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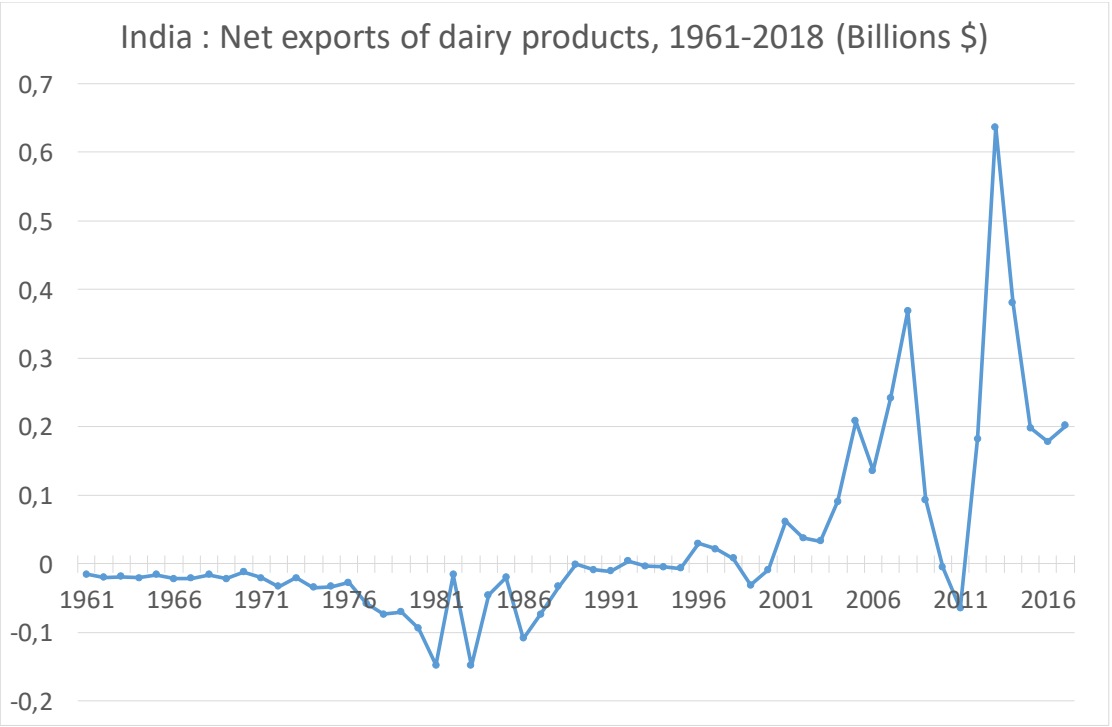
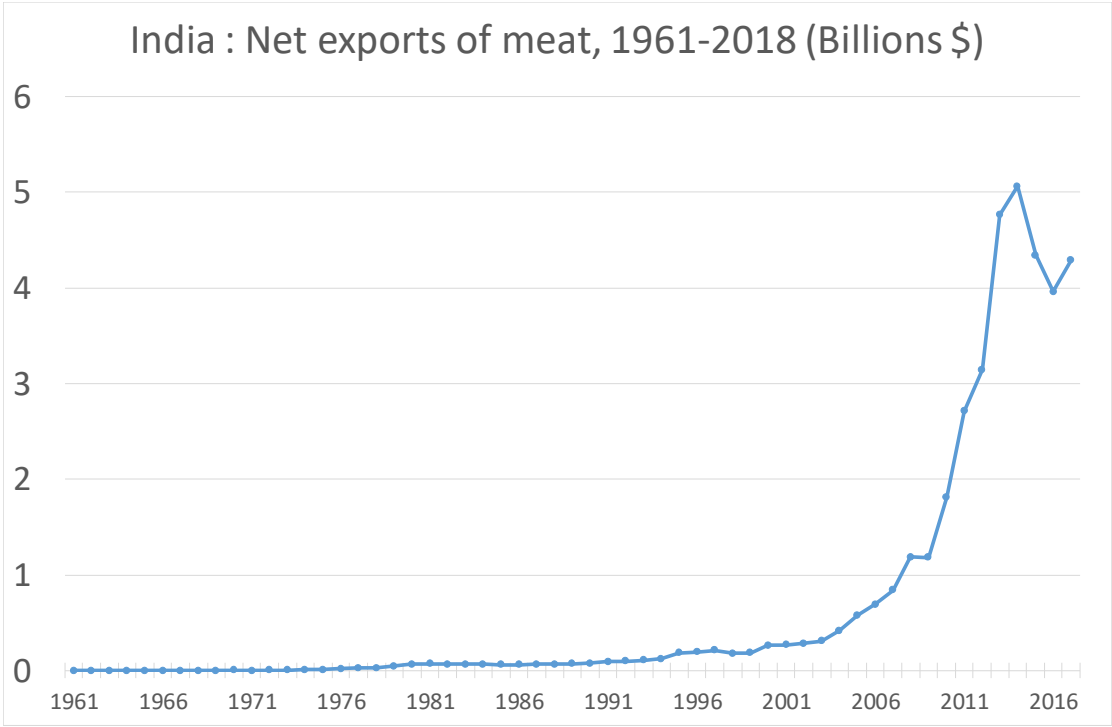
Indian dairy, social metabolism and international trade : a global and historical analysis

Benoit Daviron (Cirad UMR-MOISA), December 2019

Introduction :
A starting point, the surge in Indian net exports of bovine meat and dairy products



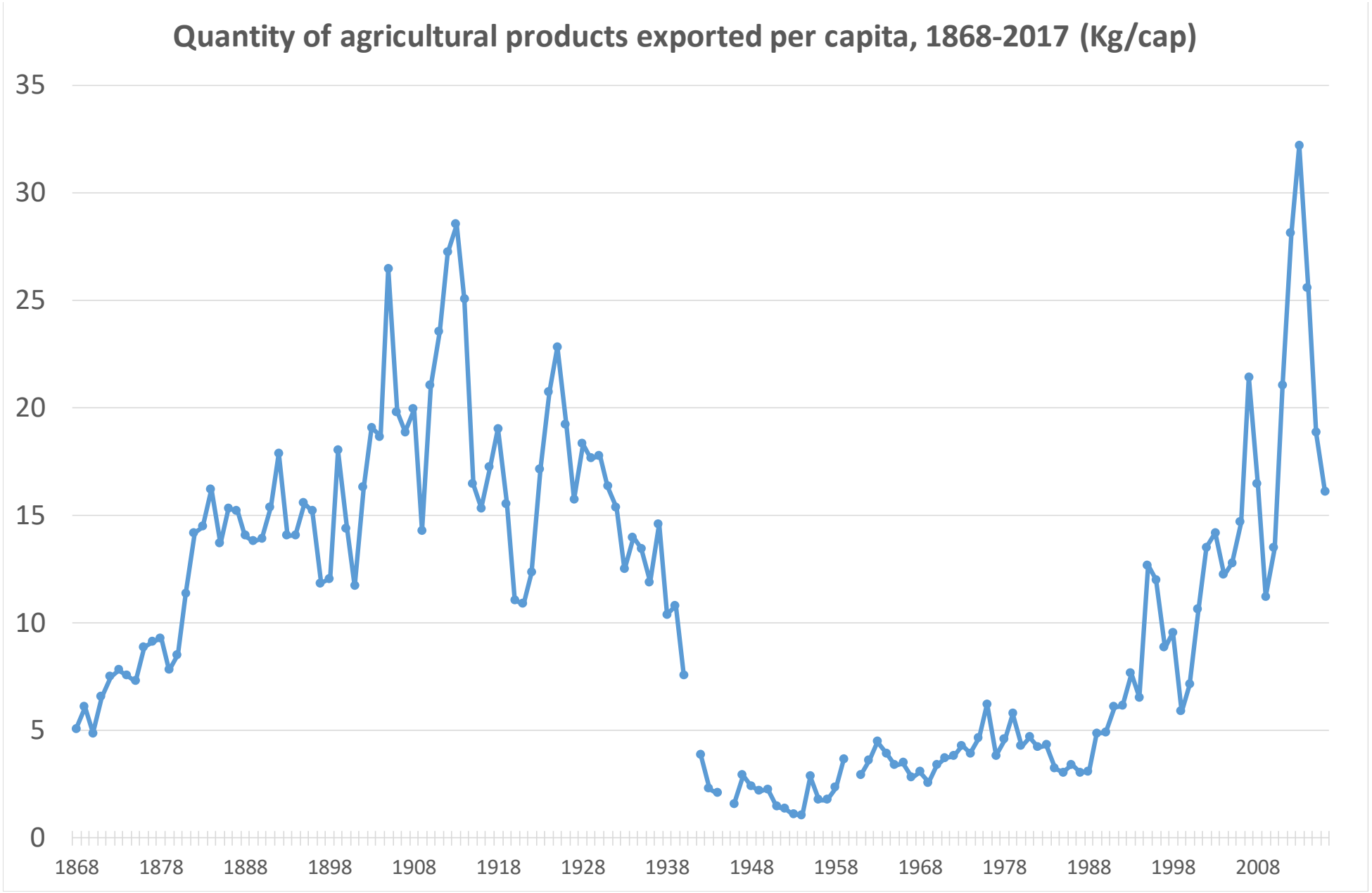


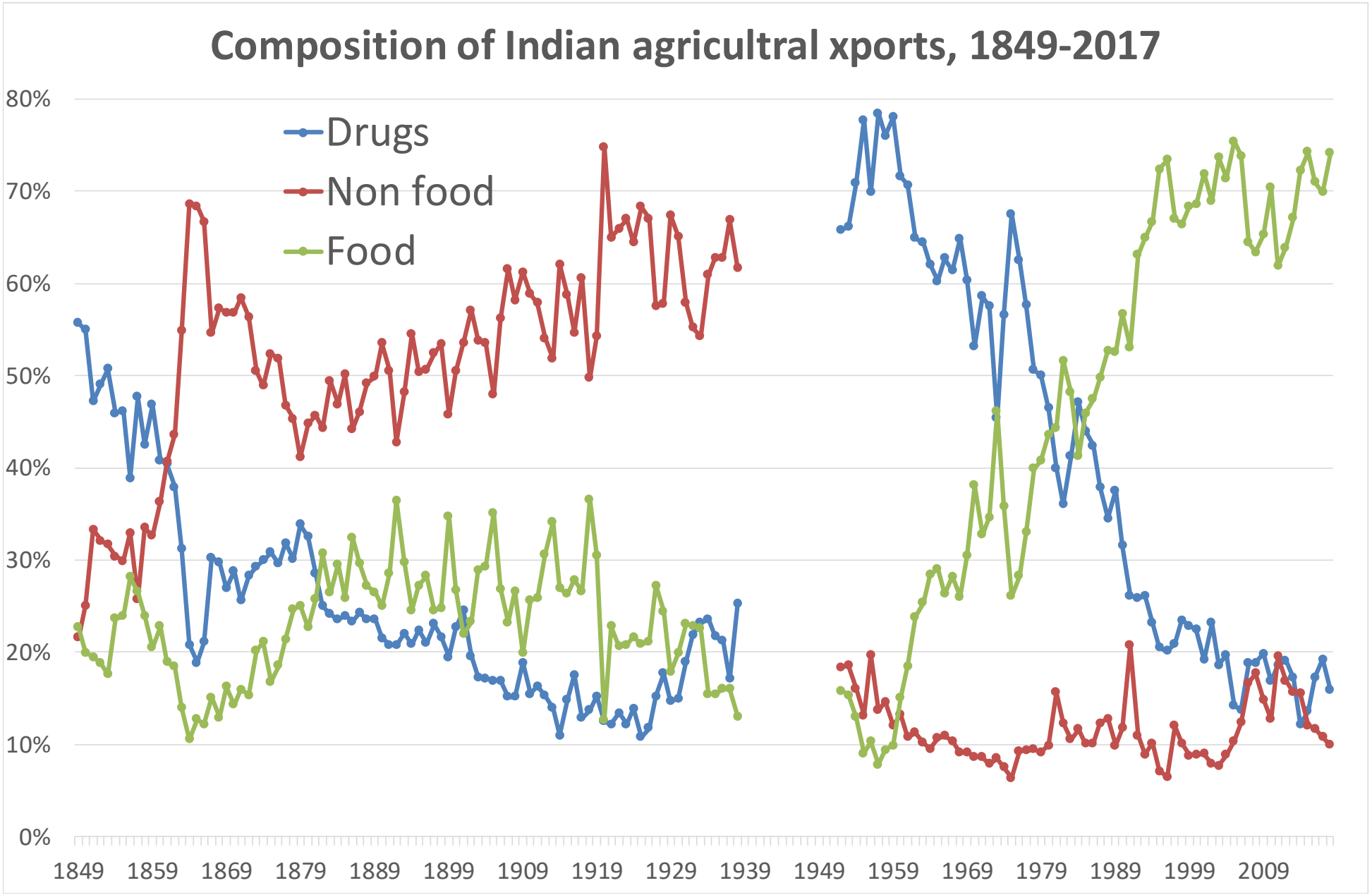
The aim of this presentation

- To propose an interpretation (and evaluation) of this surge :
  - Based on a long term analysis of the Indian agricultural exports
  - By combining the notions of social metabolism and world hegemony (country leader in world capitalism)

Agricultural trade of a country like India can be (greatly) explained by looking at the role played by biomass in the social metabolism of the hegemon

1 – Two historical facts regarding Indian agricultural exports


Quantity of agricultural products exported per capita, 1868-2017 (Kg/cap)
35
30
25
20
15
10
5
0
1868
1878
1888
1898
1908
1918
1928
1938
1948
1958
1968
1978
1988
1998
2008


Composition of Indian agricultral xports, 1849-2017
Drugs
Non food
Food
80%
70%
60%
50%
40%
30%
20%
10%
0%
1849
1859
1869
1879
1889
1899
1909
1919
1929
1939
1949
1959
1969
1979
1989
1999
2009

2 –Social metabolism and Hegemony

A few words about socio-metabolism analysis

- Social-metabolism : flow of matter and energy that go through any social entity (household, city, region, country) (Institute of Social Ecology in Vienna)

- Accumulation of wealth and power supposes the mobilization of new sources of energy and matter

- Material Flow Analysis : MFA measures all the material flows that are required for the establishment, operation and maintenance of socio-economic biophysical stocks
  - Biomass
  - Metallic minerals
  - Non-metallic minerals
  - Fossil energy carriers

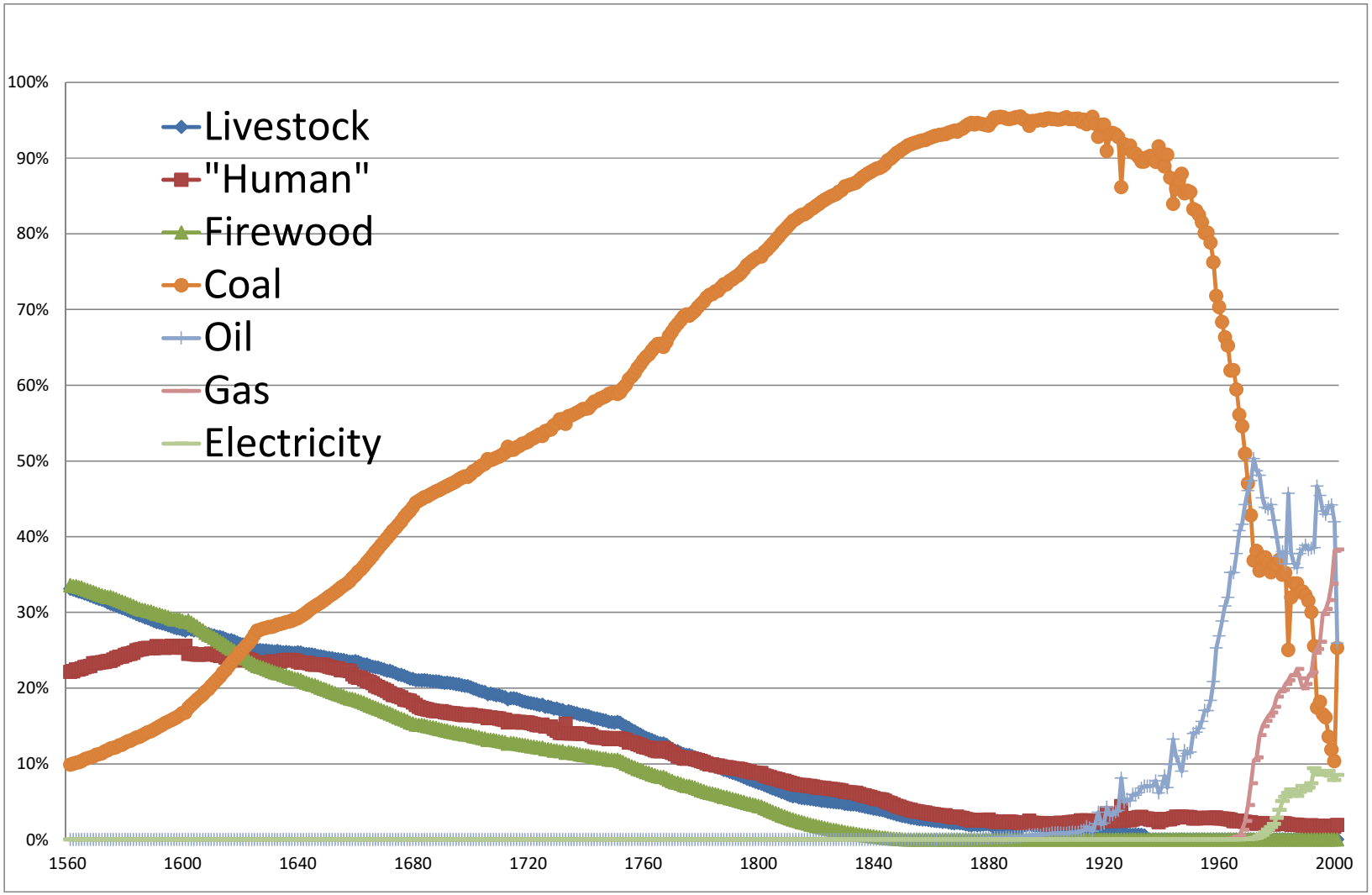
Social metabolism in history

- Solar socio-metabolic regime versus mining socio-metabolic regime (industrial revolution, “development”) : From biomass (+ wind and water stream) to underground (mineral) resources

- Two hegemons and two phases of the mining socio-metabolic regime
    - UK in the XIX°
    - USA in the XX°

The two phases : From coal to oil

Great Britain : Energy carrier share in total consumption, 1560-2010



The two phases : From the first globalization to a nationaly centred growh

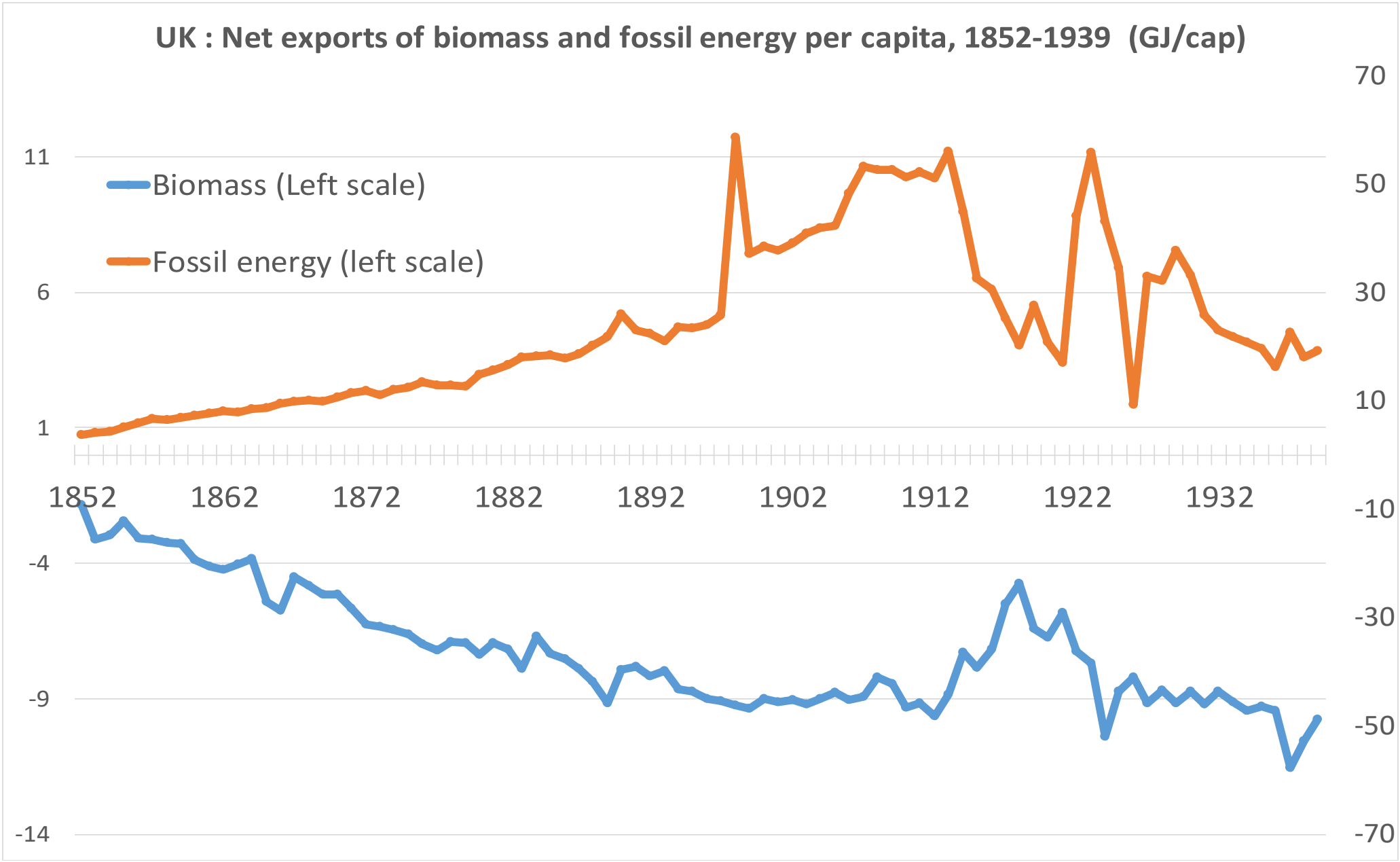
Ratio « international trade »/ « national product »
(E+I)/GDP

	% of GDP
UK 1909-1913	51%
USA 1950 ’s	9%

3 – Agriculture and the British phase of the mining socio-metabolic regime

4 characteristics

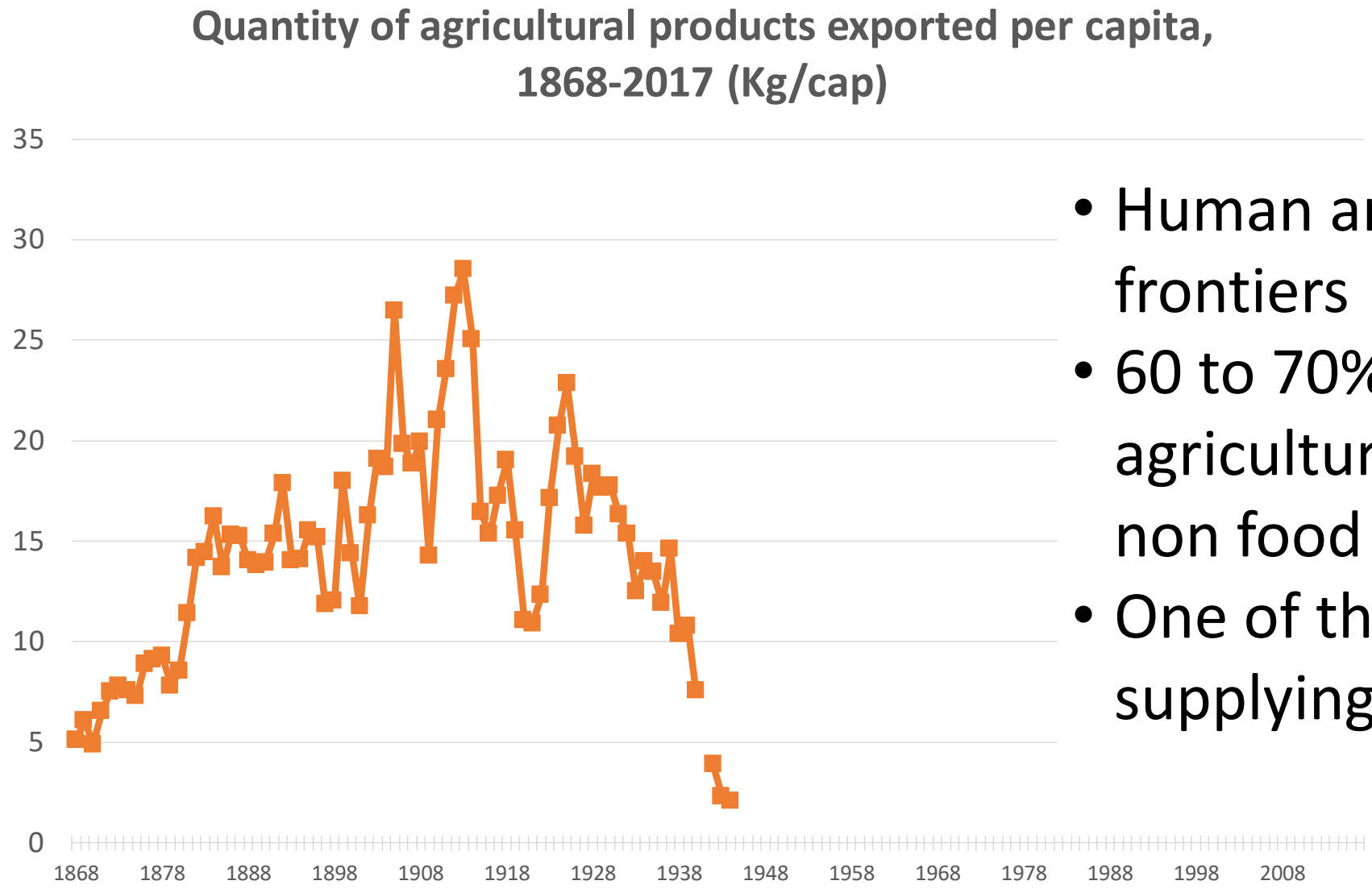
- Coal as a source of thermal energy, steam engine as a source of mechanical energy
- A surge in biomass consumption
- Defeating the tyranny of distance
  - technical : railway, cable
  - institutional innovations: standards and future markets
- Mobilizing the world biomass = > Frontiers : colonization by agriculture of forest and pastoral spaces (mining “natural” ecosystem)


UK : Net exports of biomass and fossil energy per capita, 1852-1939 (GJ/cap)
Biomass (Left scale)
Fossil energy (left scale)
11
6
1
-4
-9
-14
70
50
30
10
-10
-30
-50
-70
1852
1862
1872
1882
1892
1902
1912
1922
1932

United Kingdom : Share of imports in consumption, 1913

	1913
Wheat	81%
Meat	42%
Fibers	97%
Wood	87%

What about India ?



- Human and non human frontiers
- 60 to 70% of agricultural exports are non food products
- One of the few colonies supplying UK

4 – Agriculture and the American mining socio-metabolic regime

The birth of organic chemistry industrial sector

- Born in Germany with dyes (Bayer, BASF, …) and “transferred” during WWI to USA
- Synthesizing molecules and organic products on the basis of coal then oil
- Substituting biomass

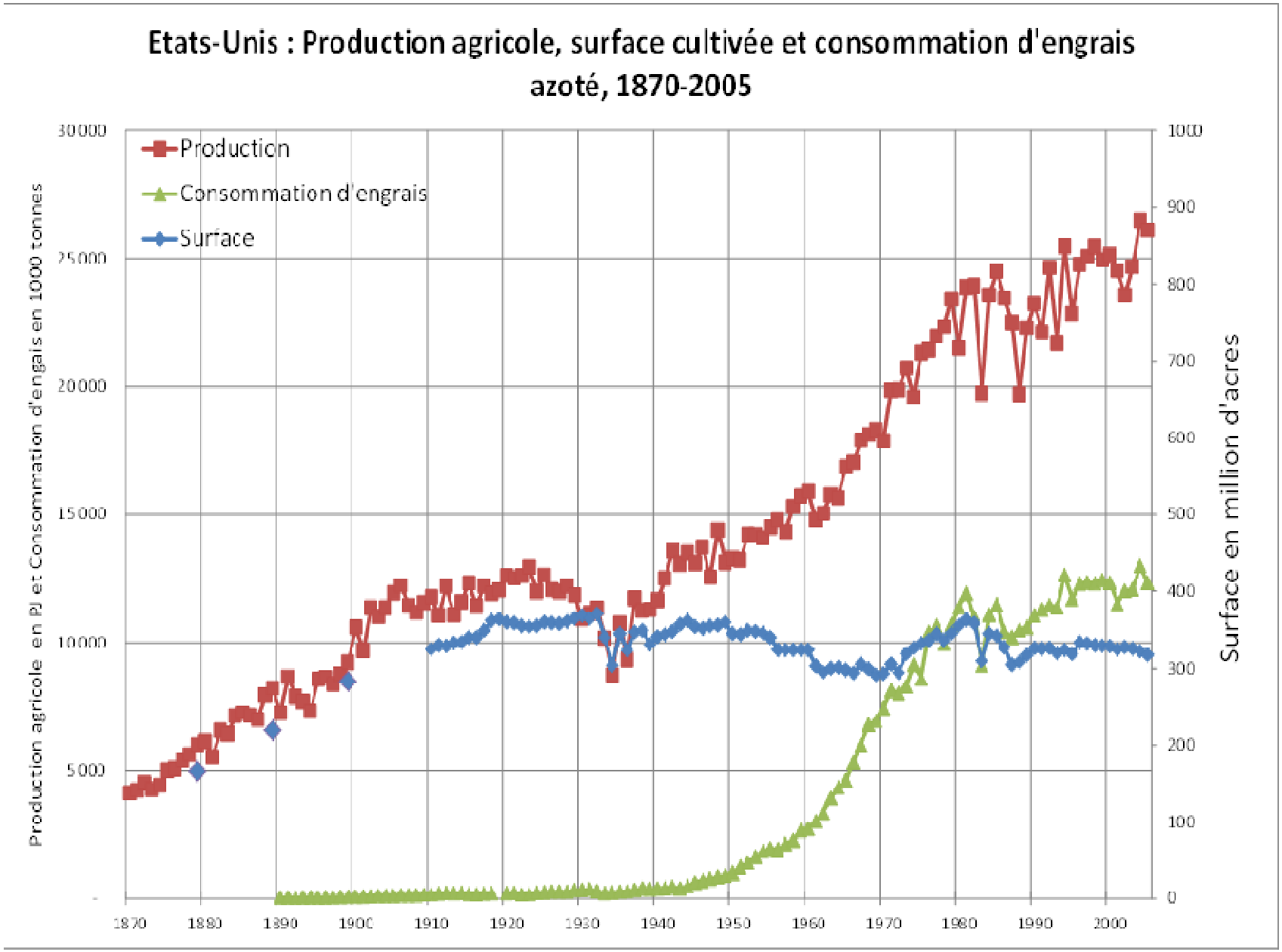
Two major implications for agriculture

Agriculture becomes specialized in food products

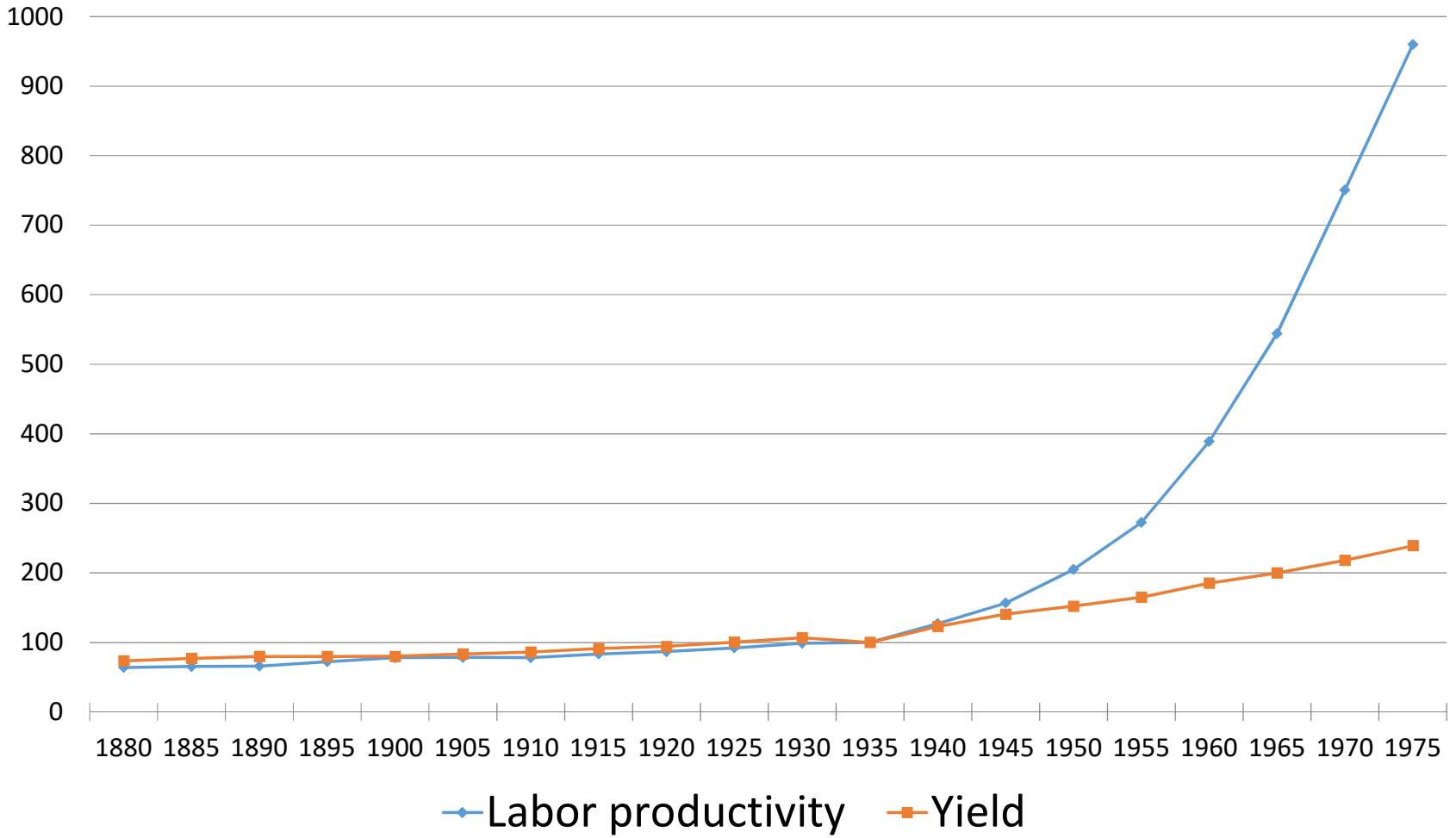
- Non-food uses of agricultural products disappeared
- Ex : Animals production become reduced to proteins and waste

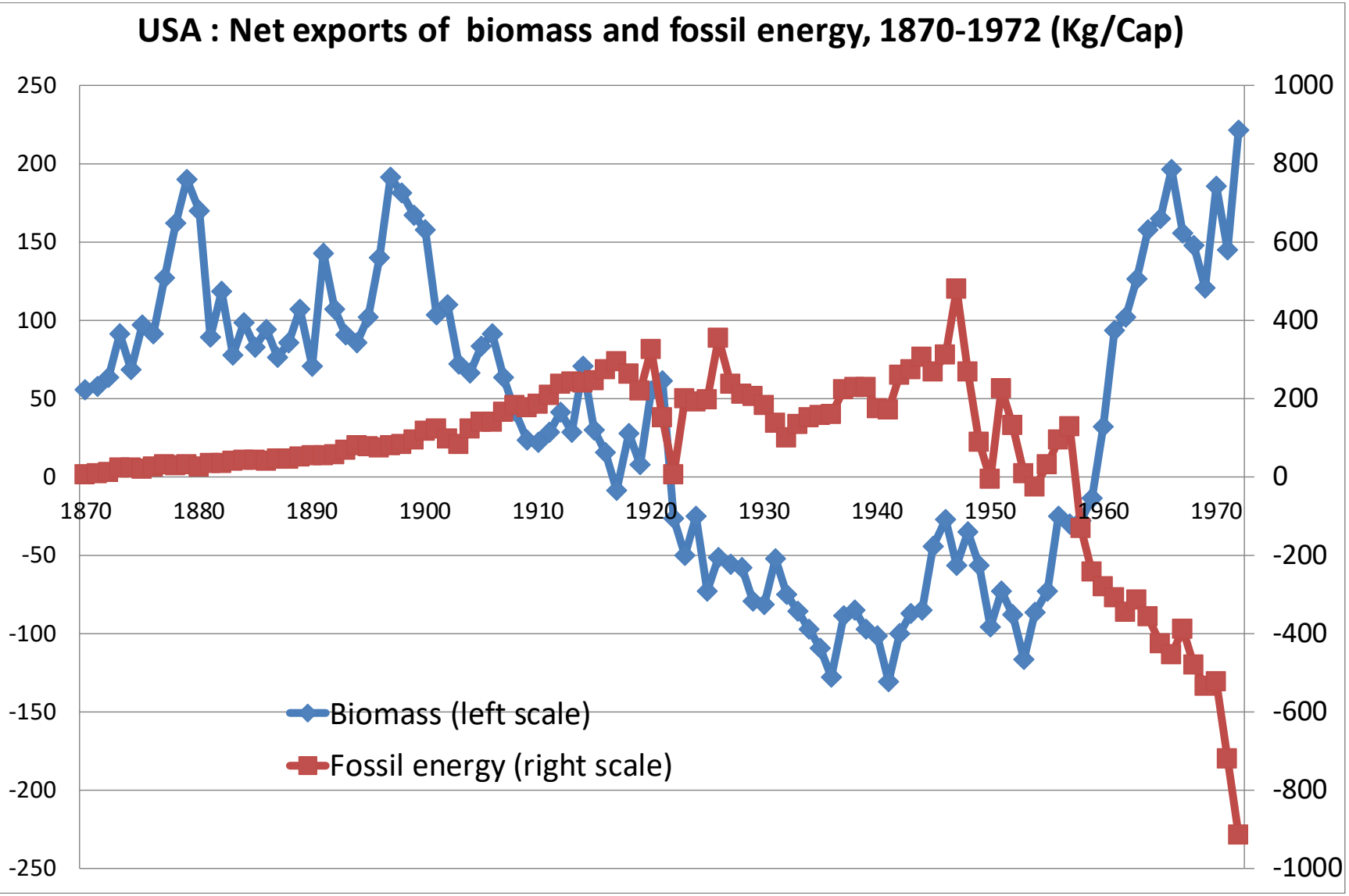
Agricultural growth depends on the "injection" of fossil energy

- Mineral and synthetic fertilizers (Amonia synthesis by Haber/Bosch in 1914)
- Pesticide
- Internal combustion engine (tractors, pumps)


Etats-Unis : Production agricole, surface cultivée et consommation d'engrais azoté, 1870-2005
Production
Consommation d'engrais
Surface
Production agricole en PJ et Consommation d'engais en 1000 tonnes
Surface en million d'acres
30000
25000
20000
15000
10000
5000
-
1000
900
800
700
600
500
400
300
200
100
0
1870
1880
1890
1900
1910
1920
1930
1940
1950
1960
1970
1980
1990
2000

Labor productivity and yield in US agriculture, 1880-1975

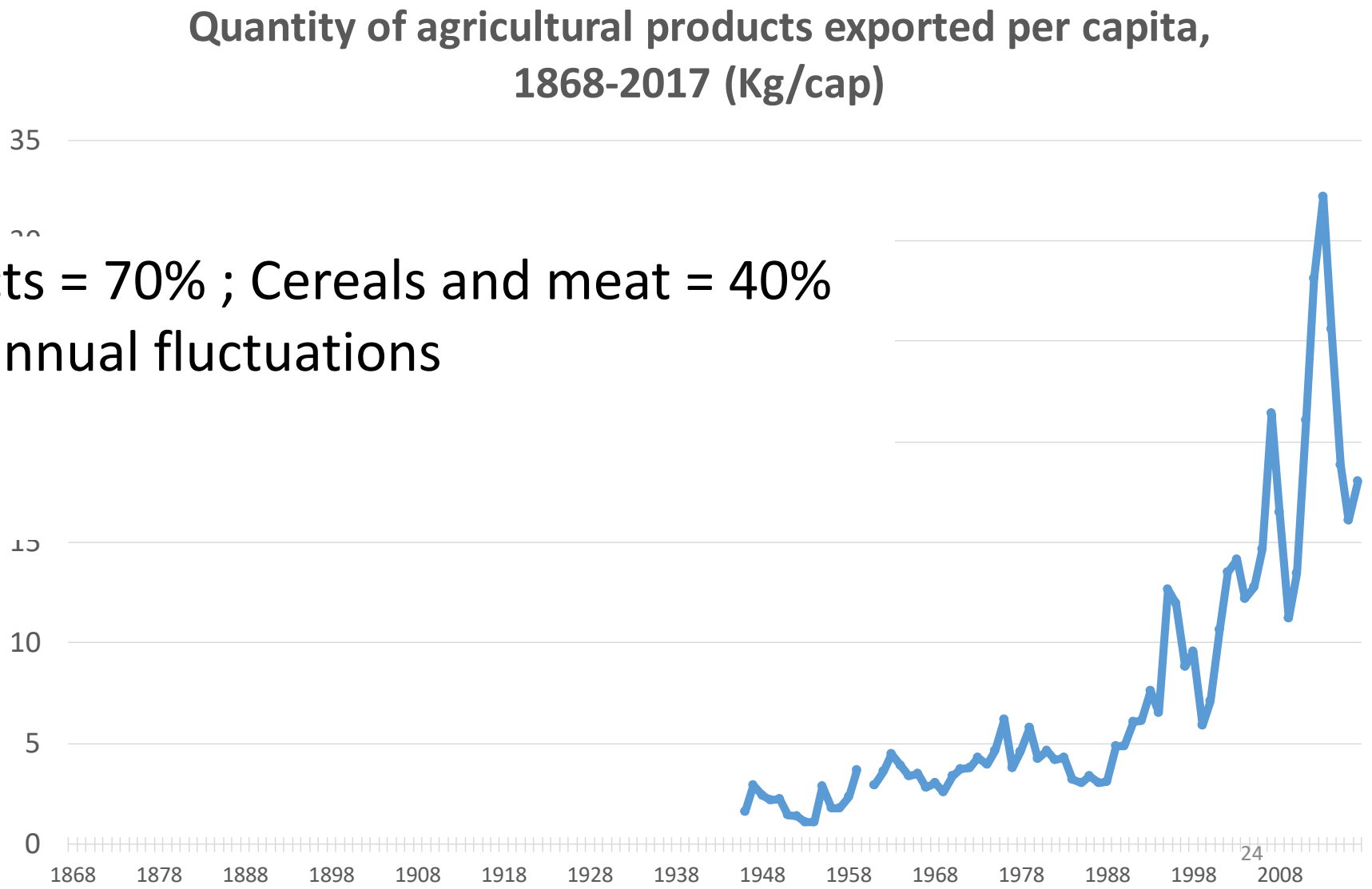


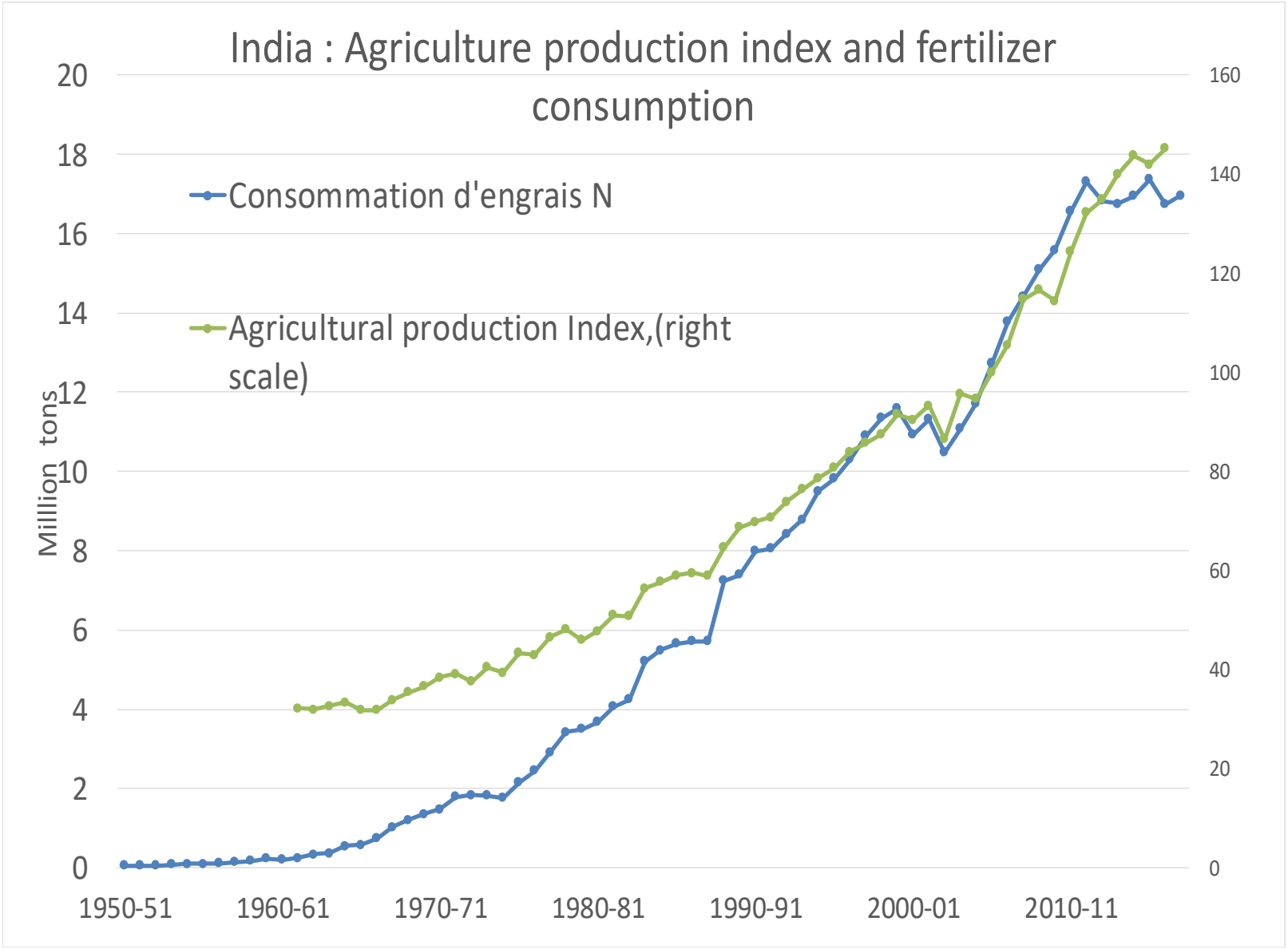


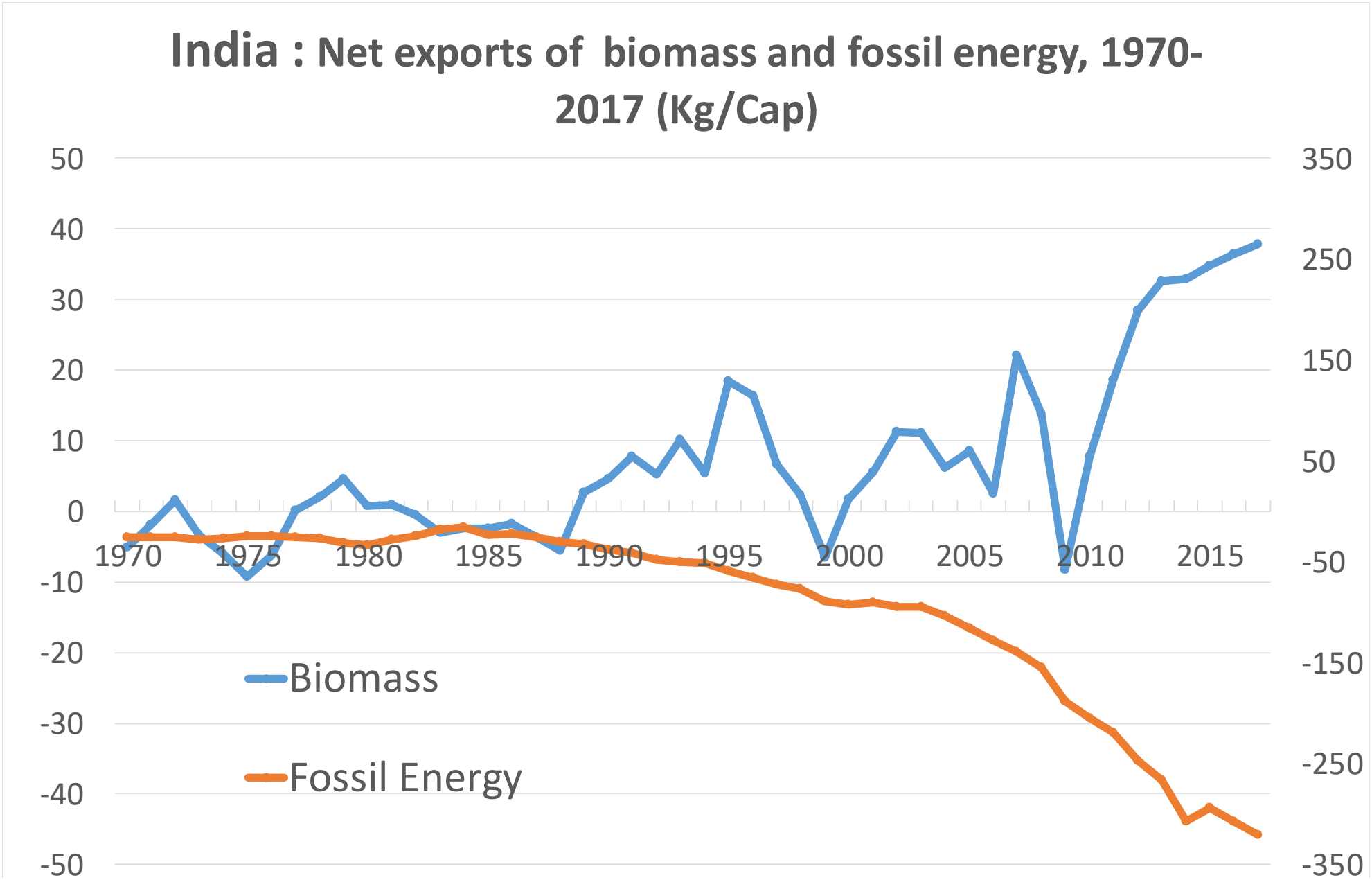
- Exporting surpluses
- Food Aid

What about India ?

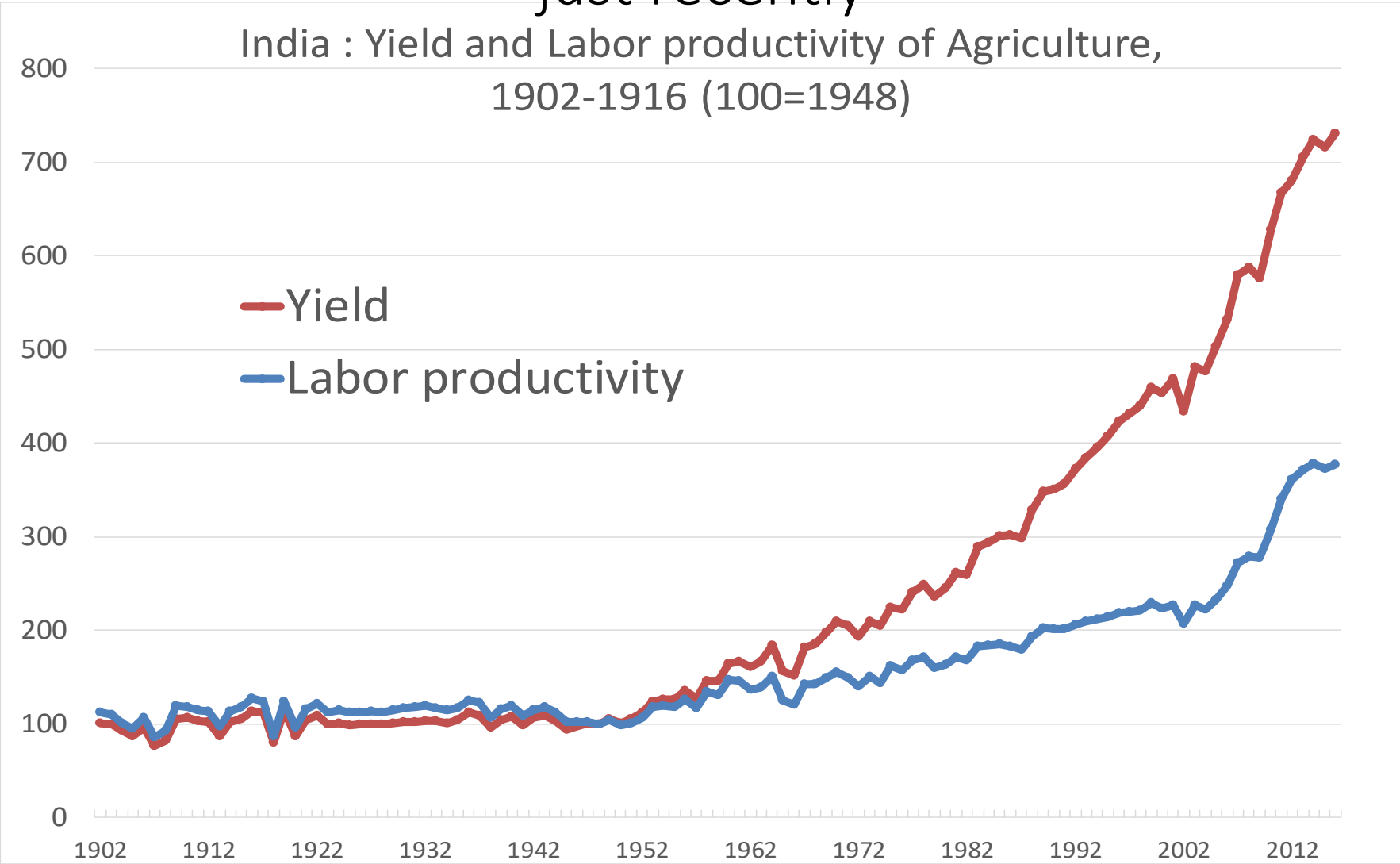
- Food products = 70% ; Cereals and meat = 40%
- Large inter-annual fluctuations




India : Agriculture production index and fertilizer consumption
Consommation d'engrais N
Agricultural production Index,(right scale)
Million tons
0
2
4
6
8
10
12
14
16
18
20
0
20
40
60
80
100
120
140
160
1950-51
1960-61
1970-71
1980-81
1990-91
2000-01
2010-11


India : Net exports of biomass and fossil energy, 1970-2017 (Kg/Cap)
50
40
30
20
10
0
-10
-20
-30
-40
-50
350
250
150
50
-50
-150
-250
-350
1970
1975
1980
1985
1990
1995
2000
2005
2010
2015
Biomass
Fossil Energy

But labor productivity increased more than yield just recently

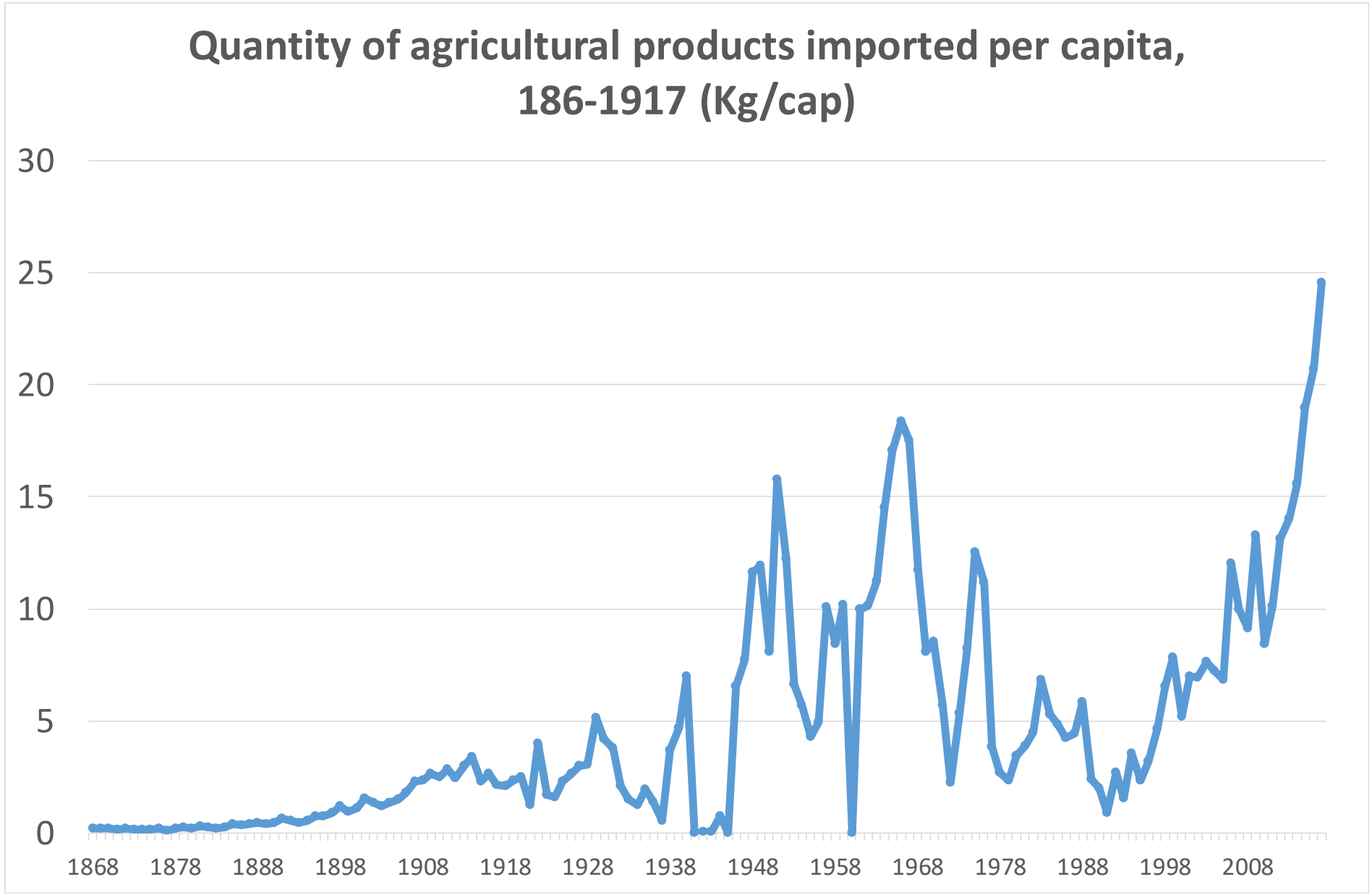


Conclusion : A few questions for the future

Short term 1

Will India reform its agricultural policy to make it compatible with :

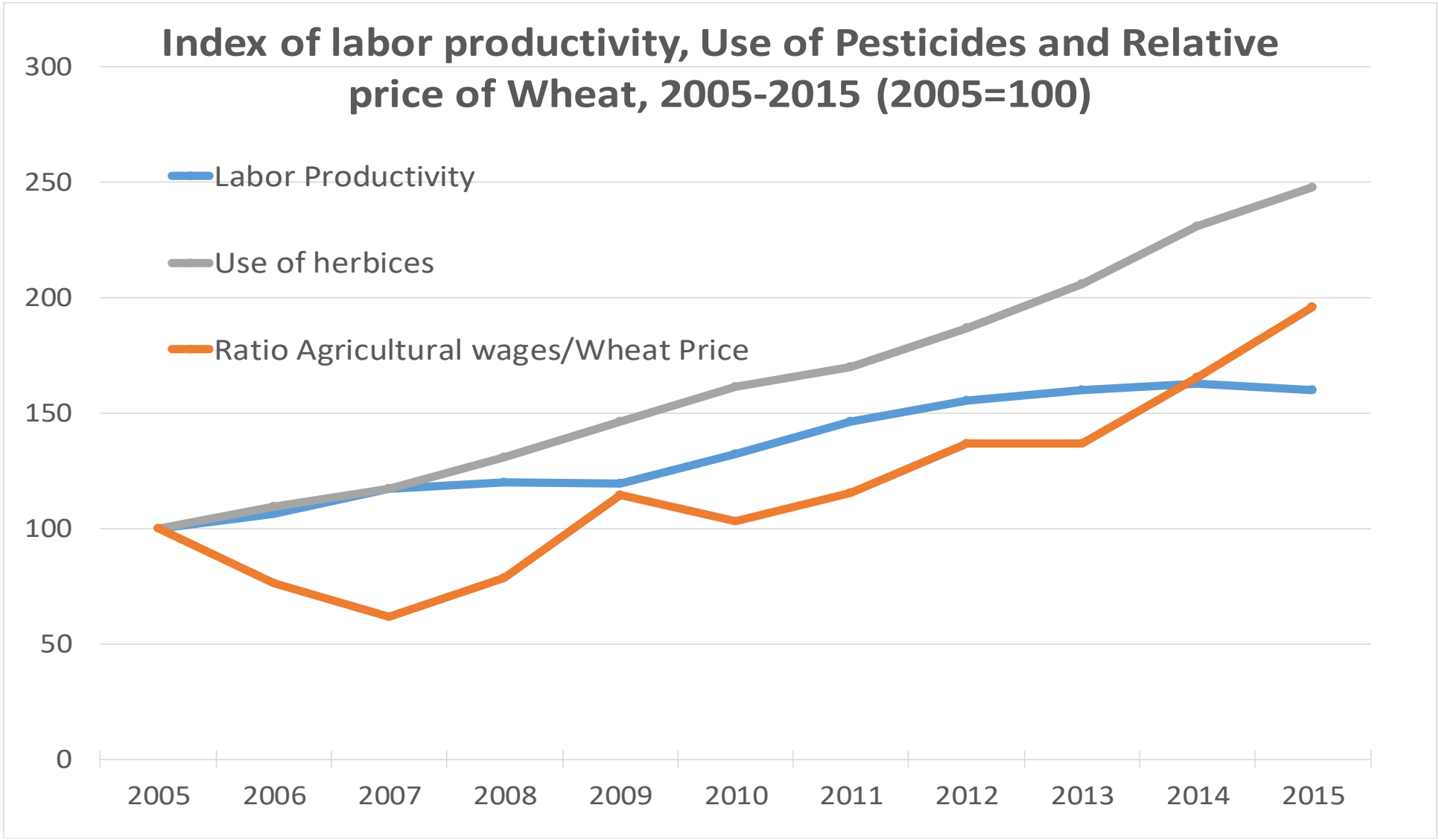
- the second globalization norm of agricultural policy (from domestic market stabilization to competitiveness)
- the increasing internalization its economy
- the surge of its food imports (vegetable oil, legumes/pulses…)


Quantity of agricultural products imported per capita, 186-1917 (Kg/cap)
30
25
20
15
10
5
0
1868
1878
1888
1898
1908
1918
1928
1938
1948
1958
1968
1978
1988
1998
2008

Short term 2

Can chemicals be further used to increase agricultural labor productivity ?

The “Herbicide Revolution”



Long term

- How to exchange agricultural product without mining national ecosystems ?

- How to go back to biomass and to crop and animal multifonctionality ?

Sources :

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Thanks