Ciclo de Seminarios de Análisis y Prospectiva, MARM
I Seminario / 2010. “El reto de la alimentación mundial en el siglo XXI”
17 de Junio de 2010

“Capacidad de respuesta productiva ante el reto alimentario”

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UNIVERSIDAD POLITÉCNICA MADRID

Contenidos

1. Prolegómenos
2. Potencial productivo (fisiológico)
3. Potencial productivo real
4. El problema del agua
5. Los ‘agujeros negros’
6. Las enseñanzas de la historia agraria
7. Cautelas y conclusiones

1. Prolegómenos (supuestos)

No se presta atención:

a) al problema de la energía, ni CC, ni GEI
b) al problema de la pérdida de biodiversidad
c) al problema del desarrollo económico, ni al reto de la pobreza
d) a la cultura alimentaria de los pueblos del mundo, ni a los OGMs

Sí examino las lecciones de la historia del comercio y de la agricultura

1. Prolegómenos

LXXXVII x CCCXCIX = ??

1. Prolegómenos

LXXXVII x CCCXCIX = ??

LXXXVIII

x CCCXCIX

MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMCXII

1. Prolegómenos

LXXXVII x CCCXCIX = ??

LXXXVIII
x CCCXCIX
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Año 825, Al-Khowârizmi

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x 399
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1. Prolegómenos

LXXXVII x CCCXCIX = ??

LXXXVIII

x CCCXCIX

MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMCXII

Año **825,** Al-Khowârizmi:

88

x 399

35112

Italia 1434, todavía se publican edictos prohibiendo el uso de números “infieles”.

2. Potencial productivo fisiológico

•Experimentos bajo condiciones óptimas muestran que la duplicación del CO2 atmosférico incrementa la fotosíntesis entre el 30 y el 50% en plantas C3, y el 10-25% en C4.

•Se traduce en incrementos de rendimientos de 10–20% C3 crops y 0-10% en C4. Aumentos hasta 550 ppm CO2 en árboles aumenta la biomasa en 0–30%

Tubiello et al. (2007). **Crop and pasture response to climate change. Proc of the Amer Acad of Science.**

Otros autores, más recientes, consideran que Tubiello et al. (2007) infravaloran el efecto del CO2 (Hoff et al. 2010; J. of Hydrology). José Mª Durán (UPM, CEIGRAM) cree que la inyección de CO2 en las tuberías de riego es….

2. Potencial productivo fisiológico

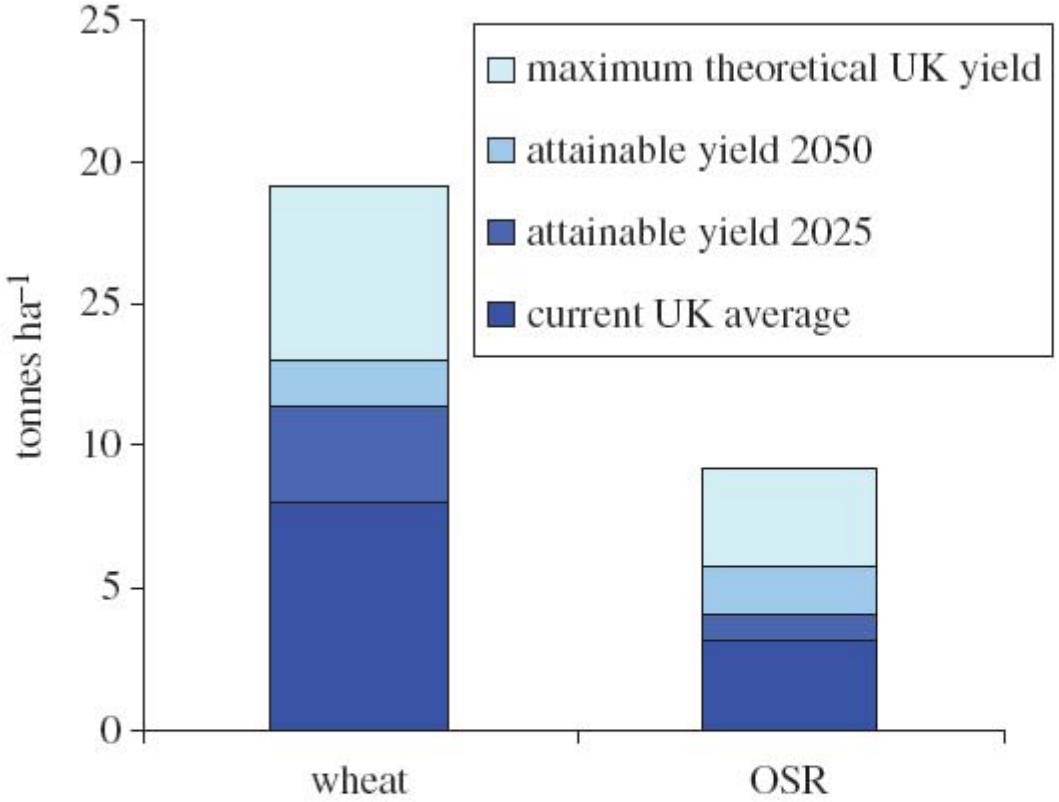


Figure 2. The theoretical and obtainable potential yields for wheat and oilseed rape (OSR) in the UK (from Berry & Spink 2006; Sylvester-Bradley *et al.* 2006; Street *et al.* 2009).

Beddington (2010) Food security: contributions from science to a new and greener revolution *Phil. Trans. R. Soc. B 2010* ***365, 61-71***

2. Potencial productivo fisiológico

ESTRATEGIAS

- **Vapour shift (VS)**
- **Rainwater harvesting (RH)**

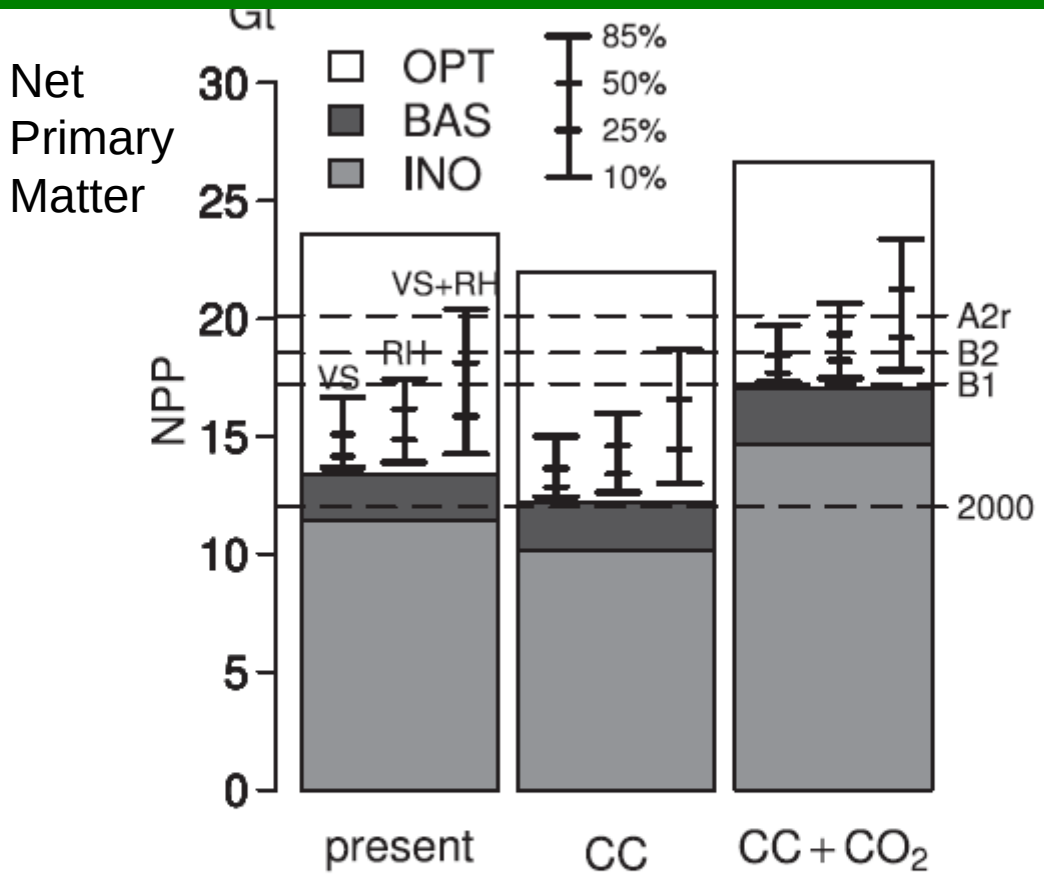
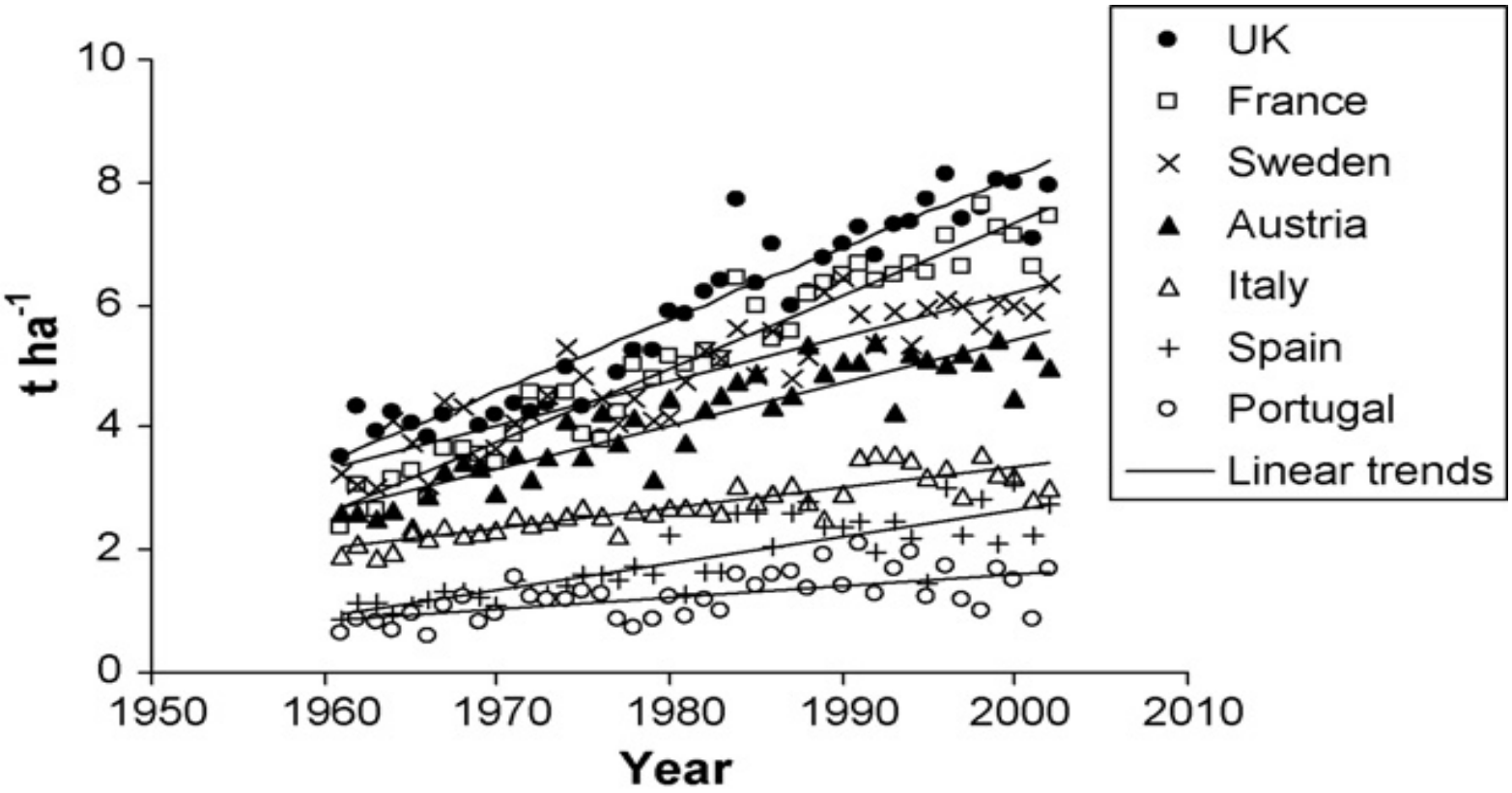


Figure 2. Crop NPP (Gt) for the different simulations under present climate (1971–2000 averages), under future climate change (CC), and under both climate and CO_2 change (CC + CO_2) (2041–2070 averages of three climate models, A2 emission scenario). Horizontal lines indicate NPP requirements at a population of 6.1 billion in 2000 and the estimated requirements for different population scenarios (SRES B1, B2, A2r).

Rost, S., et al. (2009)
Global potential to increase crop production through water management in rainfed agriculture
Environ. Res. Lett. **4 (2009)**

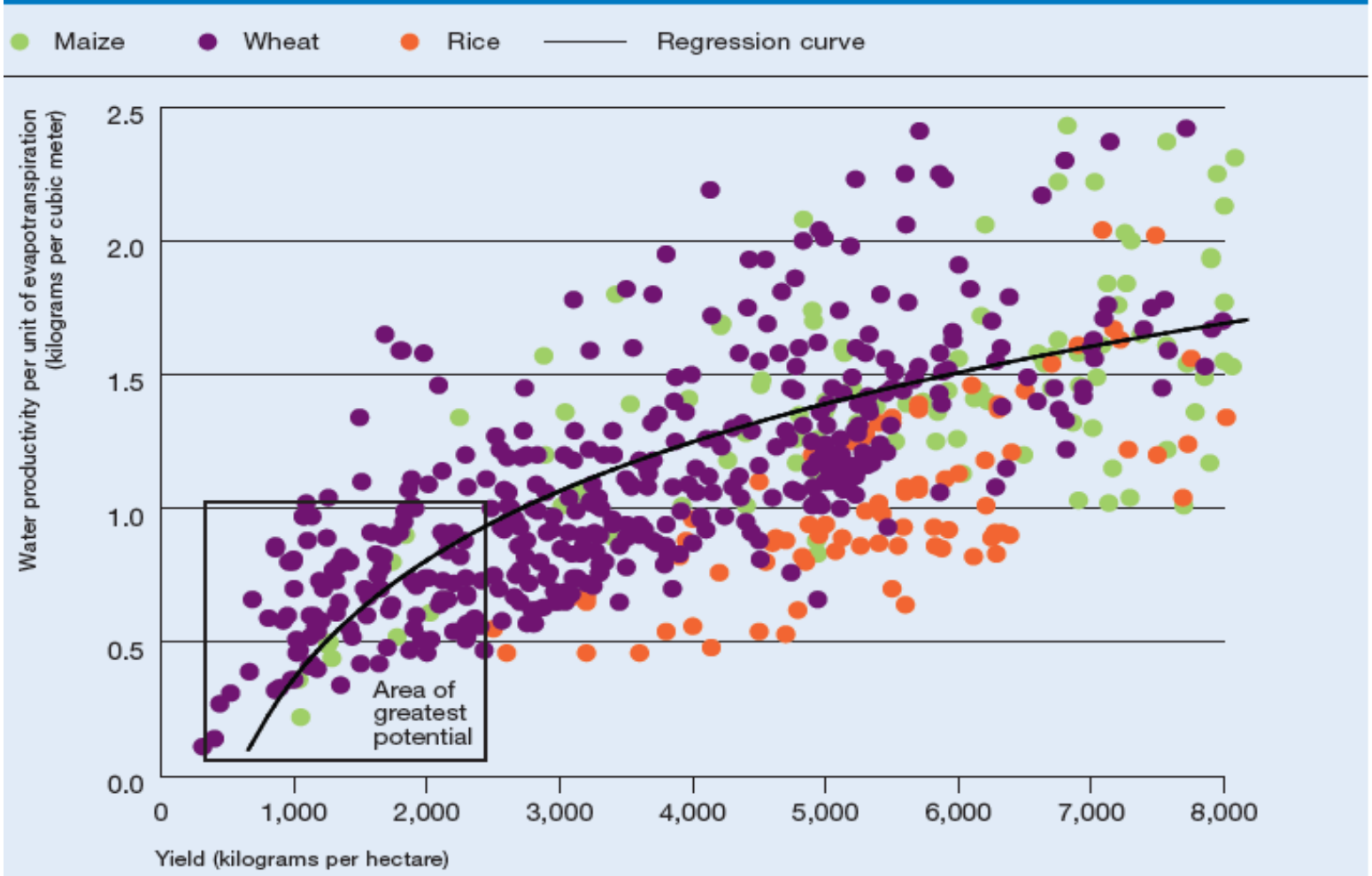
3. Potencial productivo real



J.S.I. Ingram et al. / Agriculture, Ecosystems and Environment 126 (2008) 4–12

3. Potencial productivo real

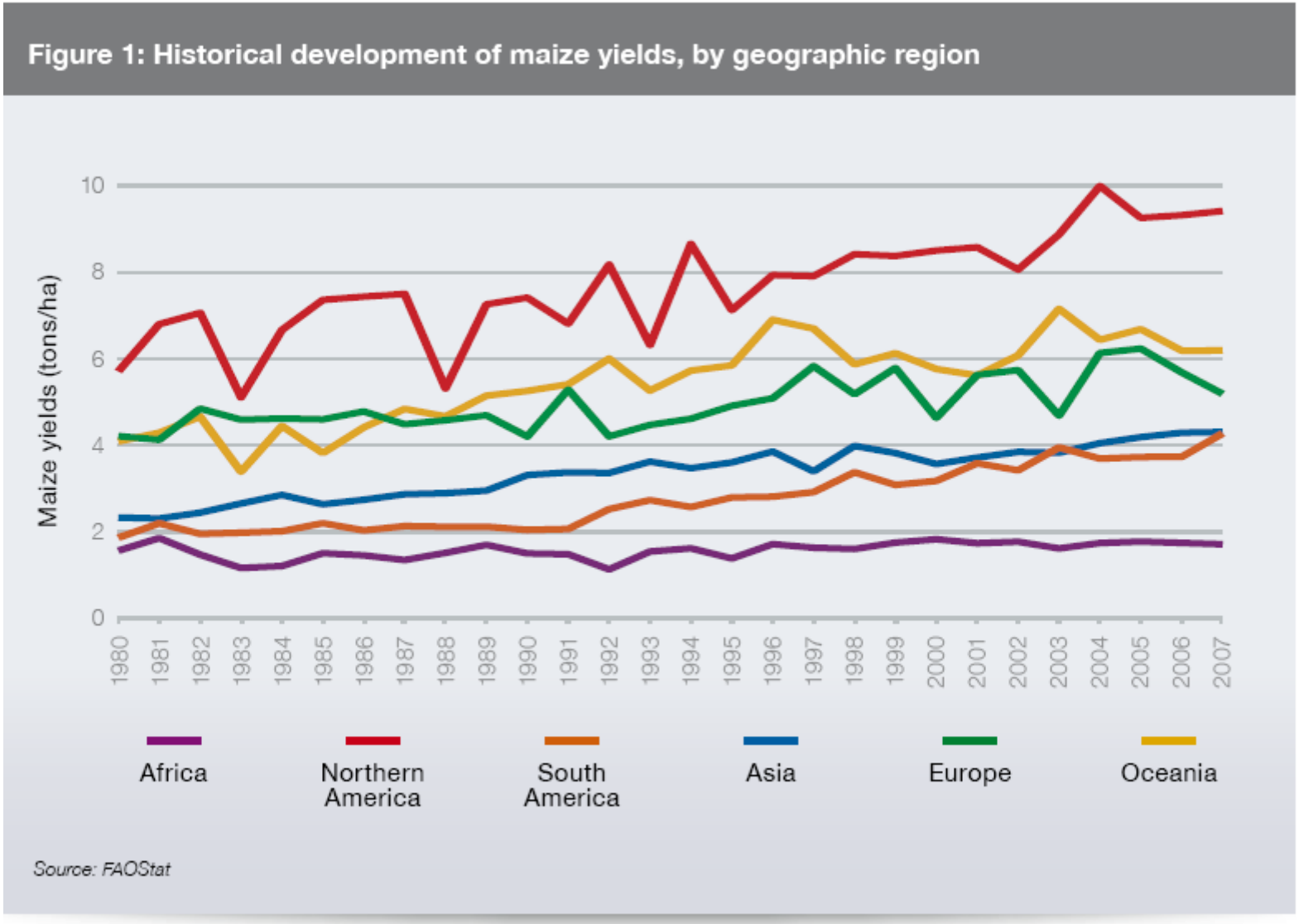
figure 7 | **The biggest potential for water productivity gains is in very low-yielding areas, which typically coincide with poverty**



Source: Adapted from Zwart, S.J., and W.G.M. Bastiaanssen, 2004, "Review of Measured Crop Water Productivity Values for Irrigated Wheat, Rice, Cotton and Maize," *Agricultural Water Management* 69 (2): 115–33; chapter 7.

Fuente: CAWMA (2007). IWMI, Sri Lanka, Earthscan

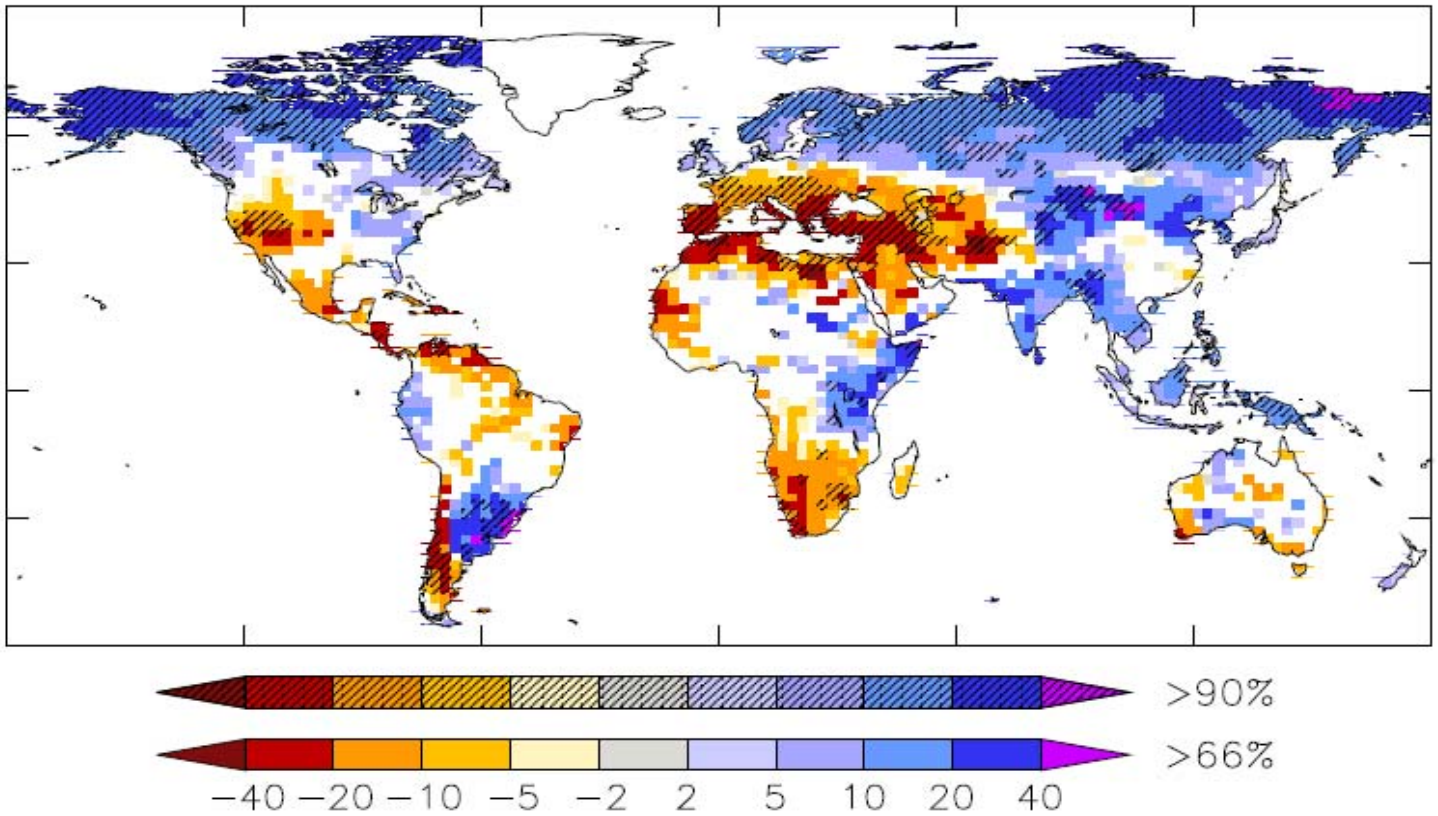
3. Potencial productivo real



Fuente: FAO “How to feed the world. **The technology challenge. Roma, 12-13 c**
High-level Expert Forum

4. El problema del agua

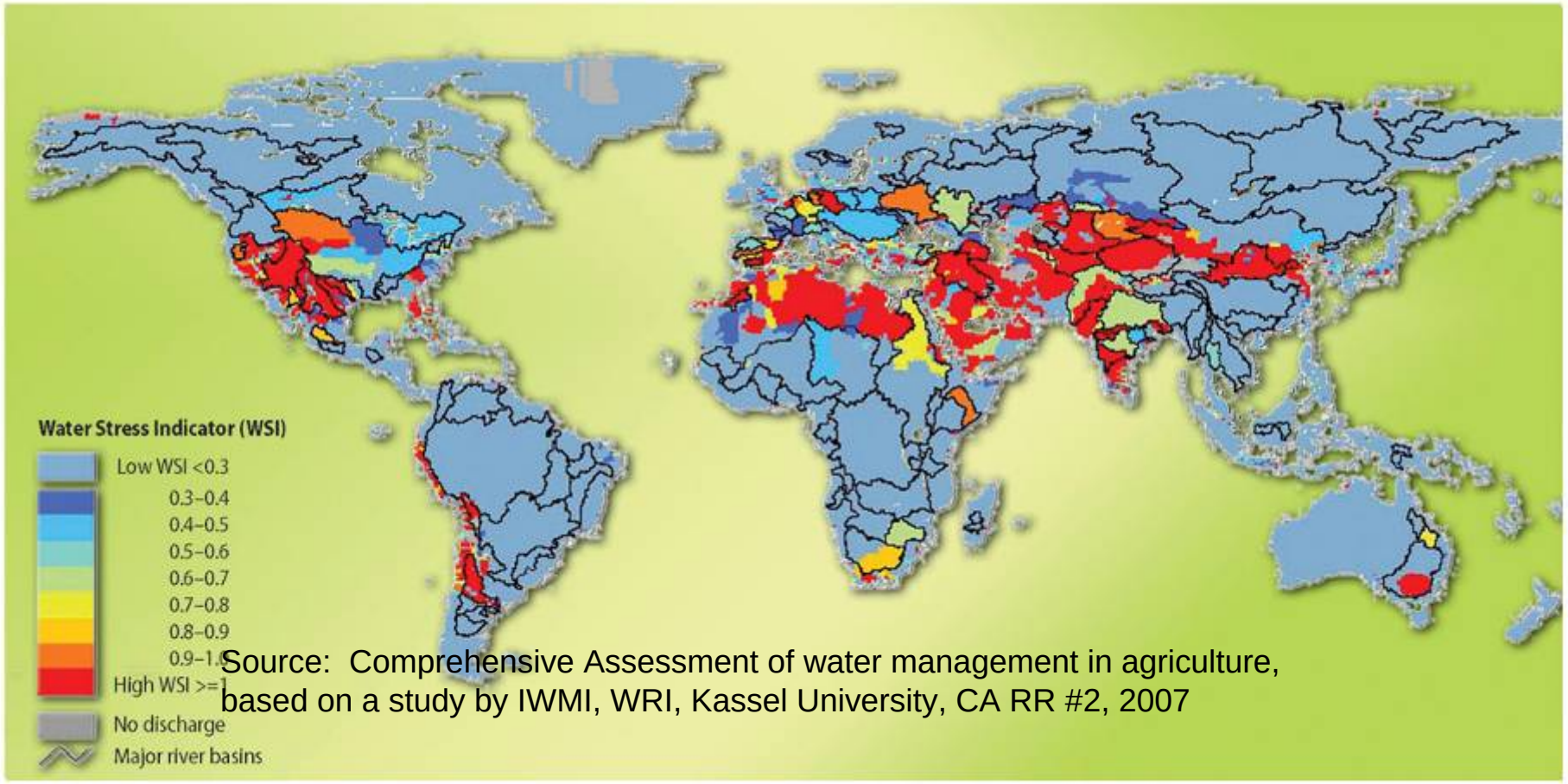
Cambios esperados de escorrentía



Fuente: Faurès, FAO (2009)

4. El problema del agua

Indicadores de estrés de recursos hídricos (usos sobre recursos sostenibles)



Source: Comprehensive Assessment of water management in agriculture, based on a study by IWMI, WRI, Kassel University, CA RR #2, 2007

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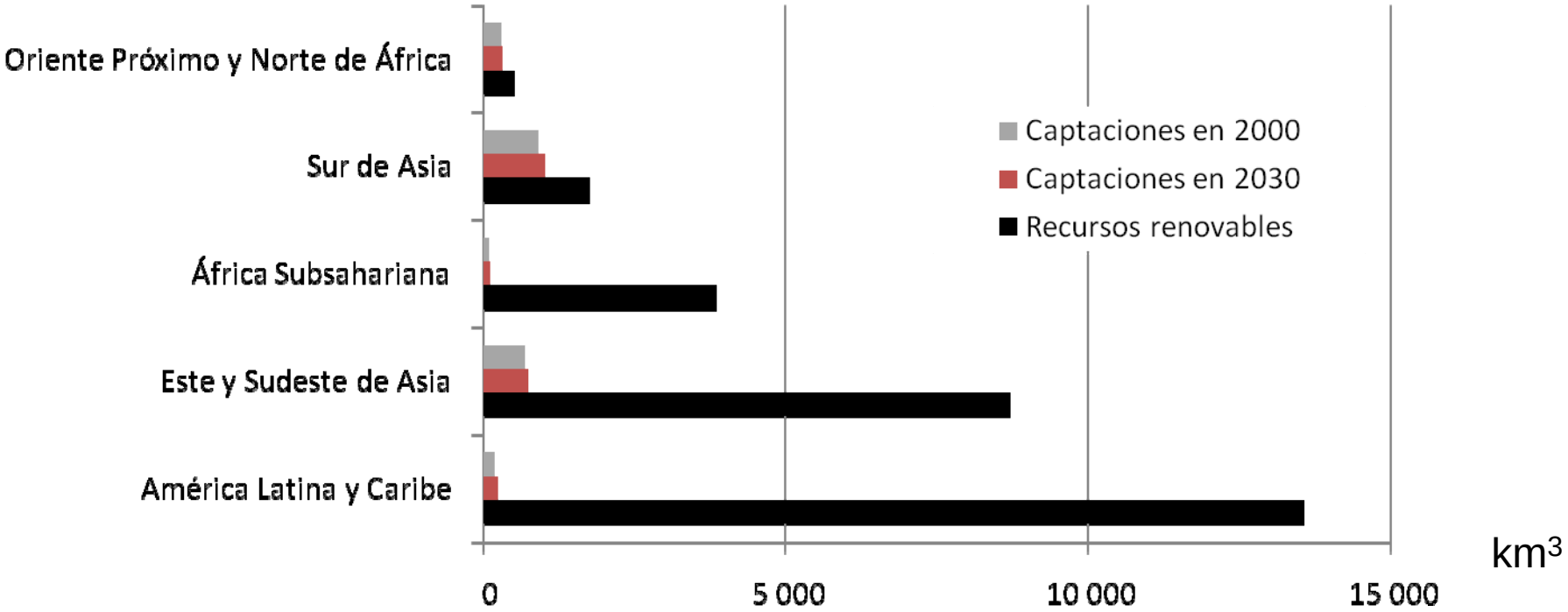
4. El problema del agua

¿Realmente escasa?



Fuente: Comprehensive Assessment of water management in agriculture (2007)

4. El problema del agua

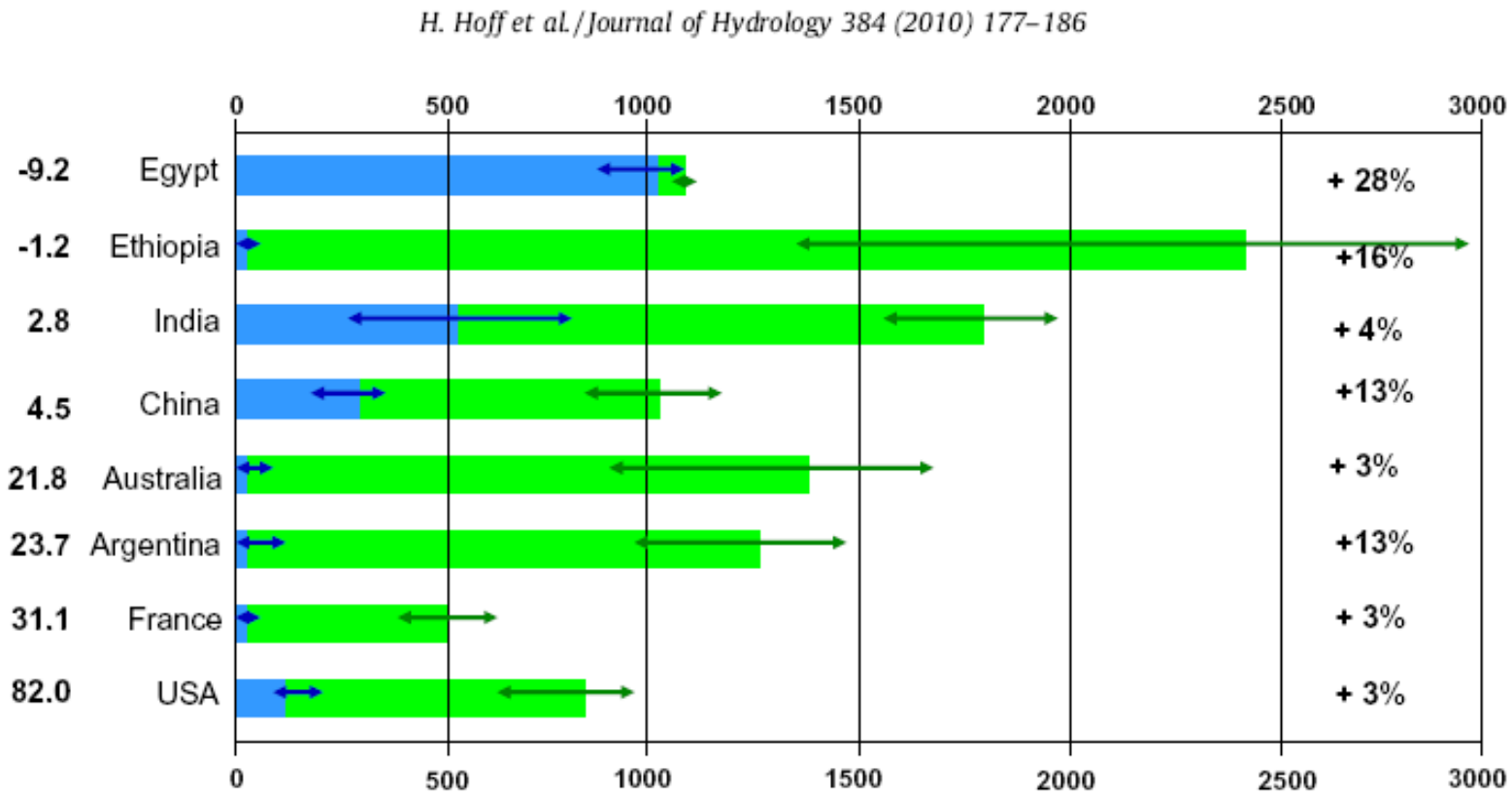


Fig. 1. Virtual water content (m^3/ton of yield) of cereals green (blue) bars show mean green (blue) virtual water contents (VWC) for the four models GC LPJmL, green and blue arrows the spread between them. LPJmL values were only calculated for temperate cereals and maize (Ethiopia only for temper left of the country name show net cereal trade in the year 2000 (million tons), negative numbers indicate net importers, positive numbers net expor Numbers right of the bars show projected average change in VWC between now and 2041–2070, calculated with LPJml, averaged across HadCM3, climate simulations and with and without CO_2 effect: note, that these numbers were not taken from contributions to this special issue, but were separ authors for this synthesis. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.

5. Los agujeros 'negros'

África (No solo la Sub-sahariana)

- **Rendimientos de cereales 1.2 T/ha; 3 T/ha en los países en desarrollo como media**

- **Consumo de fertilizante 13 kg/ha en Africa Sub-Sahariana en 2002; comparado con 73 kg MENA y 190 Asia Oriental y Pacífico**

- **Solo el 4% de la tierra cultivable se riega en Africa Sub-Sahariana, frente al 20% del mundo y 38% de Asia.**

- **El 40% de la población del Africa Subsahariana vive en países sin acceso al mar, frente al 7.5% de otros países, los costes de transporte son el 75% del valor del producto.**

Otros agujeros negros

Rusia (+ antiguas Repúblicas URSS)

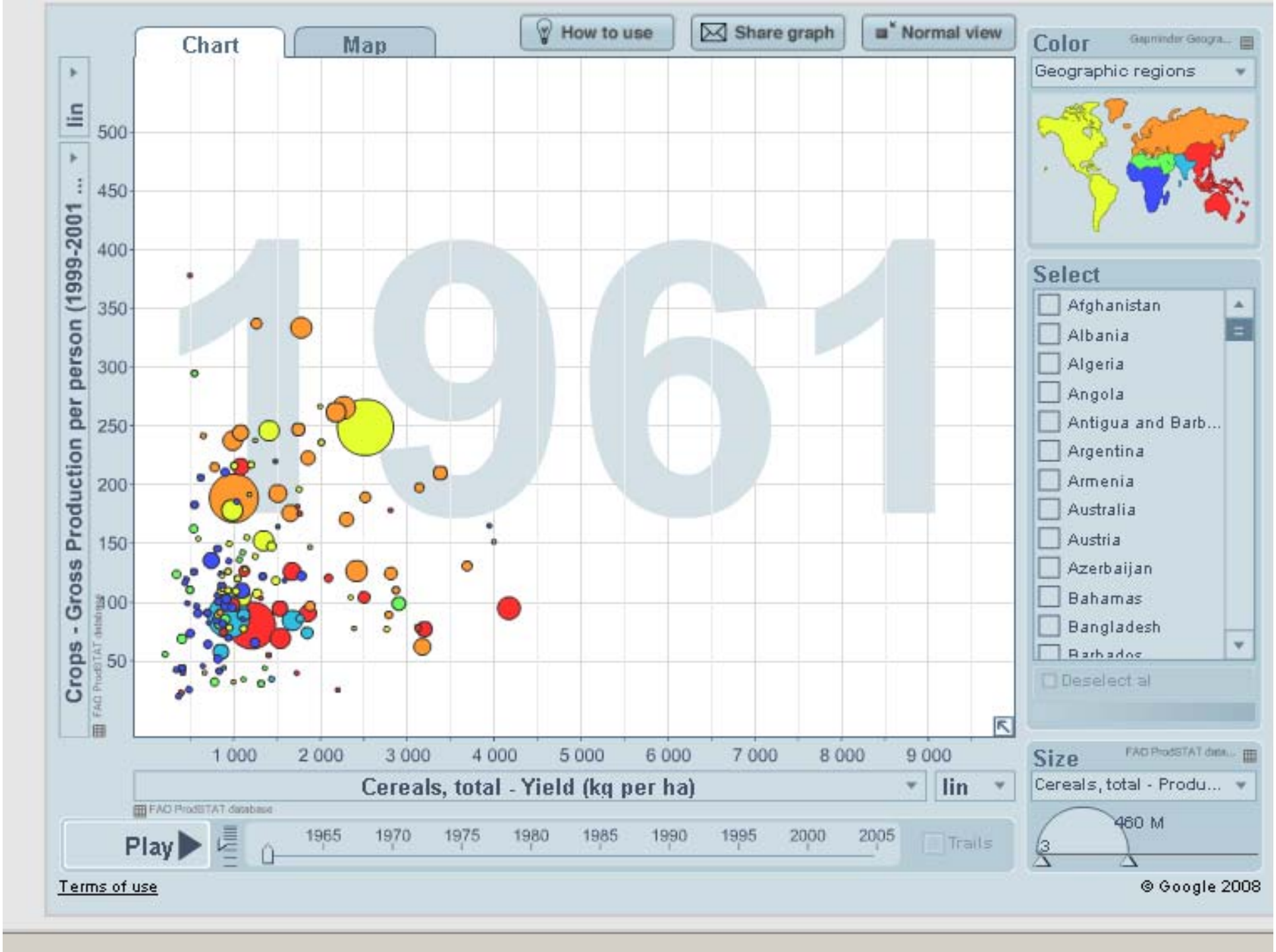
Mongolia

5. Los agujeros 'negros'

1. **Gráficos de gapminder: todos los países (rend cereal vs. gross -cops agric production $)**

2. **UN conjunto de países (rend cereal vs. net agric per person)**

Fuentes: www.gapminder.com
Hans Rosling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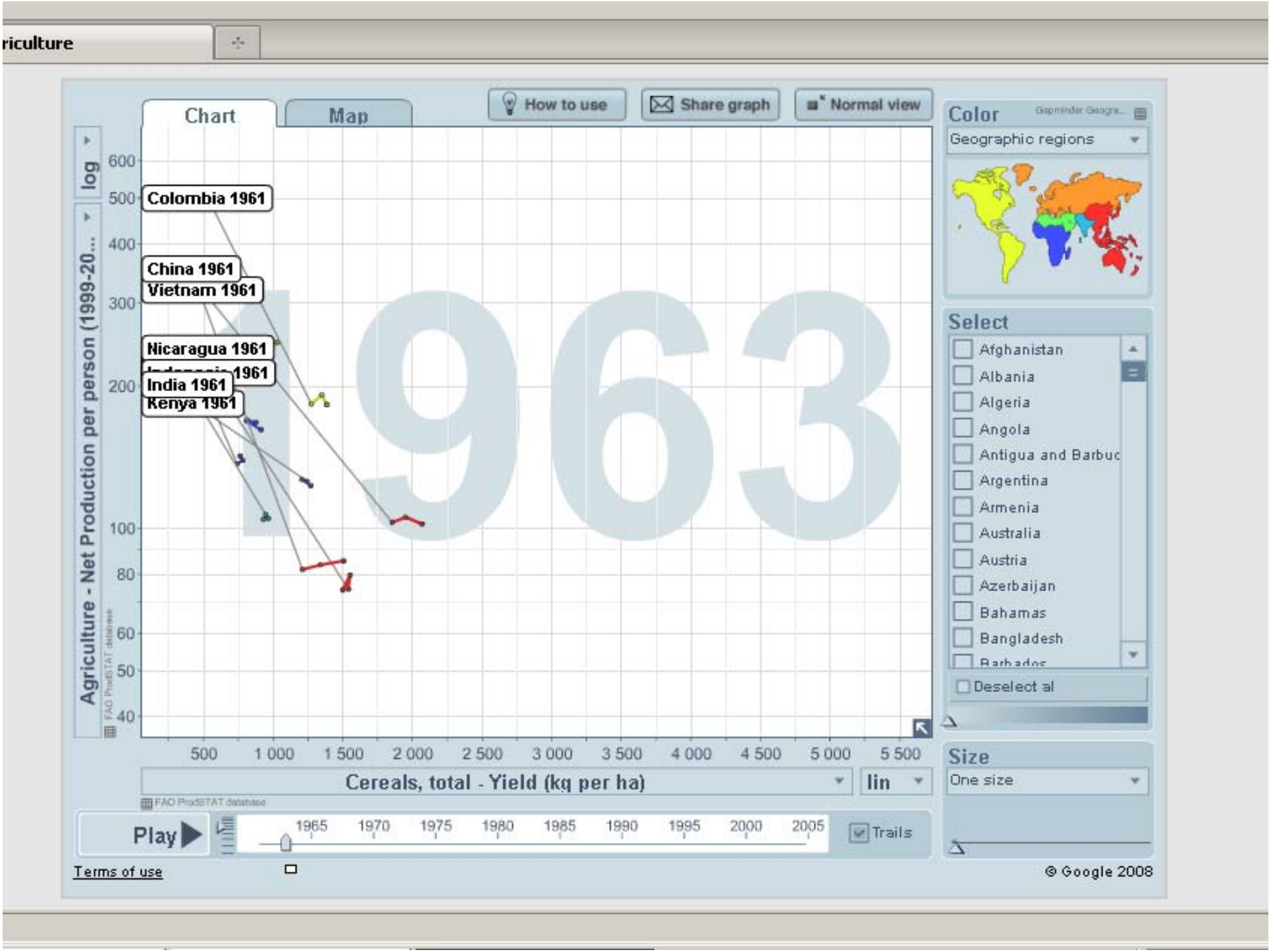
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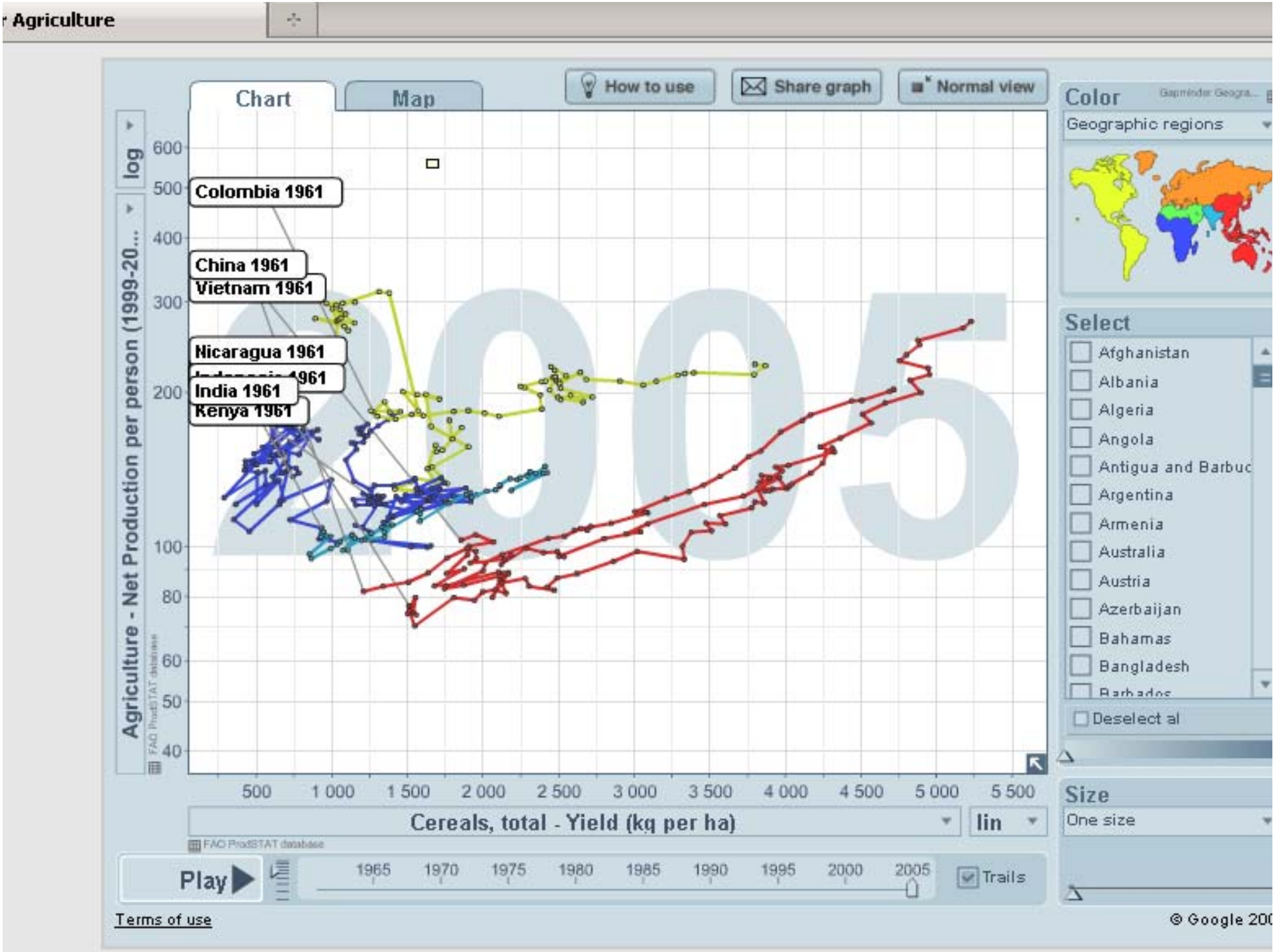
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6. Síntesis (FAO en tono canónico)

The potential to raise crop yields even with the existing technologies seems considerable.

Provided the appropriate socio-economic incentives are in place, there are still ample ‘bridgeable’ gaps in yield (i.e. the difference between agroecologically attainable and actual yields) that could be exploited.

Fears that yields (e.g. for rice) are reaching a plateau do not seem warranted (except in a few very special instances).

6. Síntesis (FAO en tono canónico)

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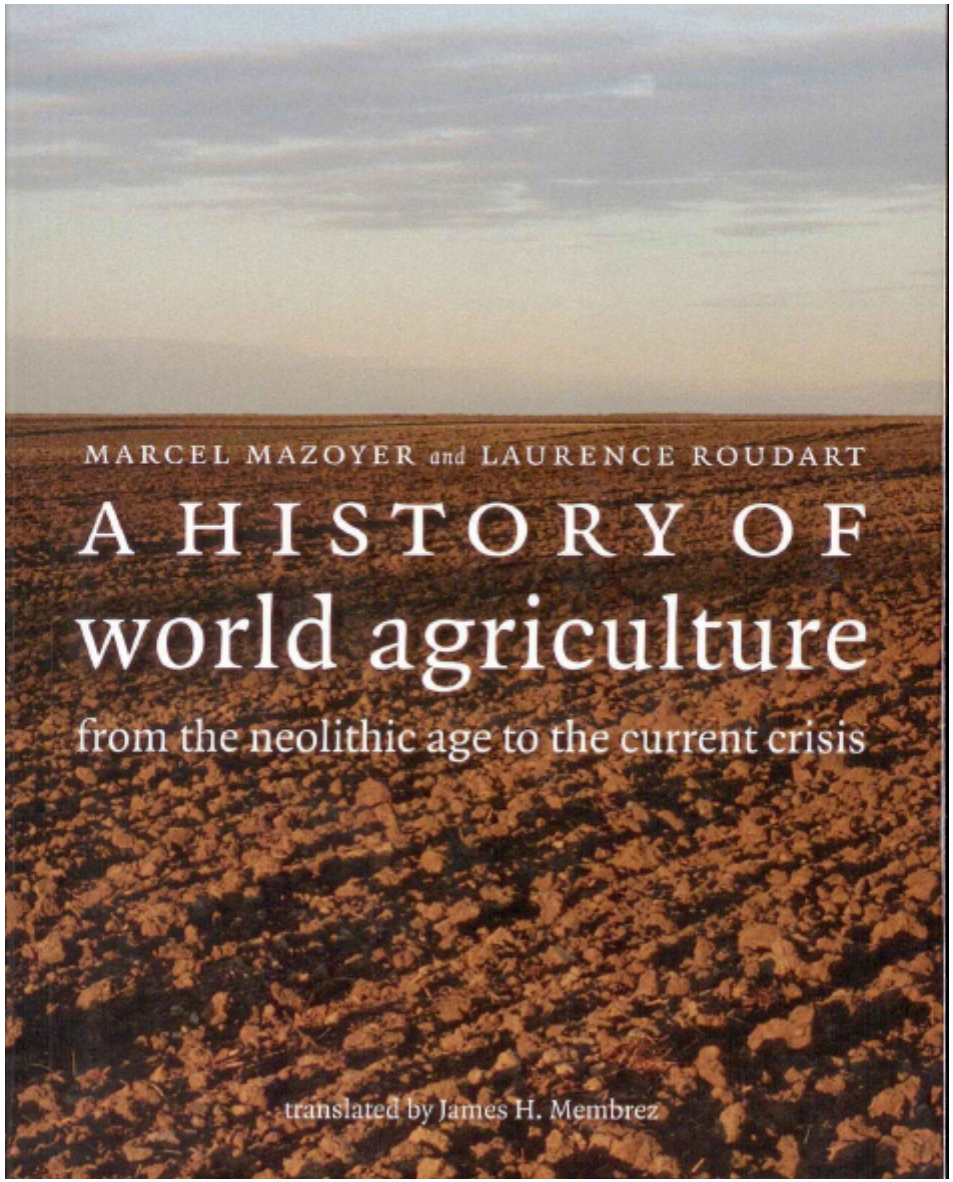
7. Las enseñanzas de la historia agraria



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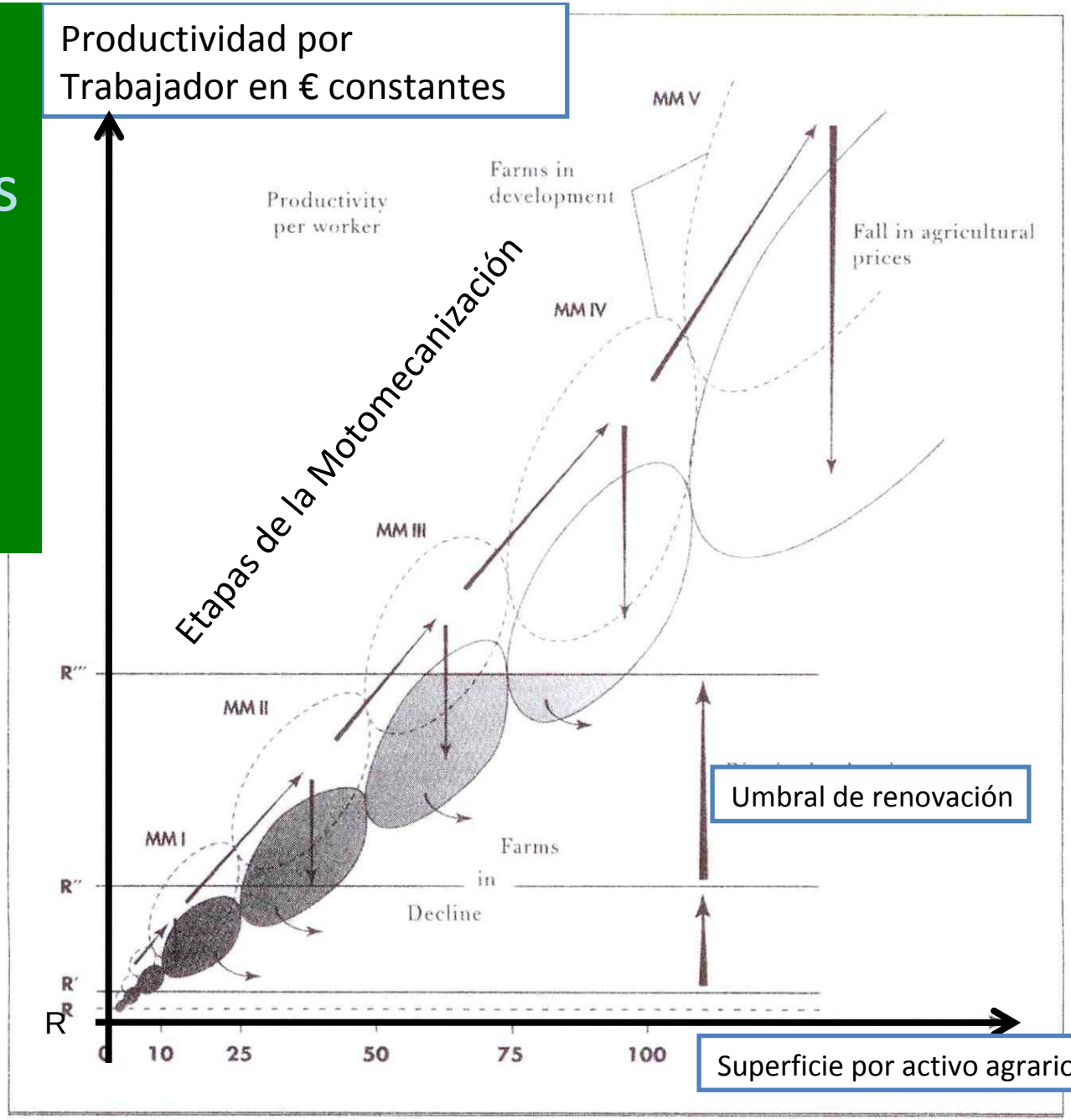
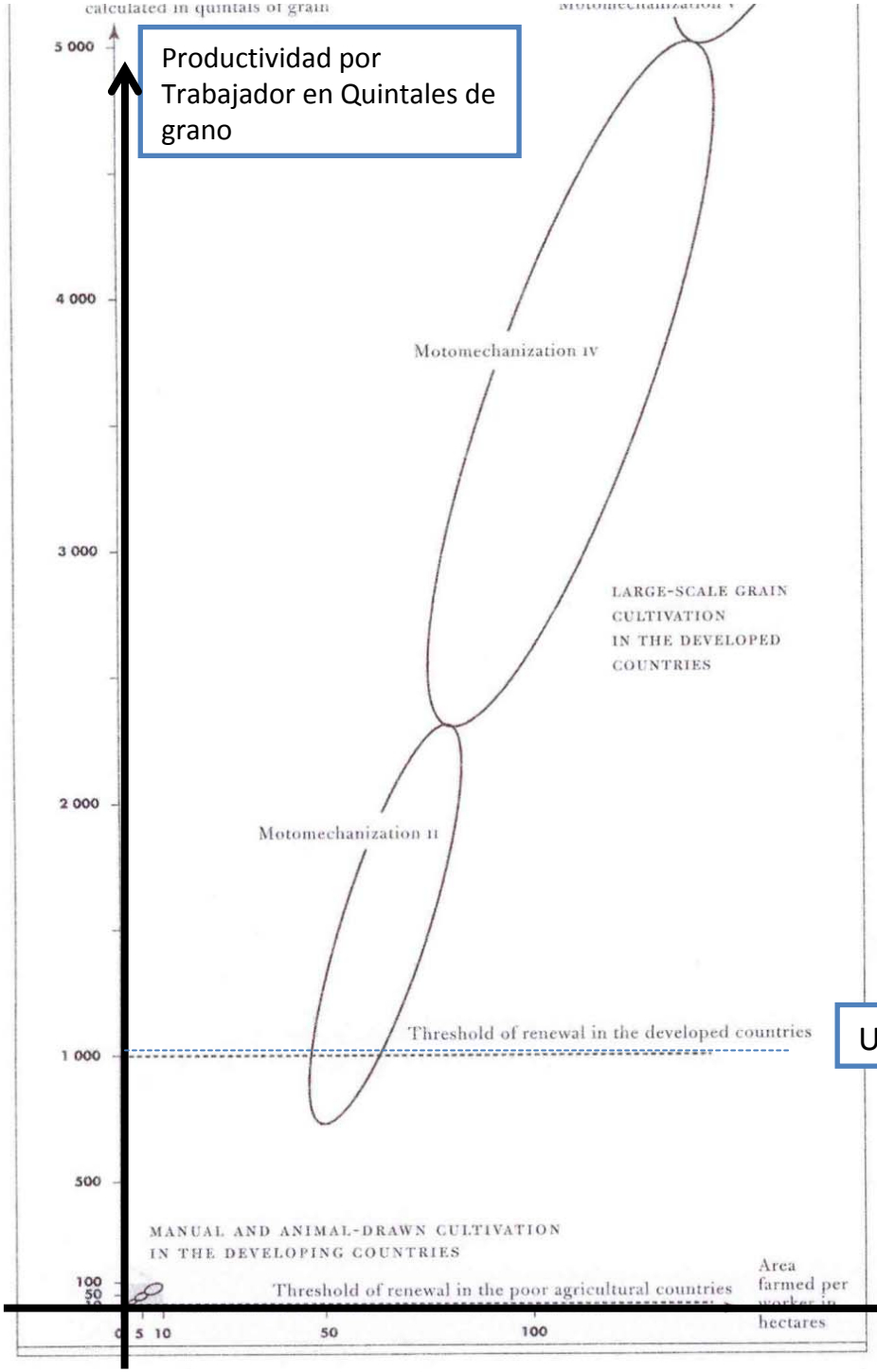


Figure 10.16 Development of Motomechanization, Productivity Gains,

7. Las enseñanzas de la historia agraria

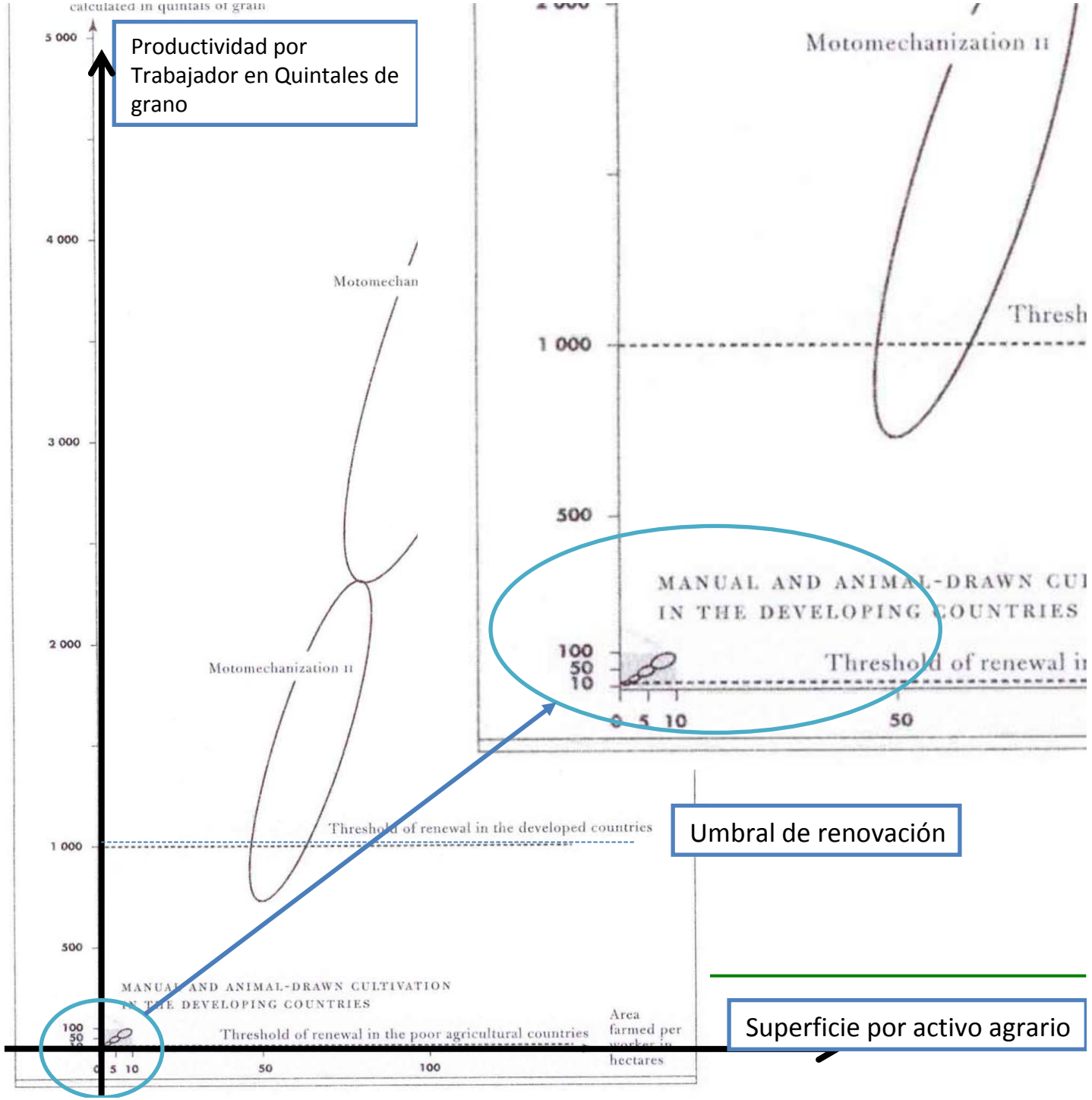


Productividad por Trabajador en Quintales de grano

Umbral de renovación

Superficie por activo agrario

7. Las enseñanzas de la historia agraria



7. Las enseñanzas de la historia agraria

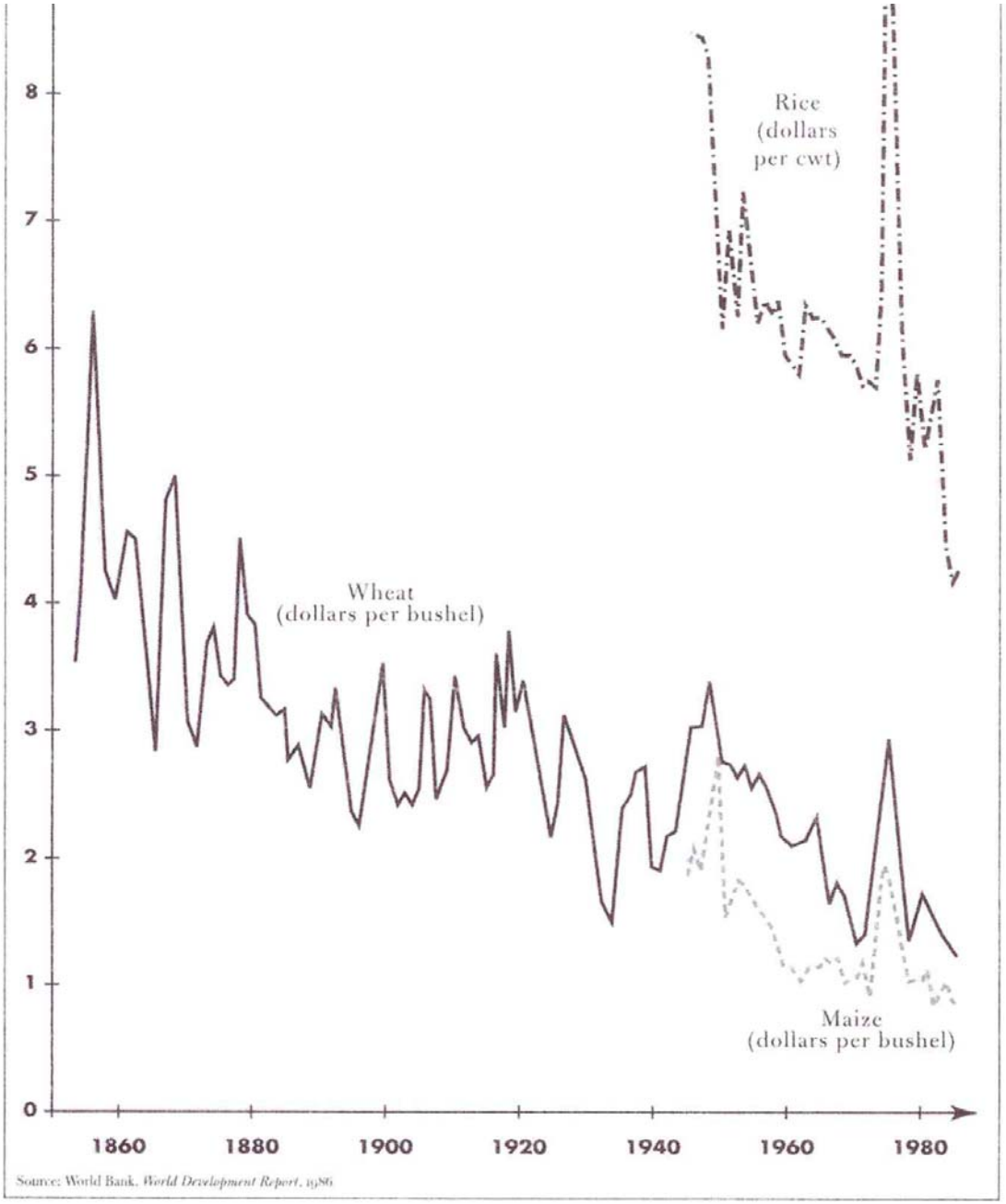
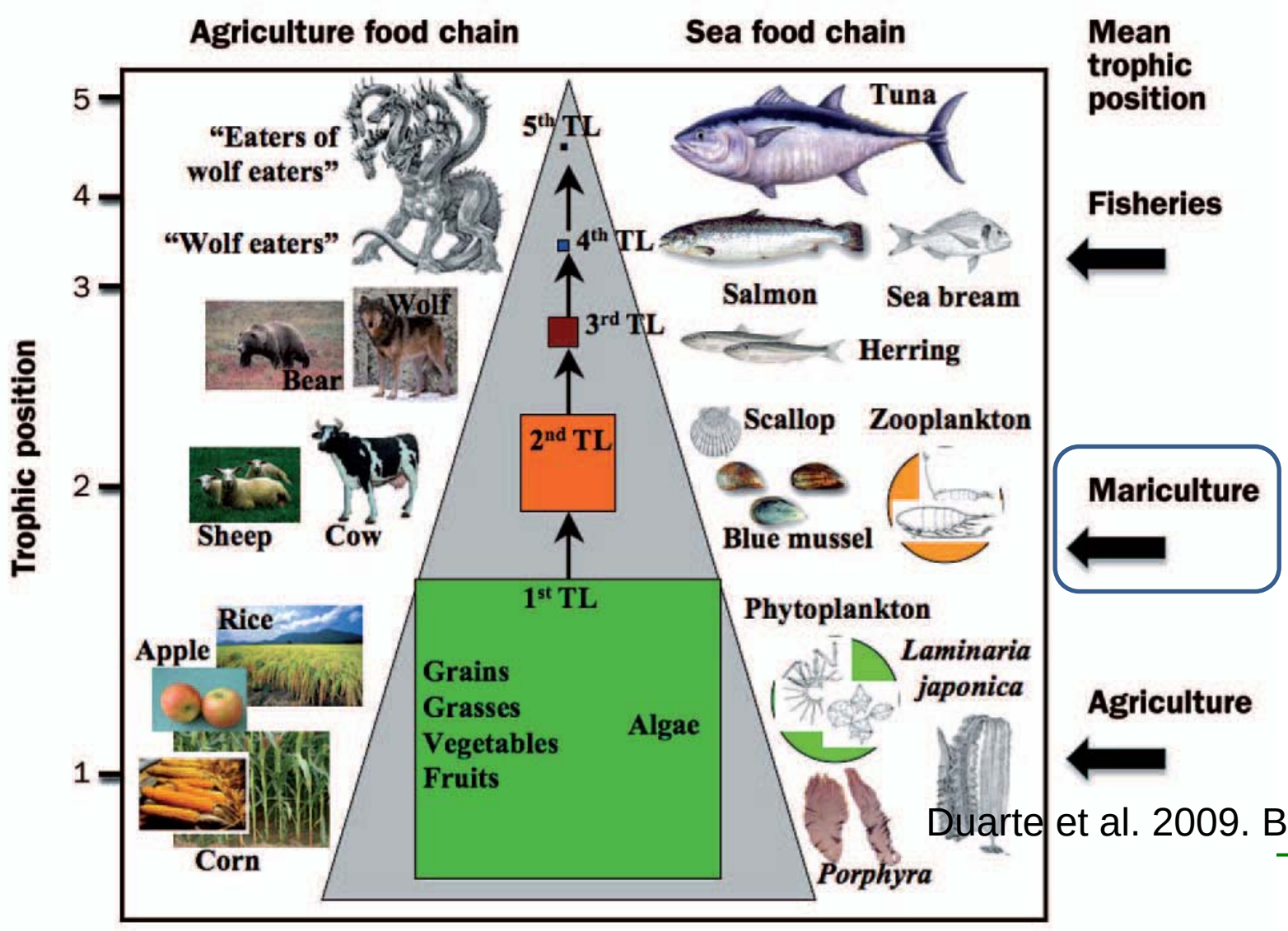


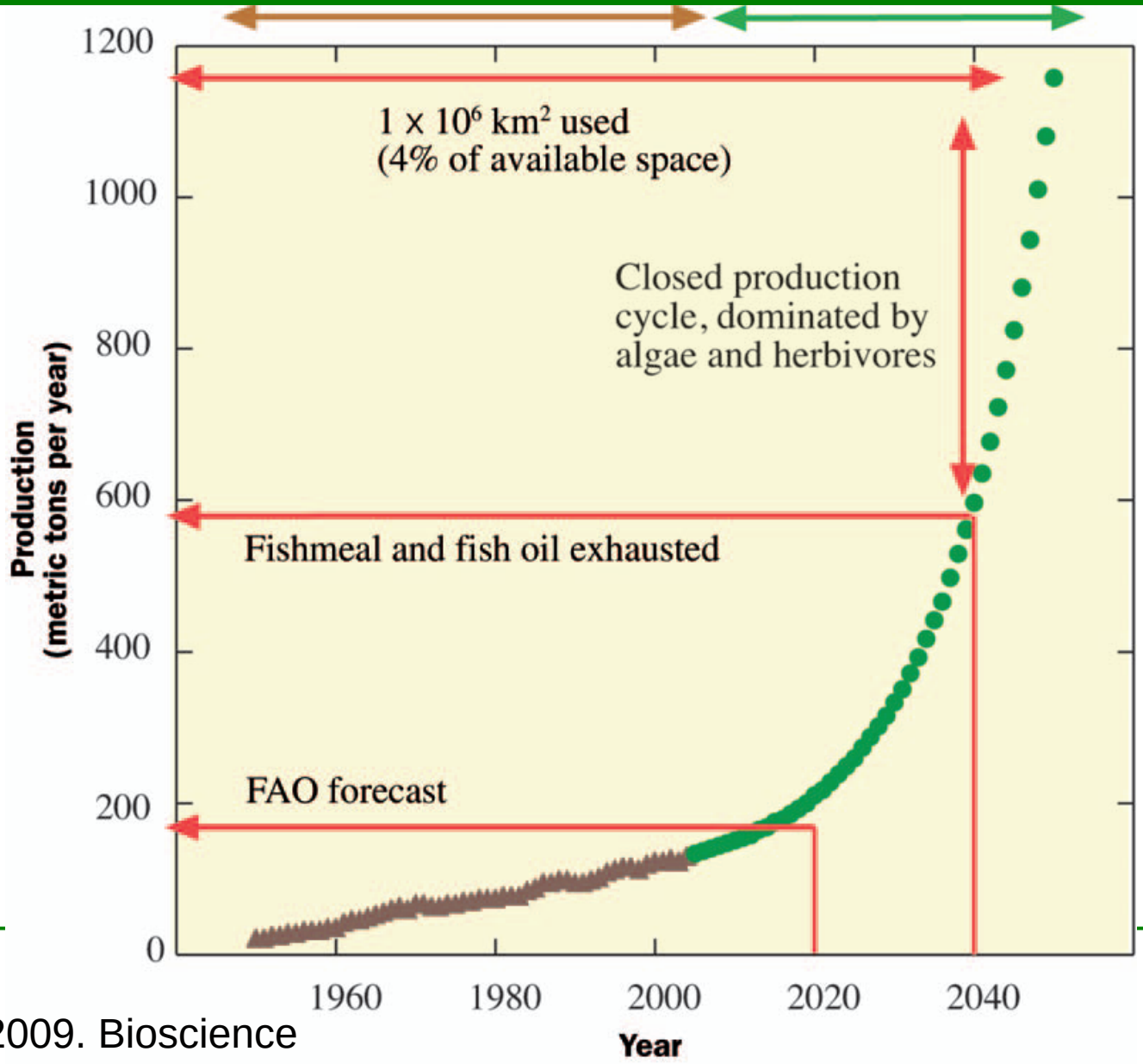
Figure 11.3 Tendency of Real Prices to Fall and Fluctuations in those Prices for Some Major Agricultural Commodities in the United States

8. La especie humana en la cadena trófica



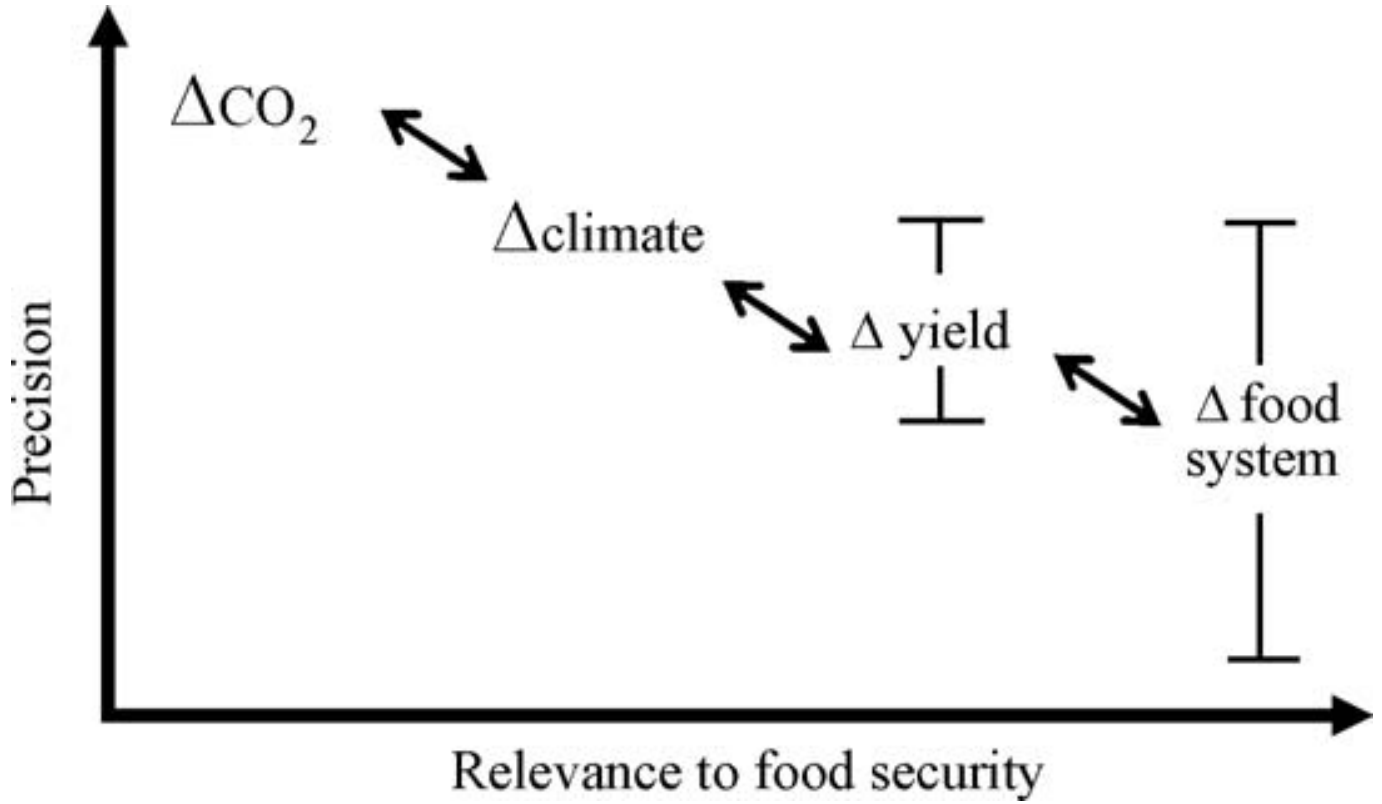
Duarte et al. 2009. Bioscience

8. La especie humana en la cadena trófica



Duarte et al. 2009. Bioscience

Nadie puede predecir el futuro



Fuente: Challinor, 2009 . “Environmental Science & Policy 12 (2009)

“**Si la miseria de los pobres no es debida a las leyes de la naturaleza, sino por causa de nuestras instituciones, grave es nuestro pecado**”

“*If the misery of the poor be caused not by the laws of nature, but by our institutions, great is our sin*”

Charles Darwin

Muchas gracias

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