



Technical Committees - details

**Technical Committee 2: Latin America**

**10 September 2014, Porto Alegre**

---

**GHG emissions of soybean production  
- results of the latest study**

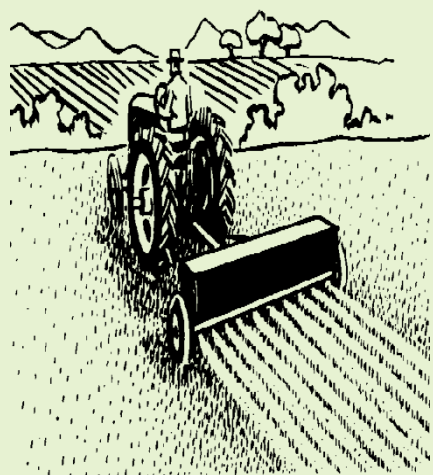
---

**Prof. Dr. Carlos Clemente Cerri**

# Carbon footprint of soybean biodiesel



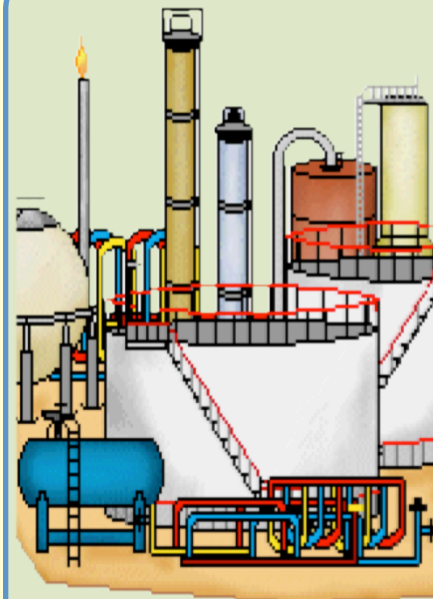
## STAGES OF PRODUCTION



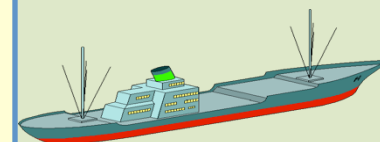
**AGRICULTURAL**



**PROCESSING OF  
SOYBEAN OIL**

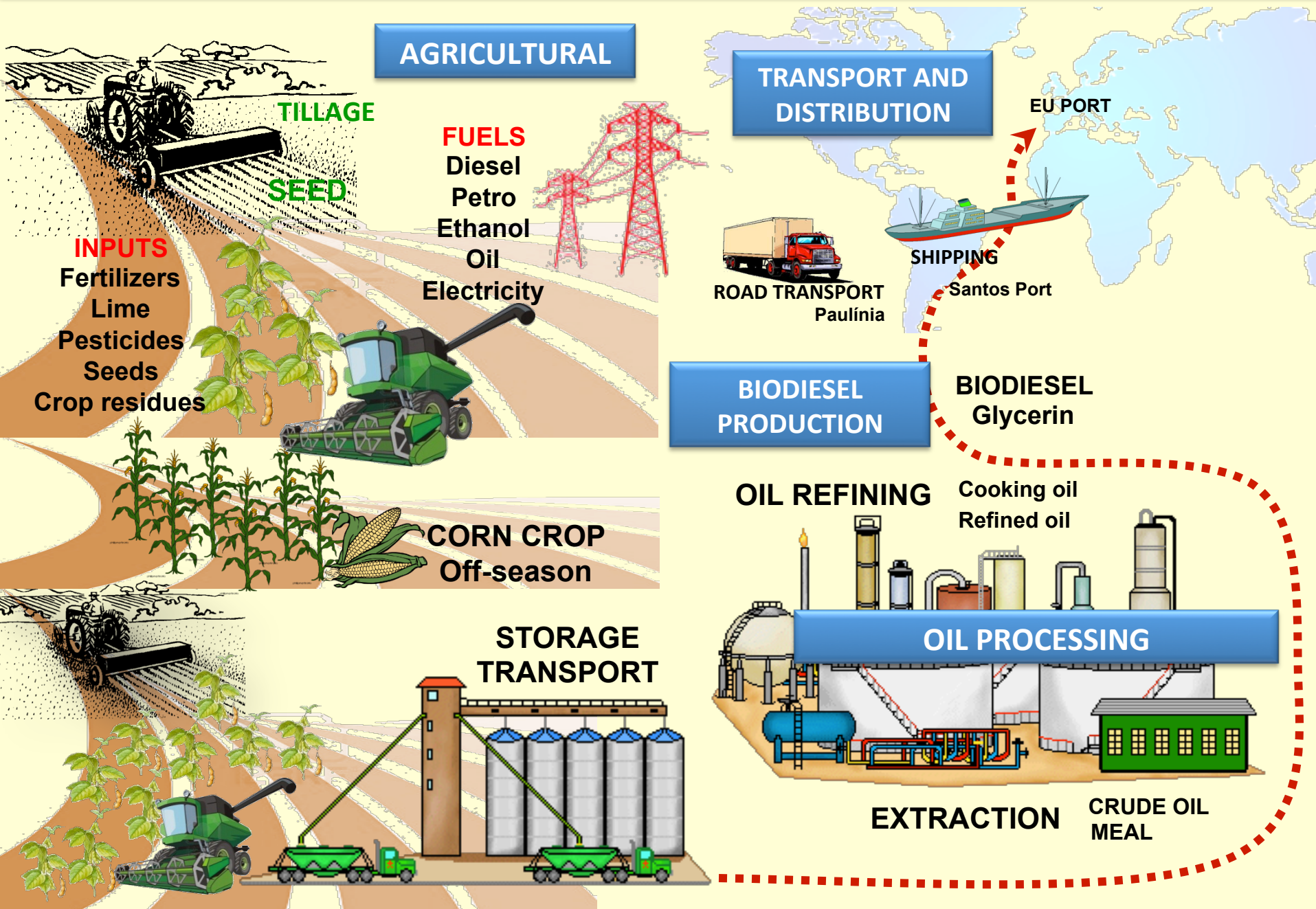


**BIODIESEL  
PRODUCTION**



**TRANSPORT AND  
DISTRIBUTION**

# Soybean biodiesel production



# Sources of GHG Emission

# Sources of GHG emission

## Agricultural stage



## Processing of soybean oil



## Biodiesel production



### Inputs

Fertilizers  
Lime  
Pesticides  
Seeds  
Crop residues

### Fuels

Diesel  
Petrol  
Ethanol  
Oil

**Electricity**

### Inputs

Hexane  
N liquid  
Caustic soda  
Phosphoric acid  
Citric acid

### Fuels

BPF  
Firewood  
Wood chip

**Electricity**

### Inputs

Methanol  
Methylate  
HCl  
Caustic soda  
Catalysts

### Fuels

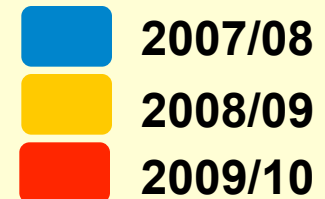
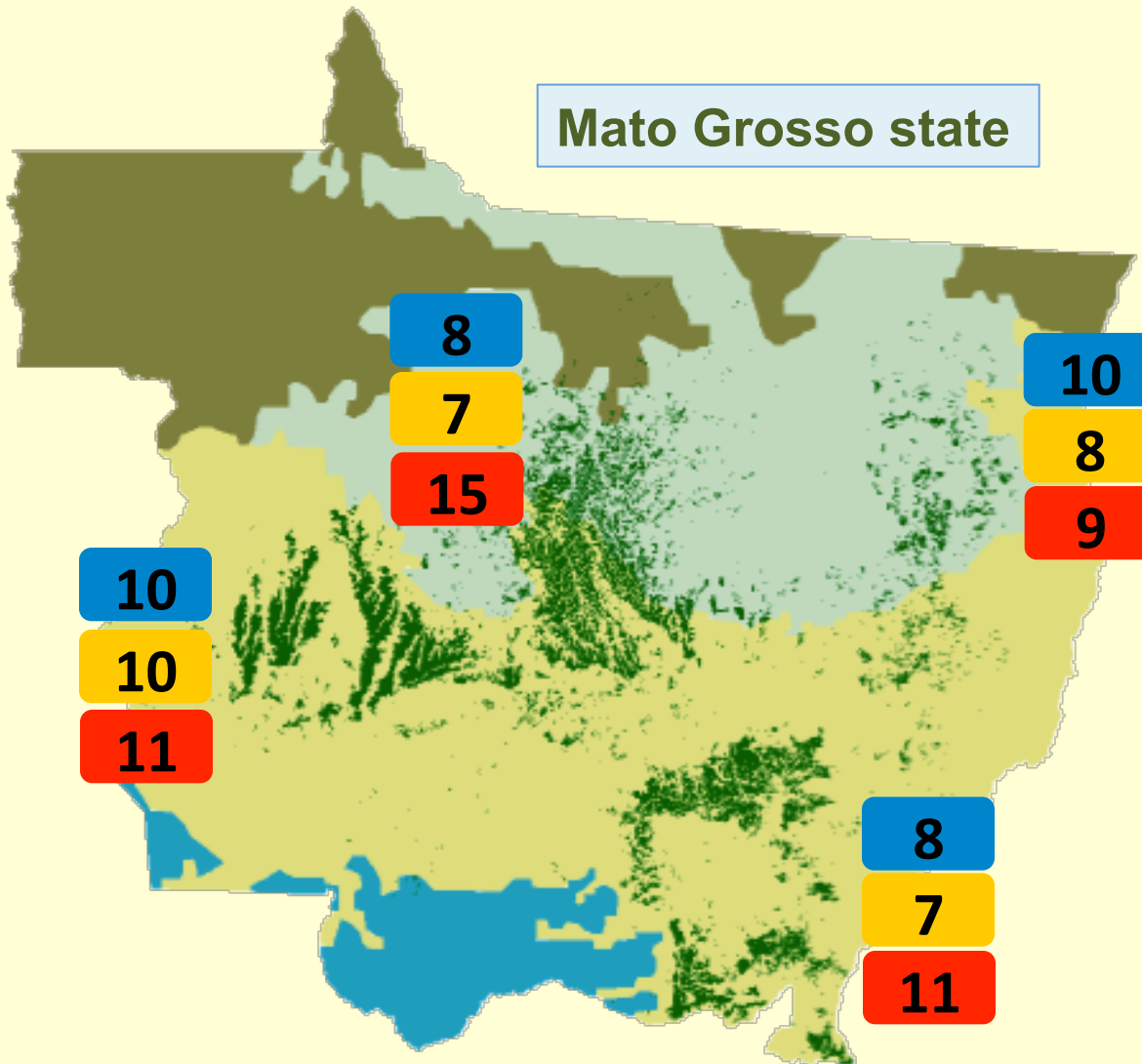
Diesel  
Petrol  
Ethanol  
LPG

**Electricity**

# Agricultural stage – Evaluated farms

Mato Grosso state

114 farms



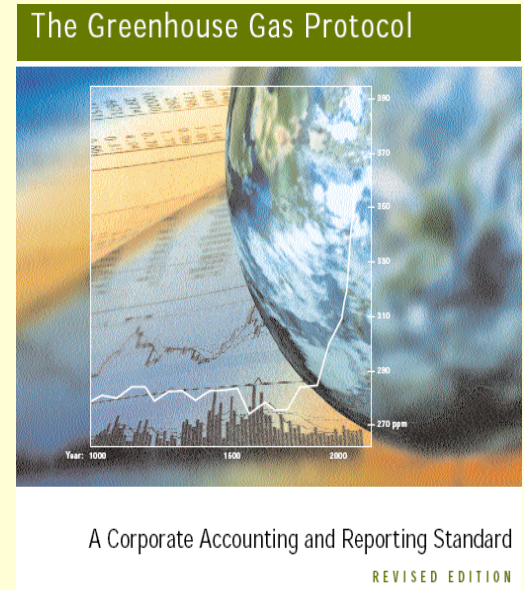
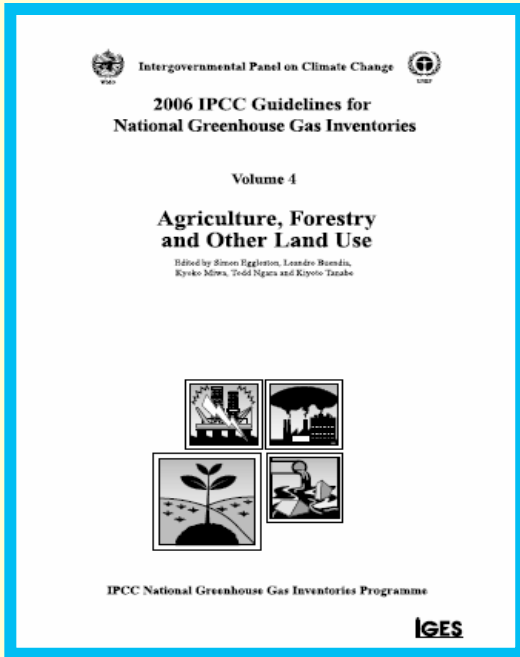
Legenda:

Fonte Vegetação: Embrapa – Análise - Aprosoja



Soybean cultivation

# Calculating the C footprint: Methodology



## PAS 2050:2008

Specification for the assessment of the life cycle greenhouse gas emissions of goods and services

# Participating companies



114 farms

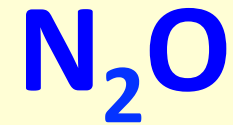
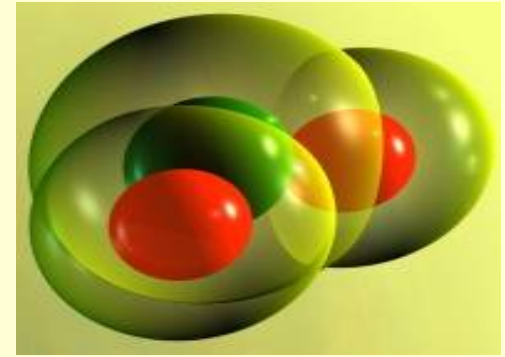
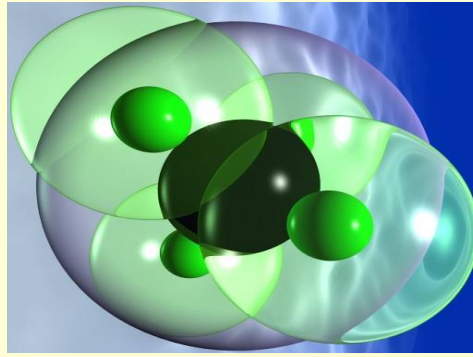
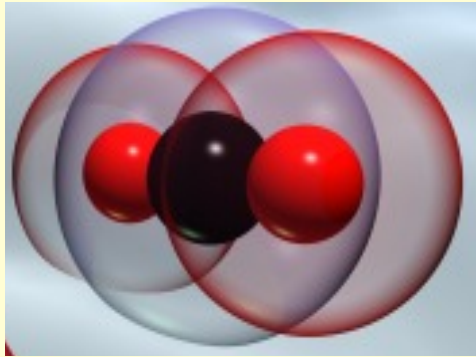




The background of the slide is a dense, close-up photograph of numerous soybeans. The beans are a light tan or yellowish color and are scattered across the entire frame. Some beans show signs of being processed, with their outer coats partially broken or missing, revealing the darker inner seed. The lighting is even, highlighting the texture and shape of the individual beans.

# Results

## ❖ Greenhouse gases



Global  
warming  
potential

1

25

298

**CO<sub>2</sub> equivalent**

**CO<sub>2</sub>e**

# Carbon footprint of B100

Expression on energy basis:  $\text{gCO}_2\text{equivalent/MJ}$

## BIODIESEL DELIVERED IN PAULÍNIA



# Carbon footprint of B100

Expression on energy basis:  $\text{gCO}_2\text{equivalent/MJ}$

## BIODIESEL DELIVERED IN PAULÍNIA

19.8 – 22.5

Relative contribution (%)

Agricultural

21-24

Processing  
of soybean oil

19-40

Biodiesel  
production

23-48

Transport and  
distribution

12

# Carbon footprint of B100

Expression on energy basis :  $\text{gCO}_2\text{equivalent/MJ}$

**BIODIESEL DELIVERED IN EUROPE**



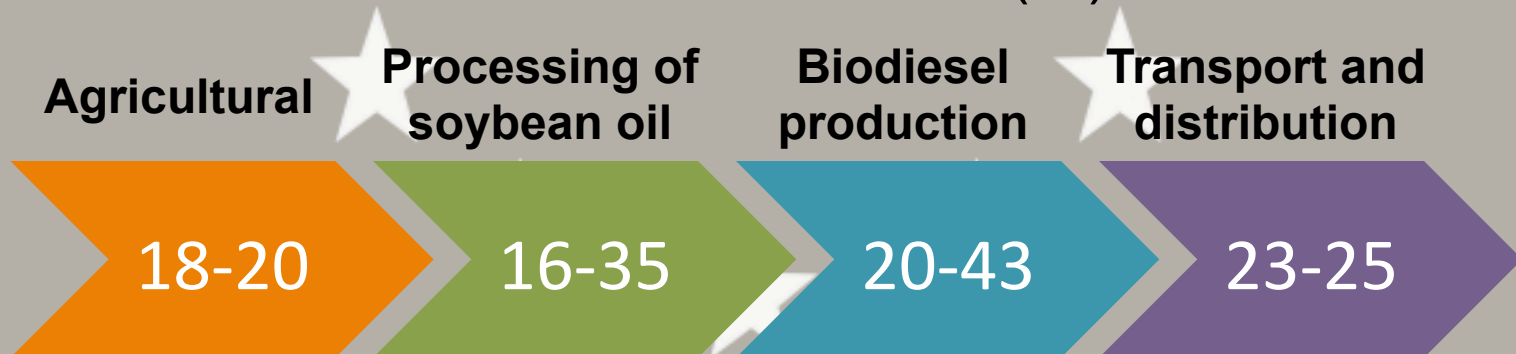
# Carbon footprint of B100

Expression on energy basis: gCO<sub>2</sub>equivalent/MJ

BIODIESEL DELIVERED IN EUROPE

23.2 – 26.3

Relative contribution (%)



# Carbon footprint of B100

European diesel  
83.8 gCO<sub>2</sub>/ MJ

Biodiesel B100  
**C footprint**  
gCO<sub>2</sub>eq/ MJ

GHG reduction  
%

APROSOJA  
ABIOVE  
UBRABIO

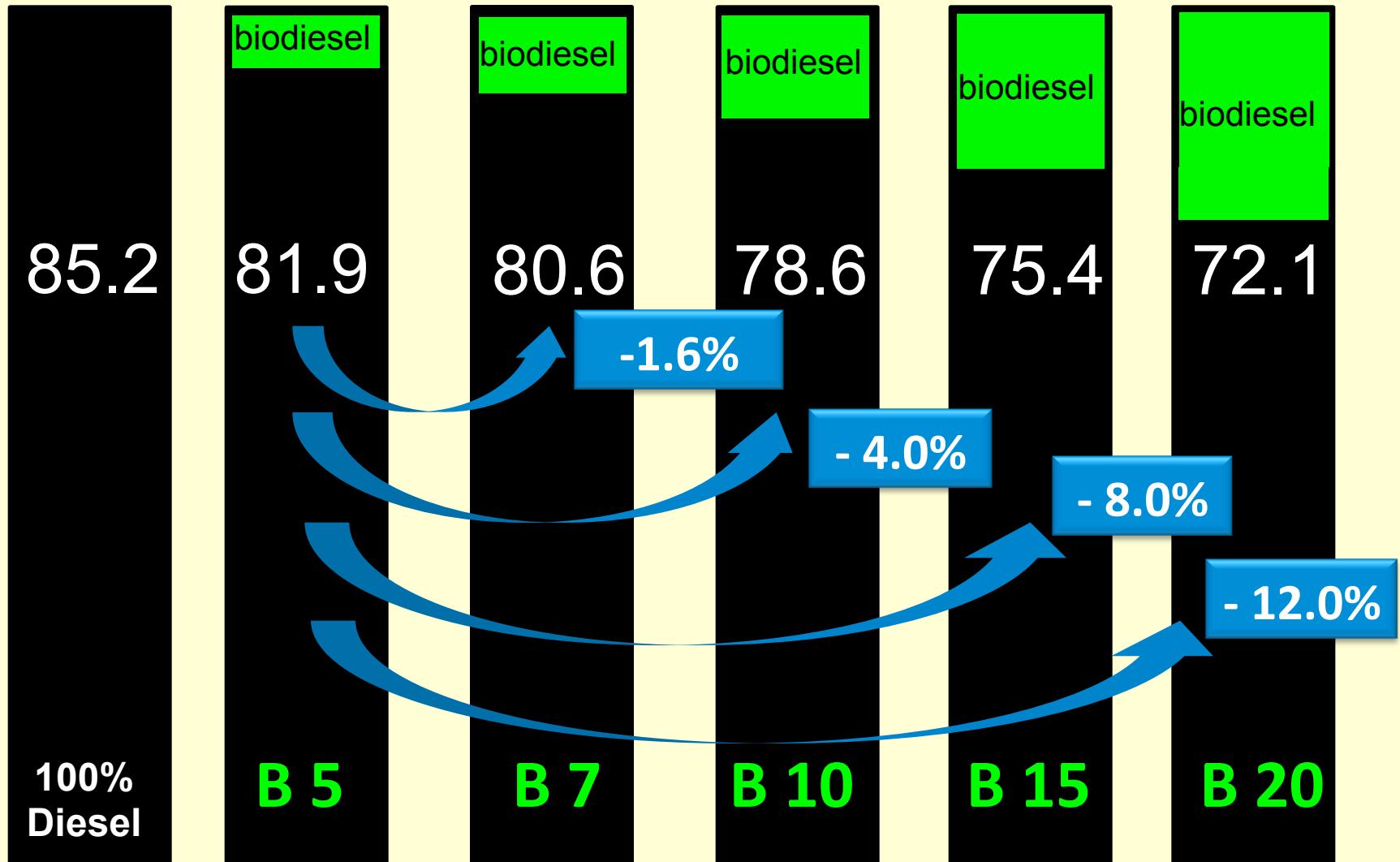
23.2 – 26.3

69

72

# Projection of GHG emission reduction of Diesel (B)

GHG emissions from pure diesel: 85.2 gCO<sub>2</sub>e/MJ





# Economic impacts

B5 → B7



R\$ 0.007 / bus pass

B5 → B7



R\$ 0.20 / unit

B5 → B10



R\$ 0.017 / bus pass

B5 → B10



R\$ 0.50 / unit



Technical Committees - details

**Technical Committee 2: Latin America**

**10 September 2014, Porto Alegre**

---

**GHG emissions of soybean production  
- results of the latest study**

---

**Prof. Dr. Carlos Clemente Cerri**