029 Cenário A2
Scenario to climate change
Temperature 2090-2099 Cenário A2

Scenario to climate change – Precipitation JJA
IPCC (AR4)- Report

<table>
<thead>
<tr>
<th>IPCC AR4</th>
<th>Brasil</th>
<th>Colômbia</th>
<th>Vietnã</th>
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</thead>
<tbody>
<tr>
<td>Prec DJF 2099</td>
<td>-05 a 10%</td>
<td>10 a 20%</td>
<td>05 a 20%</td>
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<tr>
<td>Prec JJA 2099</td>
<td>-30 a -10%</td>
<td>05 a 10%</td>
<td>05 a 10%</td>
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<tr>
<td>Temp B1 2029</td>
<td>0,5 a 1,0ºC</td>
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<td>3,0 a 3,5ºC</td>
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<td>3,5 a 4,5ºC</td>
<td>3,5 a 4,5ºC</td>
<td>3,0 a 3,5ºC</td>
</tr>
</tbody>
</table>

Adaptation actions

Tree in coffee production

Some producers in São Paulo and Minas Gerais have used mango trees, avocado trees, rubber trees, banana trees and coconut trees. Not a high number of trees per hectare is needed, only enough to make the shade, with around 60 to 70 shaded plants per hectare.
Adaptation and Mitigation Actions now and in the next years

- Mulching to reduce evaporation, avoid erosion and improve soil fertility. Terracing/contouring, drainage and trapping/storing run-off rain water.

- Plating contours to mitigate wind and water damage;

- Improving access to climate data to monitoring coffee production

- Mapping potential climate change impact on coffee in local areas

- Improving soil fertility

- Examining different production models

- Developing planting disease resistance
- Developing drought resistant varieties
- Developing high temperature tolerance varieties
The challenge of global warming, brings a new dimension to future production of coffee. More technology, more and more professional organization. Not it will be the end of the coffee production, but the beginning of new times. We must be prepared.

Obrigado, Thanks, Gracias, Merci

Eduardo Delgado Assad
assad@cnptia.embrapa.br