Embrapa
Studies and Training

# Pasture degradation and recovery: an economic perspective

*Geraldo B. Martha, Jr.*

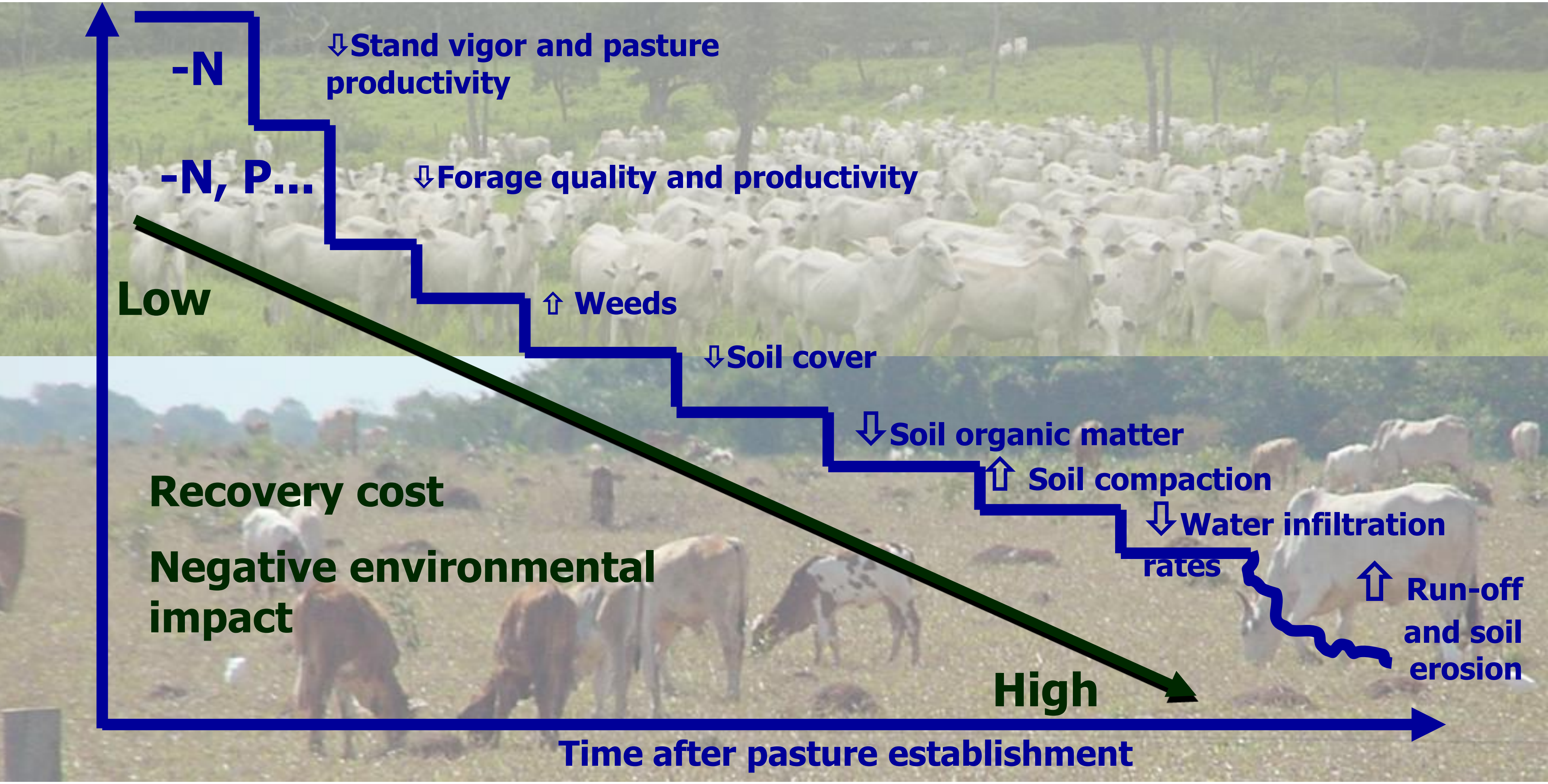
*Sustainable Livestock Sector Development, Restoring Value to Grasslands, Embrapa-Brasília, May 08, 2012*

# Outline

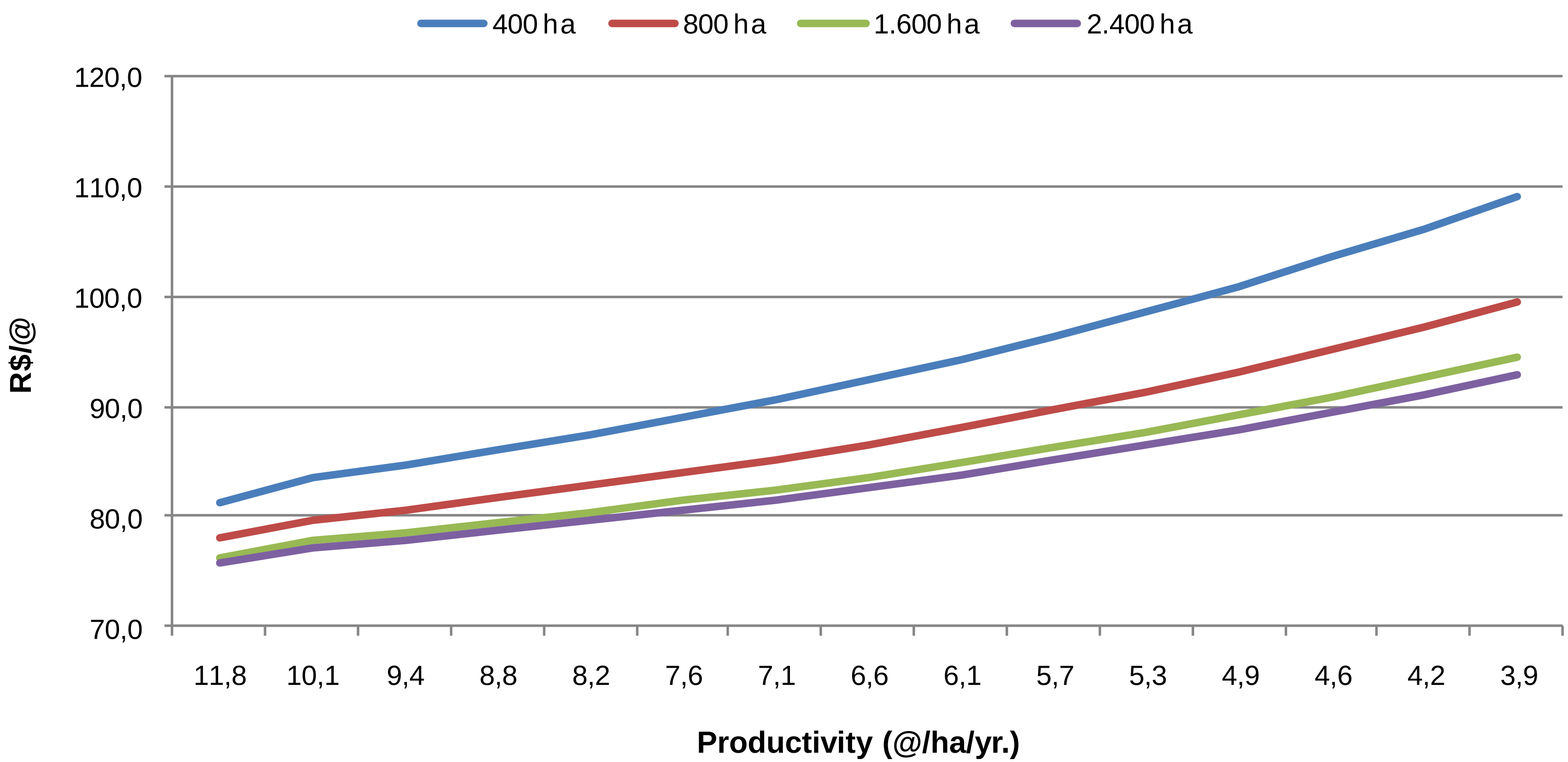
- Pasture degradation;
- Pasture recovery: stocking rates and animal performance;
- Key-steps in analyzing pasture recovery options;
- Integrated Crop-Livestock System;
- Concluding remarks;

# Pasture Degradation

# The Pasture Degradation Process



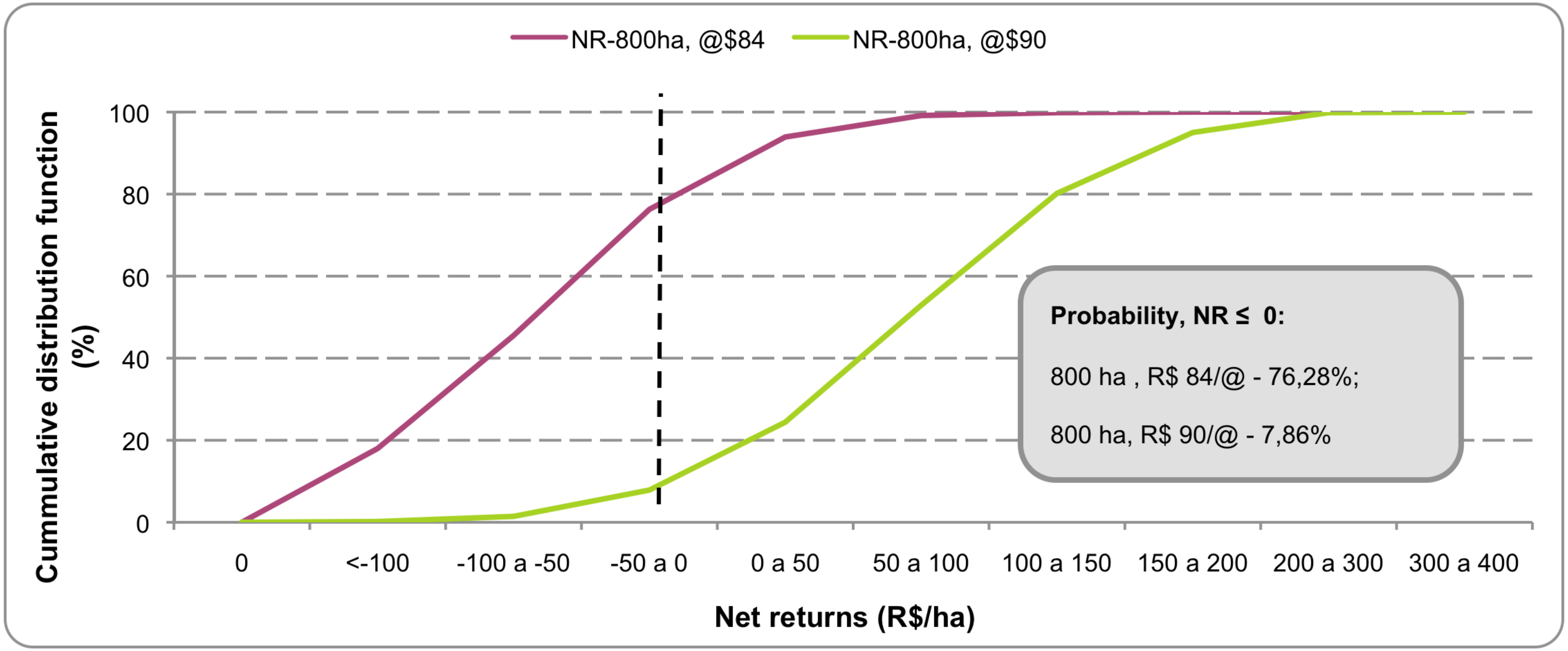
# Pasture Degradation and Cost of Production




*After Martha Jr., 2009*

**1 @ = 30 kg LW**

# Pasture Degradation and Risk (Net Returns)

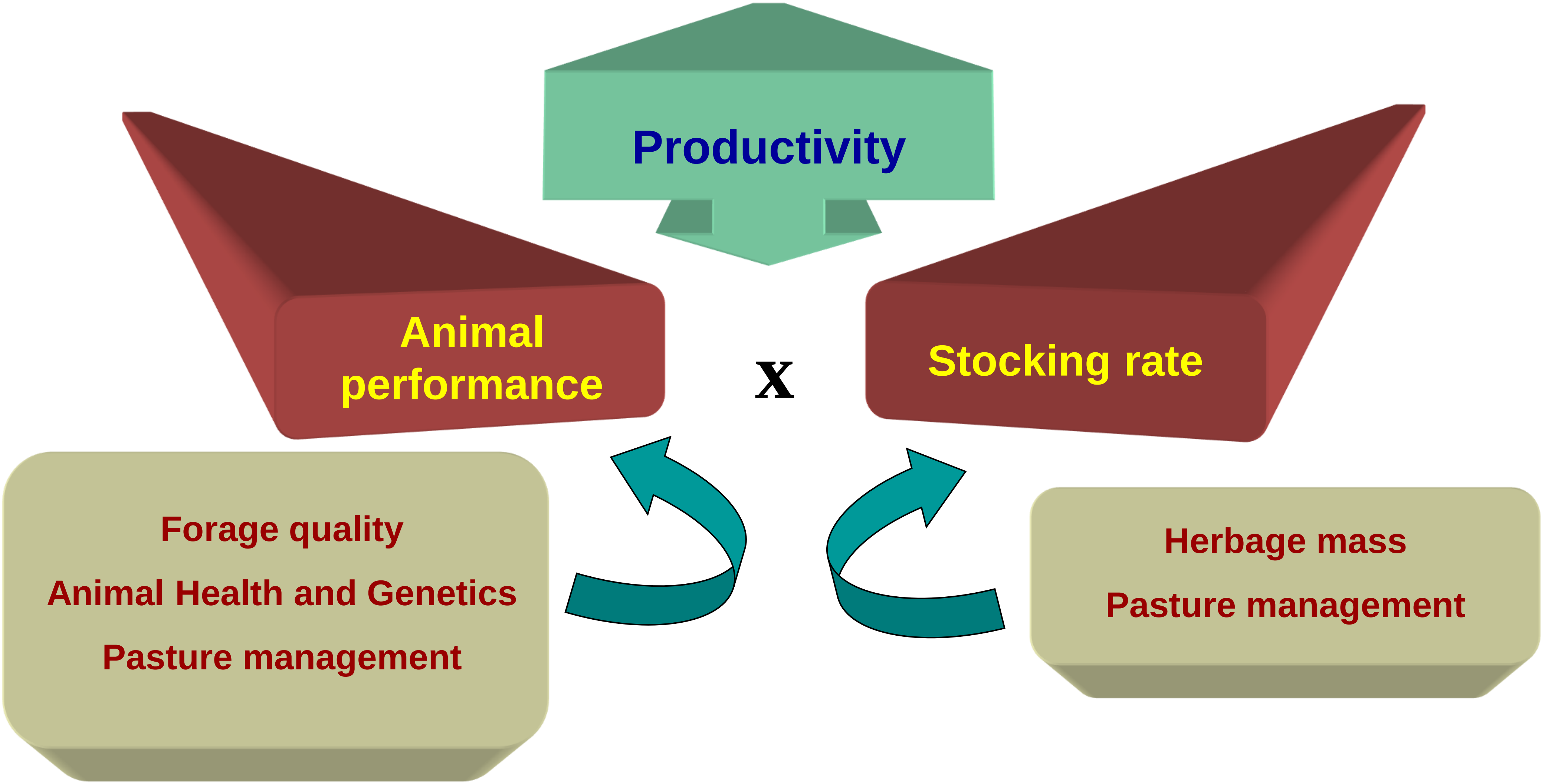



*Martha (2009).*

Embrapa

# Pasture renovation: stocking rates and animal performance

# Animal Productivity in Pastures



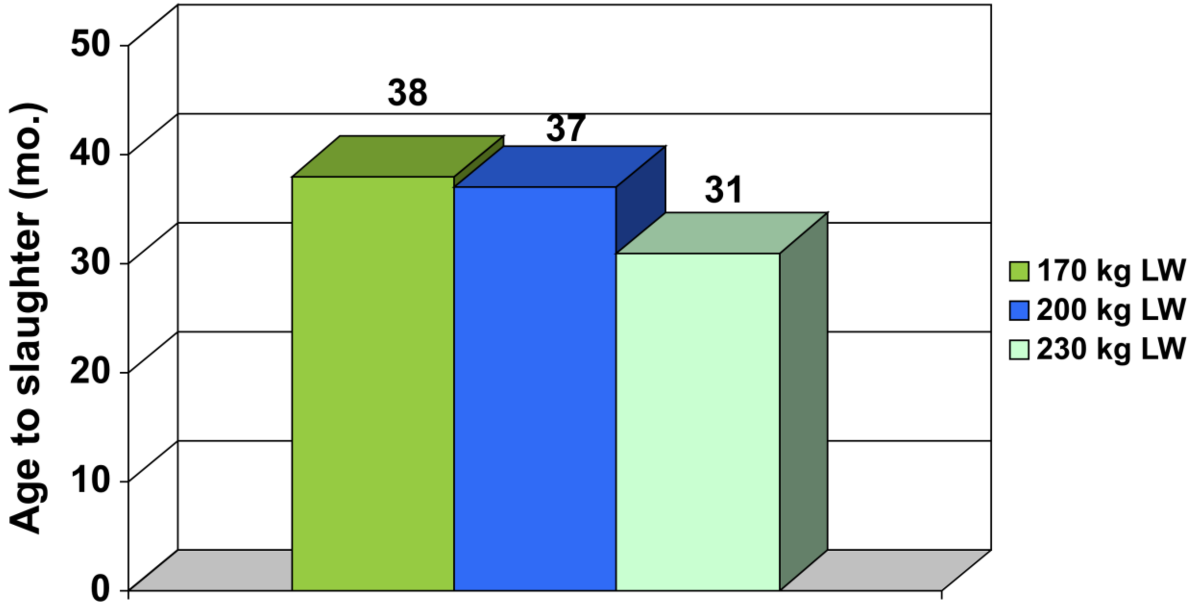
# Animal performance (time to slaughter)

**Heavier weaned calves**

**High post-weaning LWG**

# Focus on Animal Performance: Heavier Calves

Heavier weaned calves



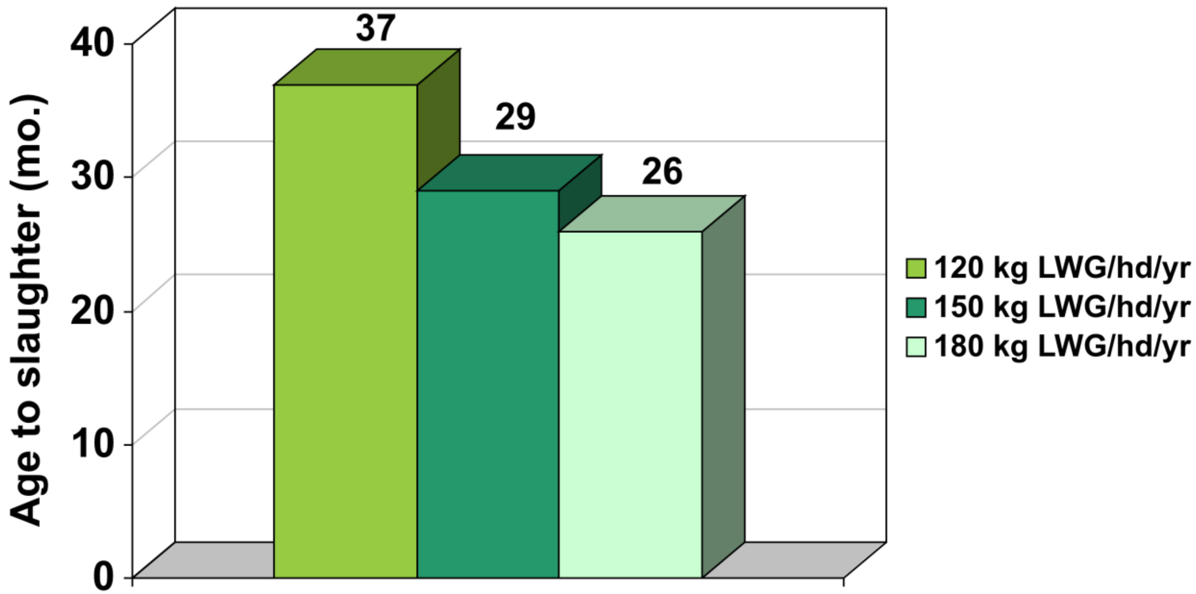

Age to slaughter (120 kg LW/hd/yr)

# Economic effects of weaning weight

| Animal performance | | LW (kg) at weaning | | | |
|---|---|---|---|---|---|
| kg/cab/ano | Slaughter (mo.) | 180 | 200 | 220 | 240 |
| | | *TR - (variable costs+deprec.), (R$/hd)* | | | |
| 224 | 24 | 328,80 | 358,80 | 388,80 | 418,80 |
| 180 | 28 | 208,80 | 238,80 | 268,80 | 328,80 |
| 150 | 32 | 88,80 | 118,80 | 178,80 | 208,80 |
| 128 | 37 | -61,20 | -1,20 | 58,80 | 118,80 |
| 112 | 41 | -181,20 | -121,20 | -31,20 | 28,80 |
| 100 | 45 | -301,20 | -211,20 | -151,20 | -91,20 |
| 90 | 49 | -421,20 | -331,20 | -271,20 | -181,20 |

# Focus on Animal Performance: Heavier Calves

High post-weaning LWG




Age to slaughter: 200 kg LW (weaning weight)

# Economic effects of post-weaning LWG

| Animal performance | | R$/@ | | | |
|---|---|---|---|---|---|
| kg/cab/ano | Slaughter (mo.) | 85,00 | 90,00 | 95,00 | 100,00 |
| | | *TR - (variable costs+deprec.), (R$/hd)* | | | |
| 224 | 24 | 243,87 | 328,80 | 413,73 | 498,67 |
| 180 | 28 | 123,87 | 208,80 | 293,73 | 378,67 |
| 150 | 32 | 3,87 | 88,80 | 173,73 | 258,67 |
| 128 | 36 | -116,13 | -31,20 | 53,73 | 138,67 |
| 112 | 40 | -236,13 | -151,20 | -66,27 | 18,67 |
| 100 | 44 | -356,13 | -271,20 | -186,27 | -101,33 |
| 90 | 48 | -476,13 | -391,20 | -306,27 | -221,33 |

# Increase stocking rate

**Legume-based pastures**

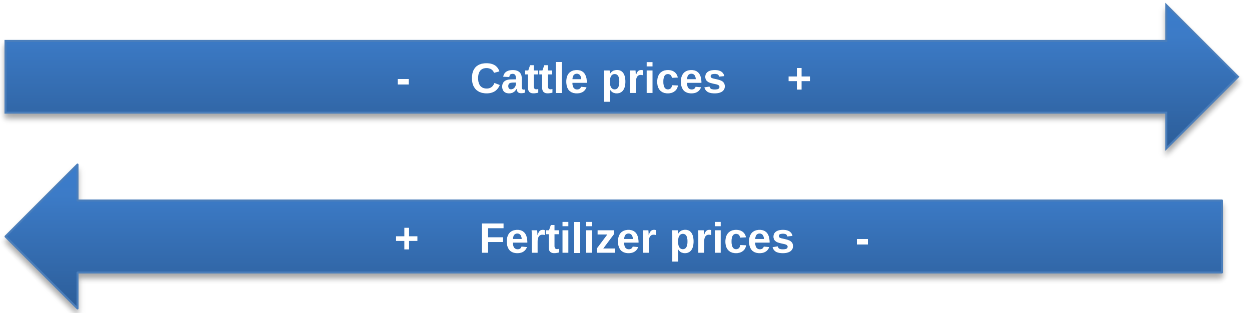
**Fertilized pastures**

**Crop-pasture rotations**

# Economic Issues in Pasture Fertilization

| | Pará | Mato Grosso | São Paulo |
|---|---|---|---|
| Land price (R$/ha) | 1500 | 3000 | 7000 |
| Bull price (R$/@) | 53 | 56,5 | 64 |
| Calf price (R$/hd) | 350 | 373 | 422 |
| Calf / bull ratio | 2,5 | 2,5 | 2,5 |
| Fertilizer cost (R$/t) | 775 | 685 | 635 |

*Fonte: Barros et al. (2004)*



# Economic Issues in Pasture Fertilization

| 0,83 AU/ha | 1,20 AU/ha | 1,50 AU/ha |
| --- | --- | --- |
| | São Paulo | |
| R$ 179,00/ha | R$ 209,00/ha | R$ 229,00/ha |

*Fonte: Barros et al. (2004)*

Embrapa

# *Key-steps in analyzing pasture recovery options*

a) to provide a detailed description of the technology or knowledge;

b) to determine which technology will be replaced, clarifying the advantages and disadvantages of the new technology compared to the one currently in use in farm;

c) to detail the systems where the new technology can be applied and the need for (and the extent of) changes/adaptations in the current system;

d) to inform the costs of production of the new technology compared to the one in use that this new technology is supposed to replace, including price and weather risks;

*Alves, 2001*

e) to inform the new technology’s potential response to modern inputs;

f) to inform if there are restrictions for adopting the new technology in terms of capital acquisition costs, education/training of the farmer, knowledge about technical service and credit limitations;

g) to identify the environmental impact of the new technology;

h) when applicable, to separate private and social costs and benefits.

*Alves, 2001*

# Integrated Crop-Livestock System

# The Opportunity Cost of ICLS

$$TR_{ICLS} - (TC_{ICLS} + NR_{Esp.}) > 0$$

***$TR_{ICLS}$ = total revenue in ICLS;***

***$TC_{ICLS}$ = total cost in ICLS;***

***$NR_{Esp.}$ = net return in specialized system (ex. cattle or soybean);***

*Martha Jr. et al. (2011).*

# Effect of the soybean price (R$/bag) and animal productivity in ICLS

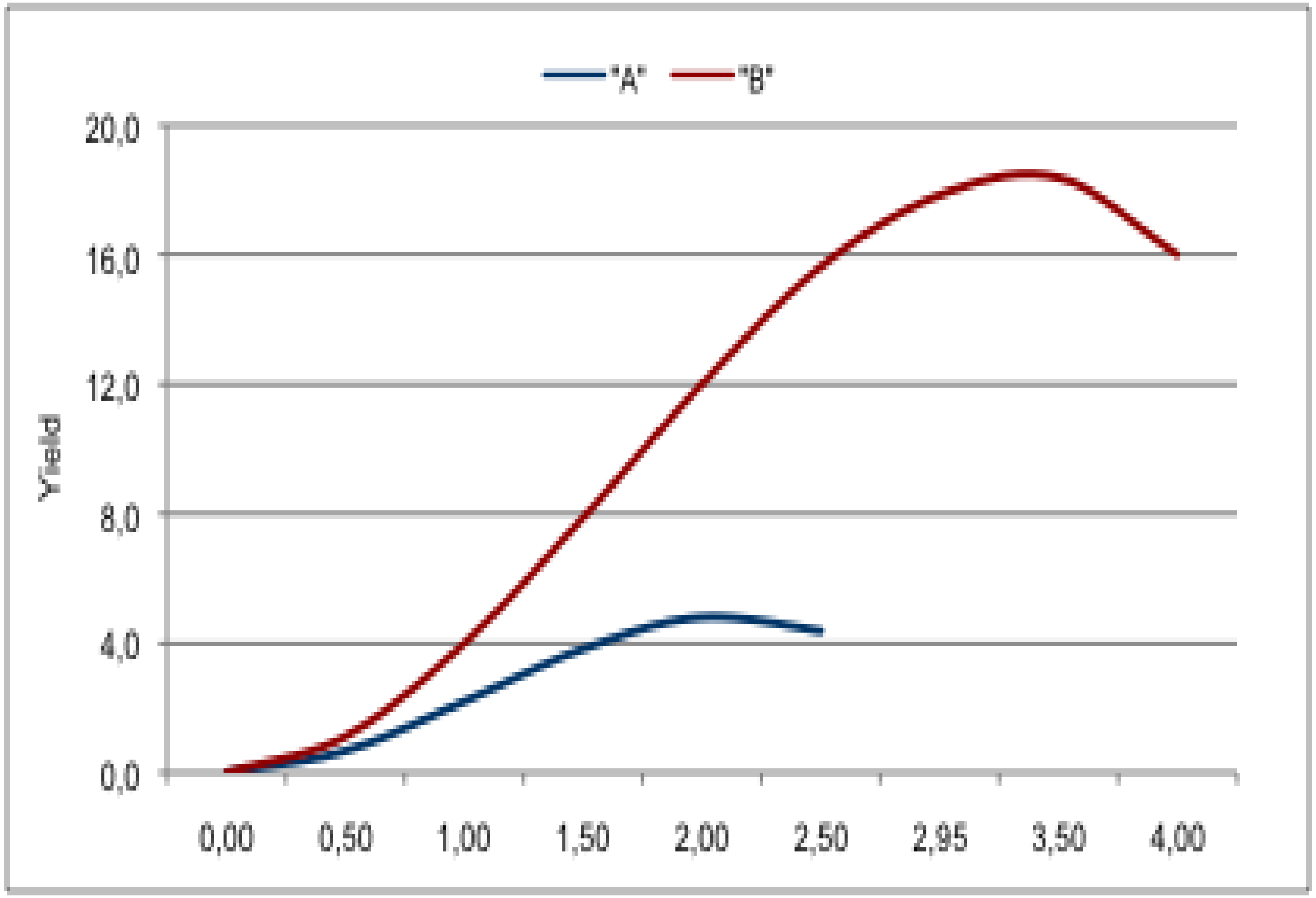
| | | Soybean price (R$/bag) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 25,00 | 30,00 | 35,00 | 40,00 | 45,00 | 50,00 | 55,00 |
| Animal productivity in ICLS (kg LWG/ha) | 268,5 | 107,07 | -14,19 | -135,46 | -256,72 | -377,99 | -499,26 | -620,52 |
| | 358,0 | 214,75 | 93,49 | -27,78 | -149,05 | -270,31 | -391,58 | -512,84 |
| | 447,5 | 321,42 | 200,15 | 78,89 | -42,38 | -163,64 | -284,91 | -406,18 |
| | 537,0 | 429,10 | 307,83 | 186,57 | 65,30 | -55,97 | -177,23 | -298,50 |
| | 626,5 | 536,78 | 415,51 | 294,24 | 172,98 | 51,71 | -69,55 | -190,82 |
| | 716,0 | 643,45 | 522,18 | 400,91 | 279,65 | 158,38 | 37,12 | -84,15 |

*Martha Jr. et al. (2011).*

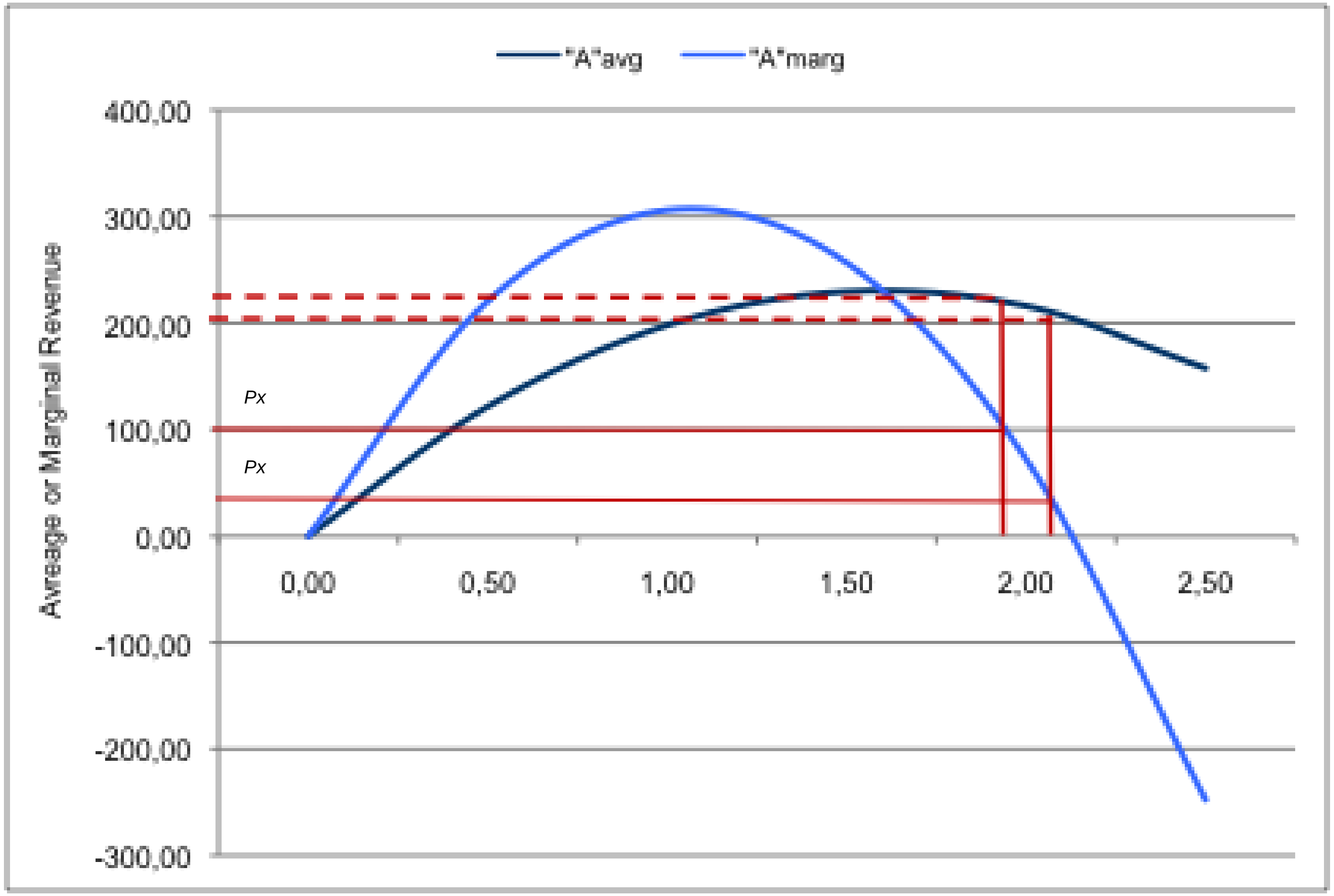
Embrapa

# Concluding Remarks

# Production Functions, Average and Marginal Yields



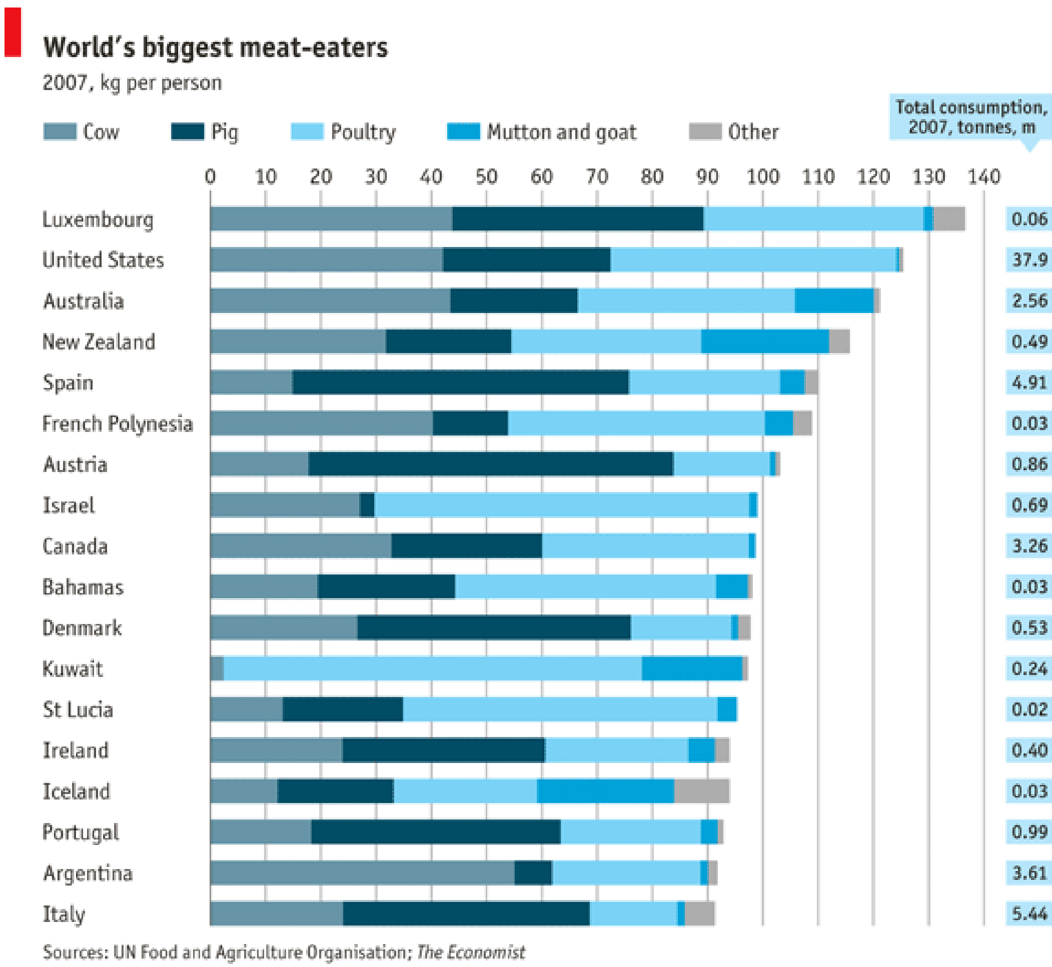
# Economic Targets

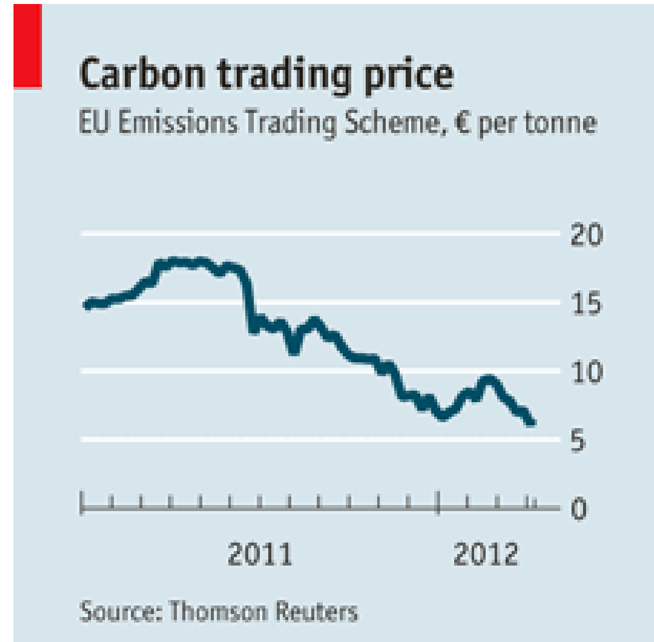


| Gás | GTP | | GWP | |
|---|---|---|---|---|
| | 2005 | Participação 2005 | 2005 | Participação 2005 |
| | Gg | % | Gg | % |
| $CO_2$ | 1.637.905 | 87,2 | 1.637.905 | 74,7 |
| $CH_4$ | 90.534 | 4,8 | 380.241 | 17,3 |
| $N_2O$ | 147.419 | 7,8 | 169.259 | 7,7 |
| HFC-125 | 139 | 0,0 | 350 | 0,0 |
| HFC-134a | 126 | 0,0 | 2.966 | 0,1 |
| HFC-143a | 398 | 0,0 | 353 | 0,0 |
| HFC-152a | 0,0175 | 0,0 | 24 | 0,0 |
| $CF_4$ | 1.245 | 0,1 | 805 | 0,0 |
| $C_2F_6$ | 233 | 0,0 | 95 | 0,0 |
| $SF_6$ | 1.031 | 0,1 | 602 | 0,0 |
| **Total** | **1.879.029** | **100** | **2.192.601** | **100** |

*MCT (2010).*

# *The Challenge Ahead*




*The Economist (2012).*

# Investments in New Technologies

- A lag between adoption and the realization of productivity benefits may create an adoption threshold, especially when a farmer is uncertain about future productive benefits or when he highly discounts future benefits. Farmers must have access to adequate financing to avoid exacerbating this threshold effect; *(Antle & Diagana, 2003)*

- Successful scaling-up depends upon multi-stakeholder approaches. Knowledge exchange, capacity development, technology transfer and well-functioning input and market chains are key-components to foster the adoption of sustainable technologies.

Embrapa

Studies and Training

*geraldo.martha@embrapa.br*

*+55 61 3448-1734*