



BIO 235
Plants & People
Evolution &
Domestication
of Crops



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BIO 235

Plants & People - Evolution & Domestication of Crops

13 Lectures:

- The origins of agriculture & crop origins - where, when, why, how, and how many times? Genetics & archaeology.
- Crop domestication syndromes, variation & selection, genes involved in domestication, hybrid and polyploid crops.
- Examples - major crops, minor crops, what do we eat today?
- Crop genetic resources and conservation - why does diversity matter?
- Modern food production - food security, globalisation, seasonality, genetic modification, Frankenstein food, organic food, fast food, slow food, fair food, cheap food.

OLAT: pdf of detailed course outline; pdfs of lecture powerpoint files before lecture.

Assessment:

- Course assignment: 'What do we eat today?' = 50%; starts in week 4
- Exam - 1.5 hrs on 17th Dec = 50%

Language: English (including assignments & exam)

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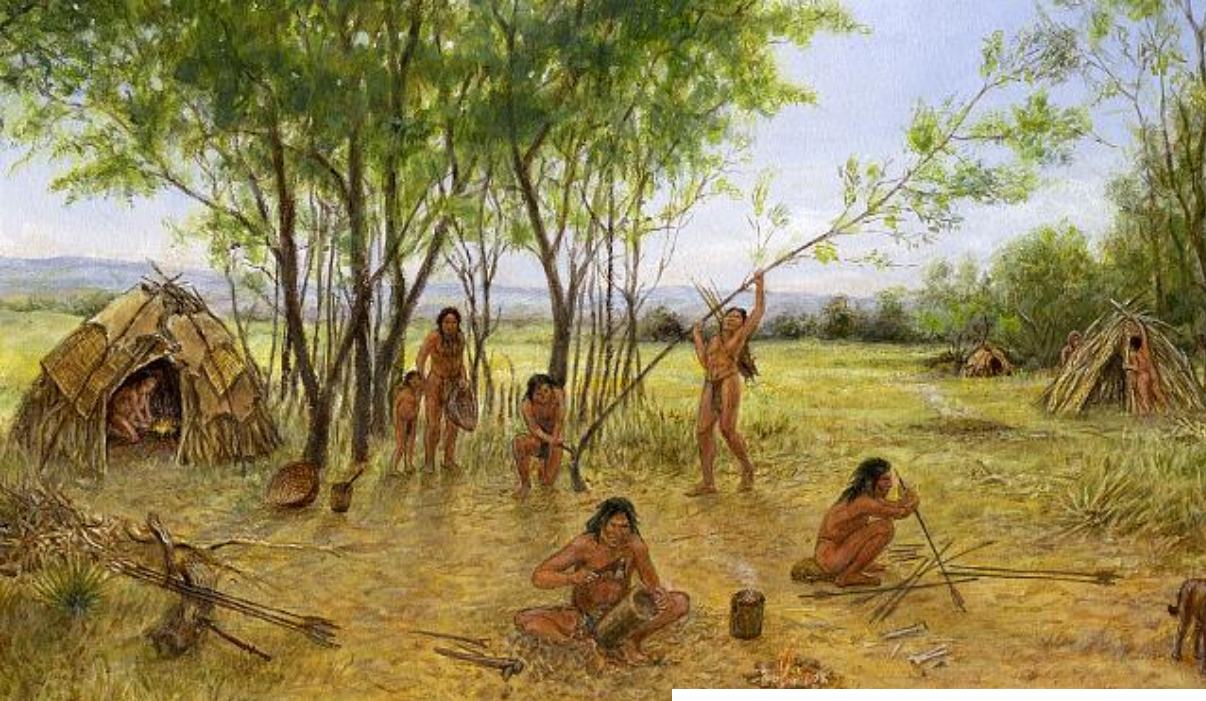
There will be no lecture in Week 5, i.e. on 15th October.

Lecture 5 will be combined with Lecture 6



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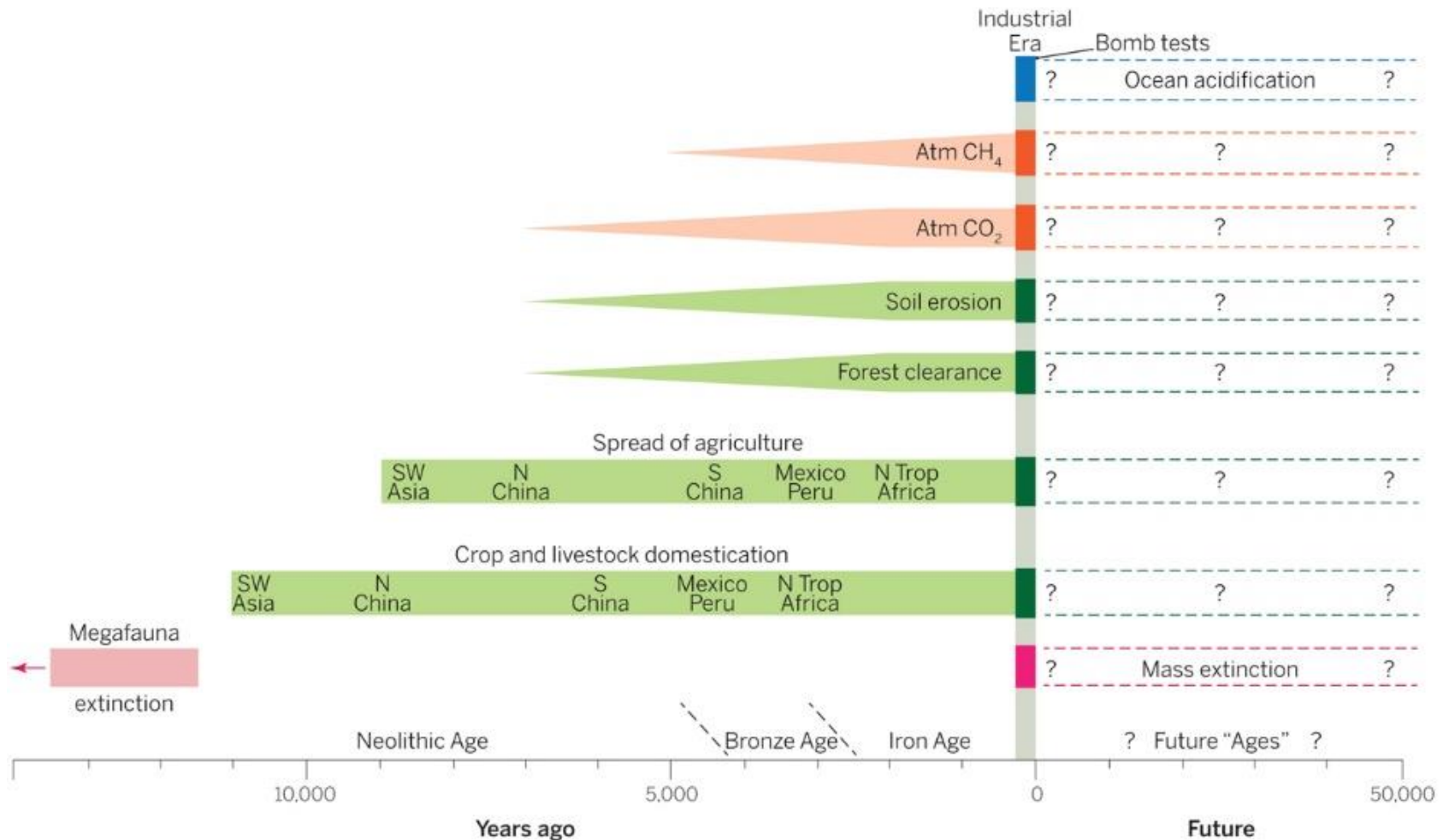


Foraging to Farming



The Anthropocene

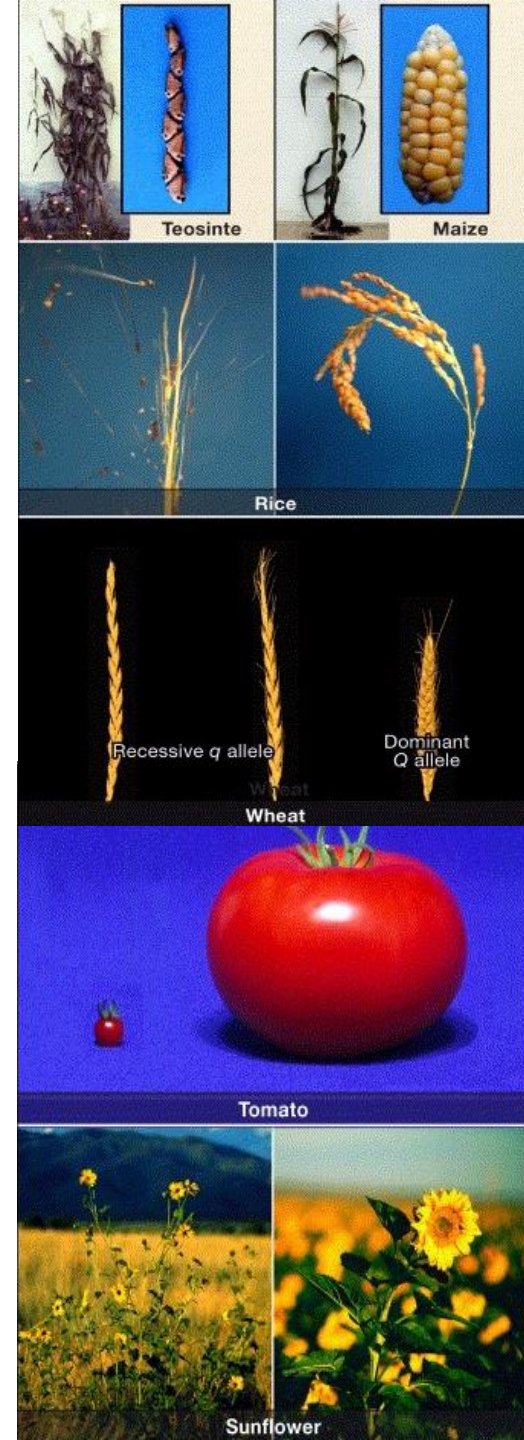
Long-term anthropogenic changes



Crop Domestication

Plant Domestication = Genetic modification of a wild species to create a new form of plant altered to meet human needs

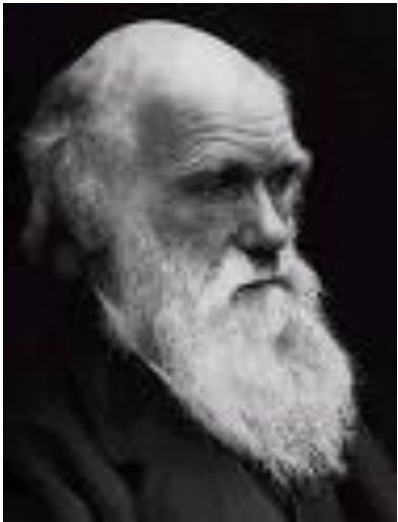
Fully Domesticated = For many, but not all crops, domesticated crops are completely dependent on humans and unable of propagating in the wild (e.g. maize, cauliflower)





This shows how the history of cultivated plants is allied to the most important problems of general history of organized beings.

Alphonse Pyramus de Candolle. 1882. *Origin of Cultivated Plants*



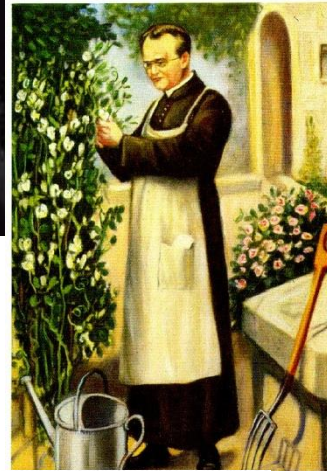
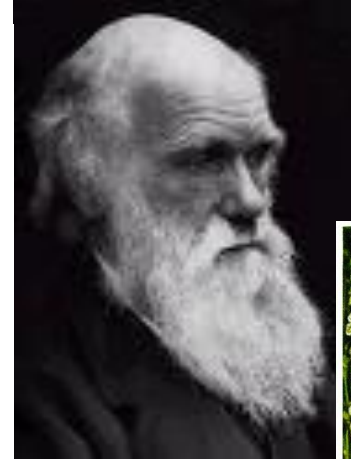
Although Man does not cause variability and cannot prevent it, he can select, preserve, and accumulate the variations given to him by the hand of Nature almost in any way he chooses; and thus he can certainly produce a great result.

Charles Darwin. 1883. *The Variation of Animals and Plants under Domestication*

When human desires collide with the diversity of nature, the results can be great indeed.

Crops in Plant Science

- Research on crop plants at the forefront of revolutions in plant biology:
 - Charles Darwin's 1883 studies of variation and selection - *The Variation of Animals and Plants under Domestication*
 - Gregor Mendel's 19th Century experiments on the garden pea and the insights they provided into the mechanisms inheritance
 - Barbara McClintock's discovery of transposable elements in maize in the 1950s for which she won a Nobel Prize in 1983
 - Jun Yu and the rice genome in 2002 - the first crop plant to be sequenced and the second plant species after Arabidopsis to have its entire genome sequenced
- Understanding the diversity and origins of crops is of central importance in plant biology and beyond.



Global Food Security

German diary The solid citizens of Stuttgart show revolutionary zeal » page 9

the guardian weekly

Global views on world events | guardianweekly.co.uk | 10-16 September 2010



In demand ... wheat ears ready to be harvested near Stafford in the UK Christopher Furlong/Getty Images

Emergency meeting to address new food crisis

Weather and traders blamed for price hikes
FAC global food index rises 5% in a month
Juliet Kollwe and Raj Patel Observer

Two years after the last food crisis, food inflation is back as a global issue. As in 2008, rocketing prices are the result of rising demand and supply shortages caused by fuel weather and poor harvests. Moreover, these conditions are exacerbated by speculation on commodity markets and changing diets in fast-growing Asian countries. The UN's Food and Agriculture Organisation (FAO) last week called an emergency meeting for 24 September to discuss the food crisis. In Mozambique, riots broke out following the government's decision to raise bread prices by 30%, following double-digit hikes in the price of energy and water. The unrest left seven people dead and hundreds injured. Mozambicans spend an average of three-quarters of their household budget on food and half of Mozambique's poor already suffer from acute malnutrition, according to the FAO. The global concerns were strengthened as the Russian government extended its export ban on wheat by another 12 months as it battles drought, shortages and inflation at home. This has completely changed the complexion of the market, said Sudakshina Undurkhan, a commodities analyst at Barclays Capital. "We see further upside for corn and wheat prices. Consuming countries are scrambling to gain access to supplies." European wheat prices hit more than \$294 a tonne last week, just below last month's two-year high. Corn prices are at their highest level since June 2009 while sugar has been on a rollercoaster ride after hitting a 29-year peak in February. The European flour milling association has highlighted the role of speculators in driving up wheat prices, although the global shortage appears to be the main factor. E&O economist Abdoelreza Abhisit stresses the prospect of further civil unrest in less developed countries if the price of basic food continues to rise. "India's move is another unfortunate development that will prolong upward pressure on grain prices and contribute to higher prices."

International
Drug wars have taken a Mexican valley back to the 1880s » page 10

Review
Communism seemed to be the future as Sputnik flew high » page 25

Comment
Simon Jenkins says Tony Blair was a great talent and a miserable prime minister » page 21

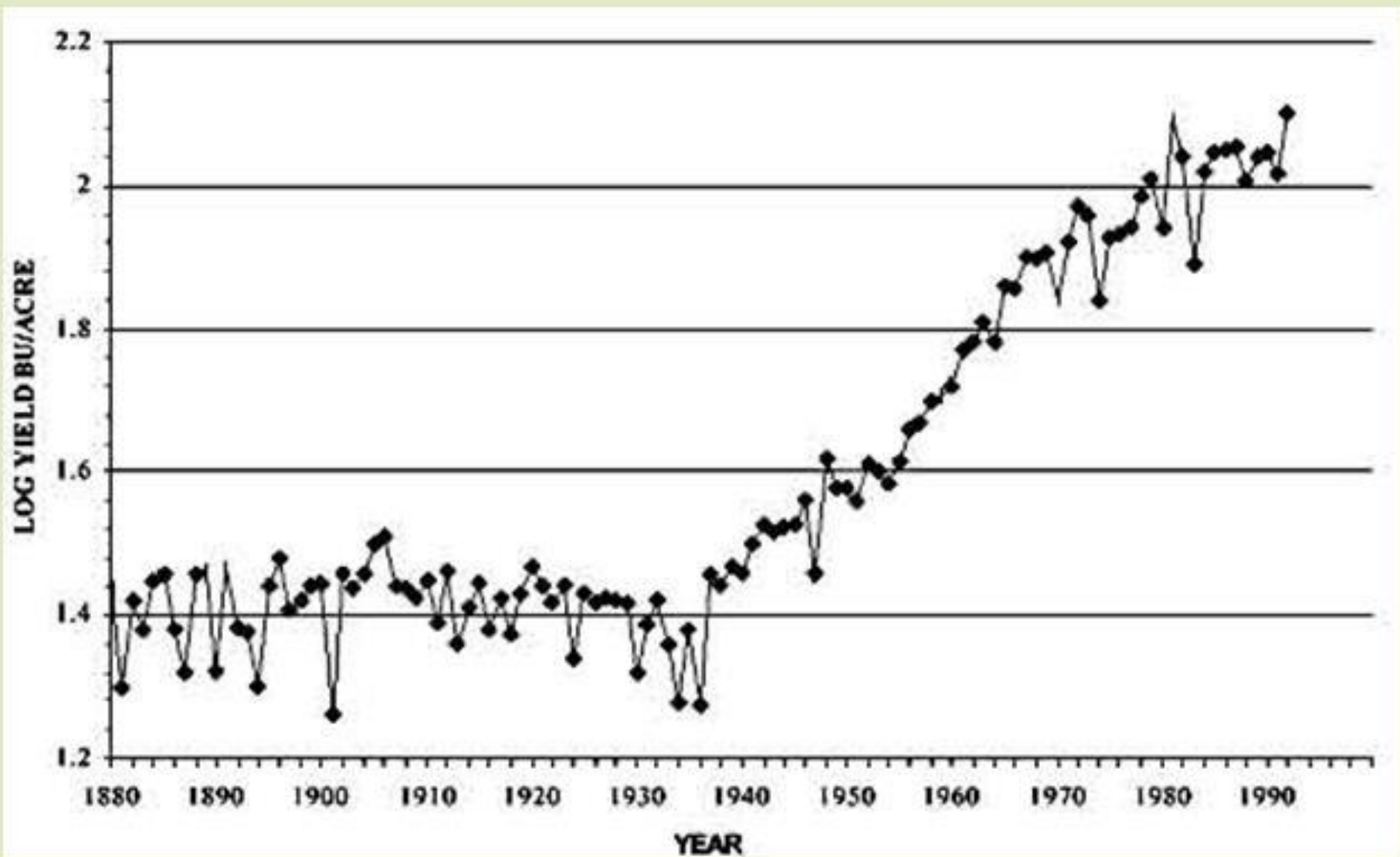
Science
Frozen Zoo was founded on hopes now coming to fruition » page 32

Books
Kundera's essays cast a spell with their insights into creativity » page 38

Incorporating material from the Observer, Le Monde and the Washington Post

Also from the Guardian: 10-16 Sept 2010: 25-26 Sept 2010: 27-28 Sept 2010: 29 Sept 2010: 30 Sept 2010: 1 Oct 2010: 2 Oct 2010: 3 Oct 2010: 4 Oct 2010: 5 Oct 2010: 6 Oct 2010: 7 Oct 2010: 8 Oct 2010: 9 Oct 2010: 10 Oct 2010: 11 Oct 2010: 12 Oct 2010: 13 Oct 2010: 14 Oct 2010: 15 Oct 2010: 16 Oct 2010: 17 Oct 2010: 18 Oct 2010: 19 Oct 2010: 20 Oct 2010: 21 Oct 2010: 22 Oct 2010: 23 Oct 2010: 24 Oct 2010: 25 Oct 2010: 26 Oct 2010: 27 Oct 2010: 28 Oct 2010: 29 Oct 2010: 30 Oct 2010: 31 Oct 2010: 1 Nov 2010: 2 Nov 2010: 3 Nov 2010: 4 Nov 2010: 5 Nov 2010: 6 Nov 2010: 7 Nov 2010: 8 Nov 2010: 9 Nov 2010: 10 Nov 2010: 11 Nov 2010: 12 Nov 2010: 13 Nov 2010: 14 Nov 2010: 15 Nov 2010: 16 Nov 2010: 17 Nov 2010: 18 Nov 2010: 19 Nov 2010: 20 Nov 2010: 21 Nov 2010: 22 Nov 2010: 23 Nov 2010: 24 Nov 2010: 25 Nov 2010: 26 Nov 2010: 27 Nov 2010: 28 Nov 2010: 29 Nov 2010: 30 Nov 2010: 1 Dec 2010: 2 Dec 2010: 3 Dec 2010: 4 Dec 2010: 5 Dec 2010: 6 Dec 2010: 7 Dec 2010: 8 Dec 2010: 9 Dec 2010: 10 Dec 2010: 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Traditional Crop Breeding & Yield Gains for Maize from 1930 onwards

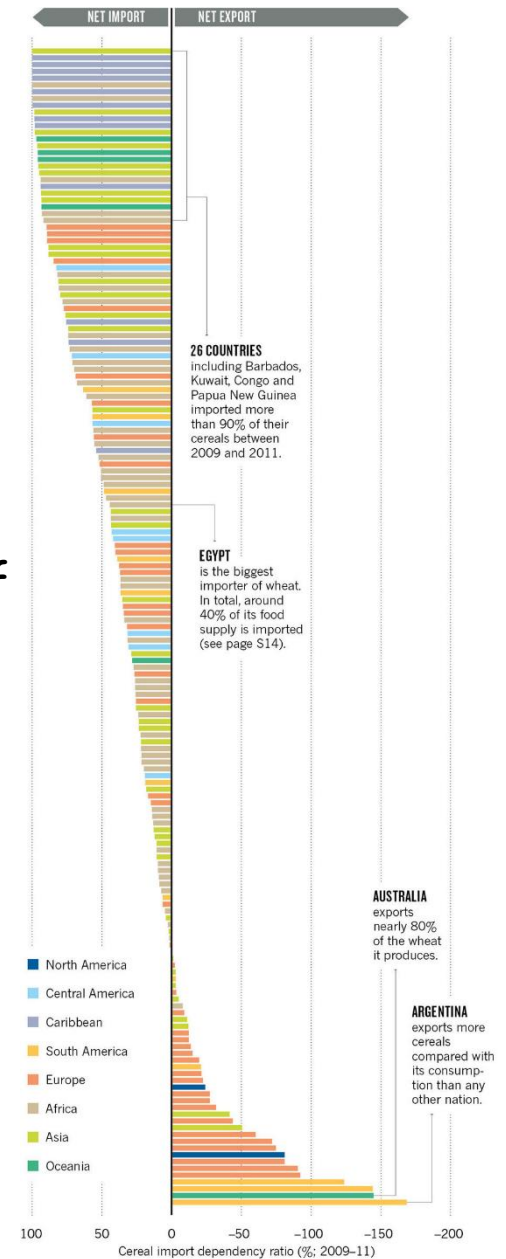
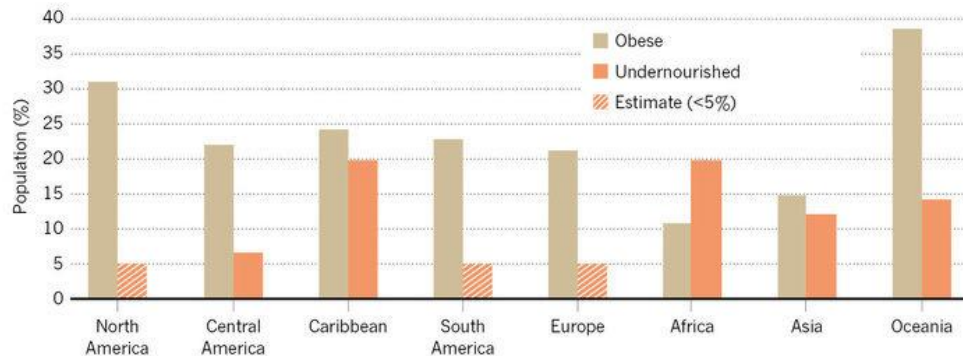


A World of Insecurity

- Malnutrition is a global problem
- With population and consumption set to rise over the coming decades achieving food security will require action on many fronts

Spread it around - 80% of countries are net importers of cereals

Malnutrition includes both over- and under-consumption of calories



Global Food Security

- Food security remains an massive on-going world challenge.
- Some 800 million people can't afford the food they need and are under-nourished. At the same time an equal or greater number of people, estimated by some to be as many as 1 billion, are obese and suffering from unbalanced diets.
- The green revolution and industrial agriculture has been remarkably successful over the last 6 decades, but there are major questions about food security as we race towards and past landmarks of 'peak oil', 'peak water', 'peak soil' well before we reach 'peak population' or 'peak consumerism'.
- How close are we to 'peak food'? What are the limits to food production?
- How sustainable is modern food production?
- Have increased crop yields been achieved at the cost of decreased resilience and sustainability and loss of cultural heritage?
- Are there on-going technical developments and innovations that can continue to increase food production for the next 50 years?
- Towards the end of the course we will examine some of these questions and how they are challenging the relationships between plants and people in new ways.



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Lecture 1

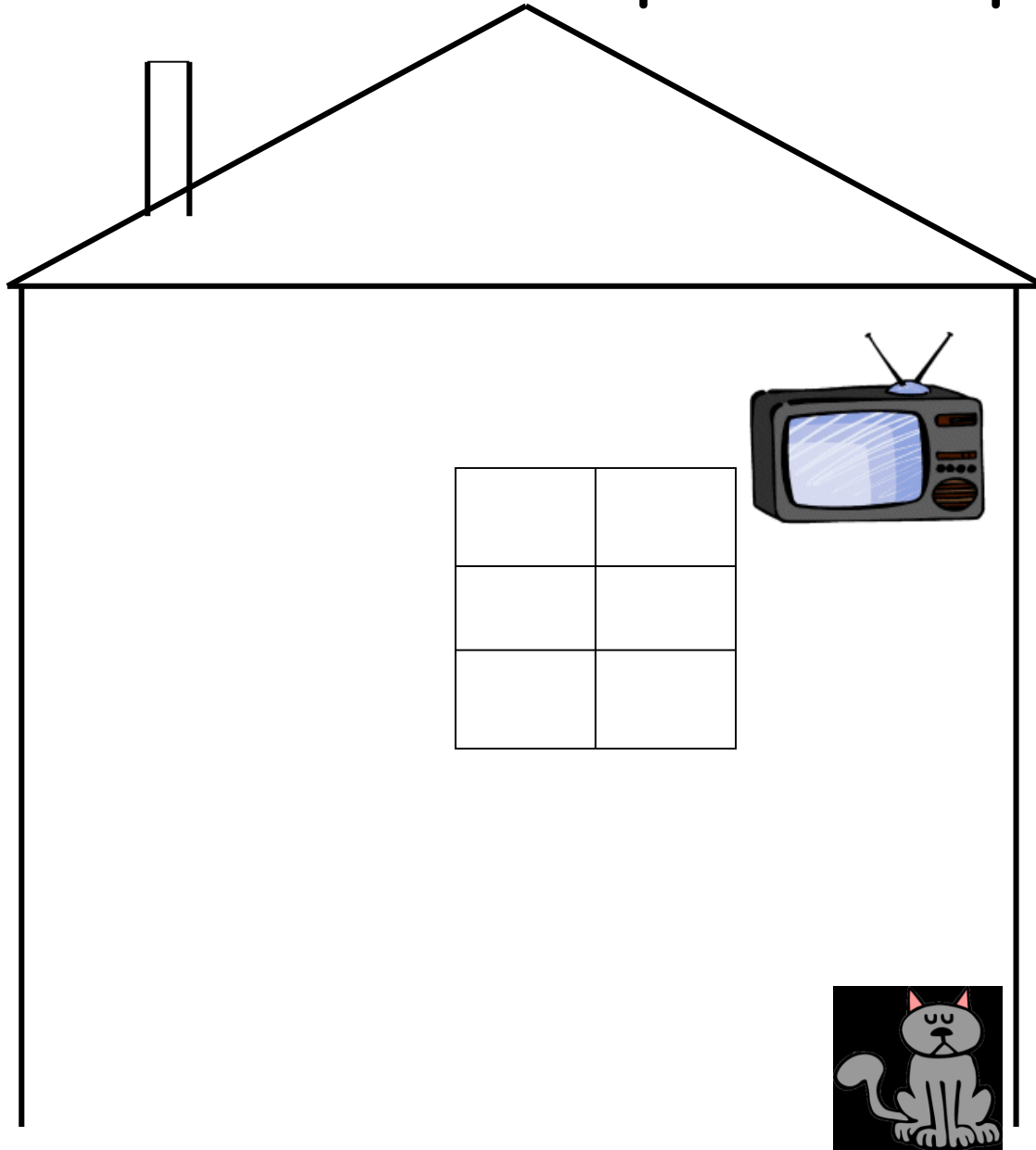
Introduction - Plants that Changed the World

- Plants are important for people
- Taste, nutrition, sweetness, beauty, and intoxication
- Plant Portraits
 - Potato
 - Tulip
 - Coca
 - Sugarcane

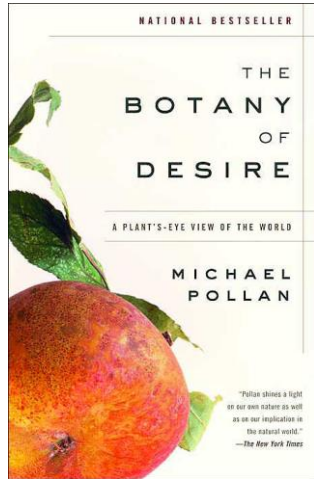
Plants are important for people!!



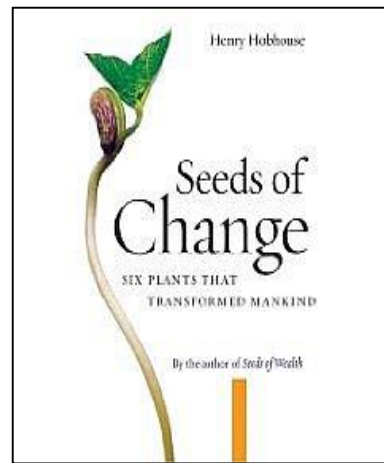
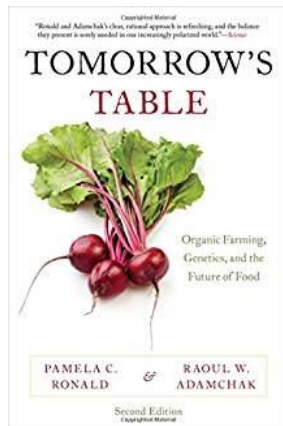
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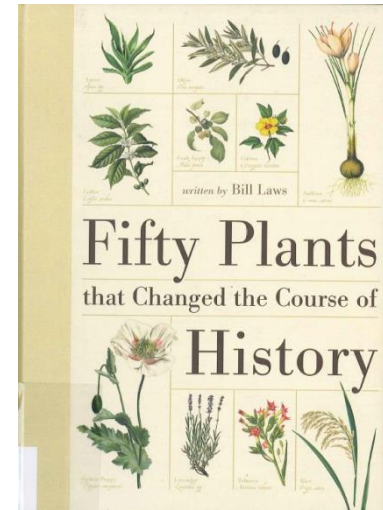
Human desires of
taste, sweetness,
beauty, and
intoxication



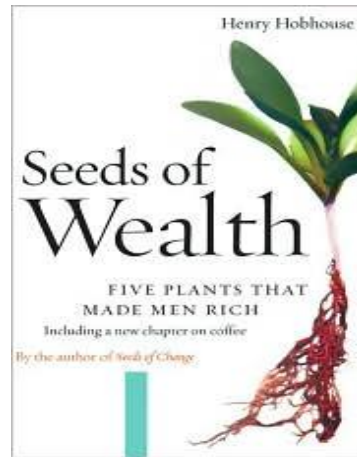
- Apple
- Tulip
- Cannabis
- Potato



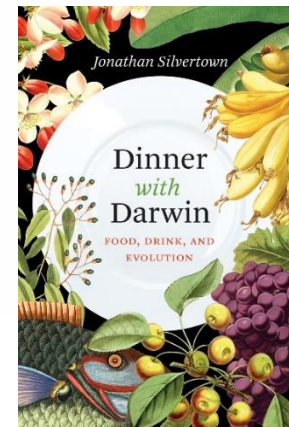
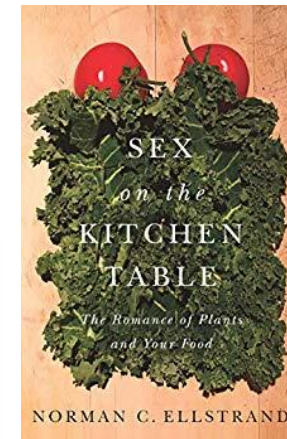
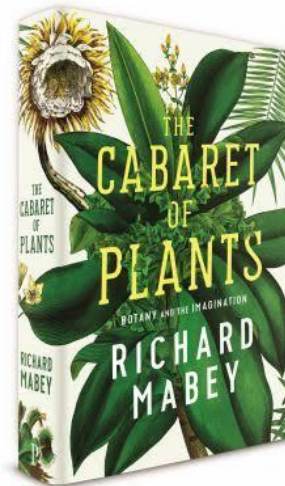
- Quinine
- Sugar
- Tea
- Cotton
- Potato
- Coca



Economic Botany Ethnobotany



- Mahogany
- Rubber
- Tobacco
- Grapes



Bananas, coffee,
potatoes, quinoa,
coca, grapes,
timber



FLORA MIRABILIS

*How Plants Have Shaped World Knowledge,
Health, Wealth, and Beauty*

AN ILLUSTRATED TIME LINE

Origins

- date palm, wheat, rice, olive

Discovery

-Black pepper, sugarcane, maize, citrus, tulip

Exploration

-Tobacco, tea, coffee, peppers, cinchona

Enlightenment

-Tomato, rose, grape, cotton, apple

Empire

-Cannabis, rubber, potato, opium, poppy, orchids

Science

- Bamboo, yam, cacao

Rich in carbohydrates and energy.

A natural source of folate.

Full of vitamin C.

Low in calories.

Good source of niacin, vitamin B6 iodine and thiamin.

Good source of minerals.

No cholesterol whatsoever.

Completely fat-free.

Great source of protein.

Natural, good-for-you dietary fibre.

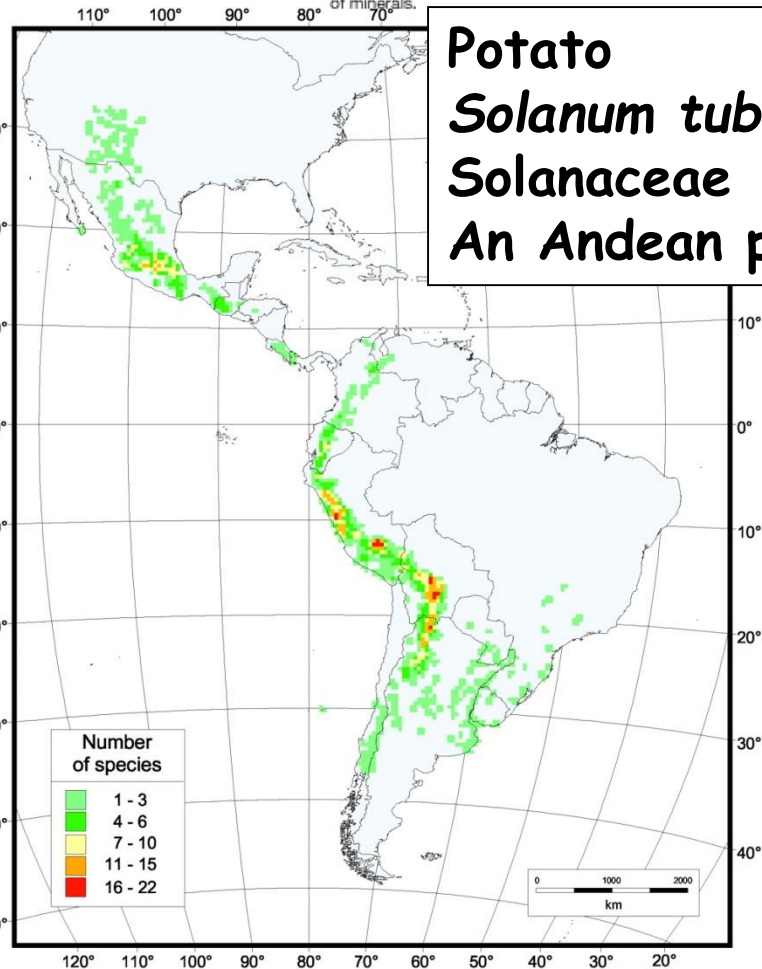


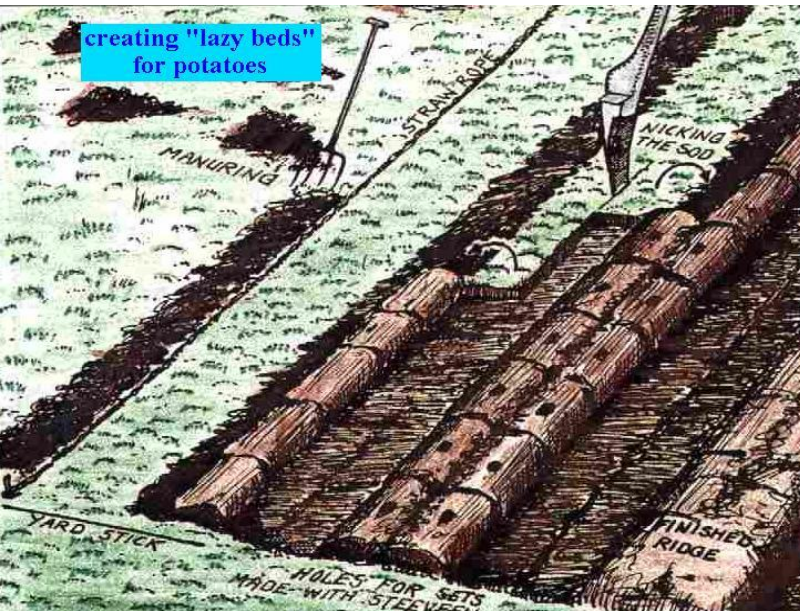
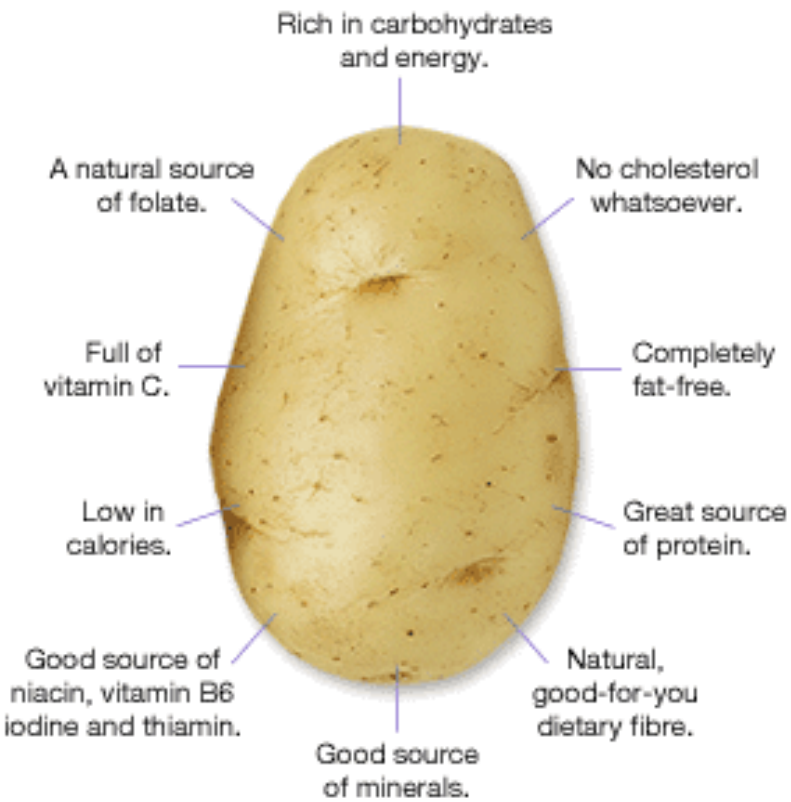
Potato

Solanum tuberosum

Solanaceae

An Andean polyculture





The Potato & Population Growth in Ireland

1660 - 0.5 million

1688 - 1.25 million

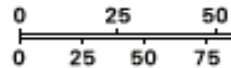
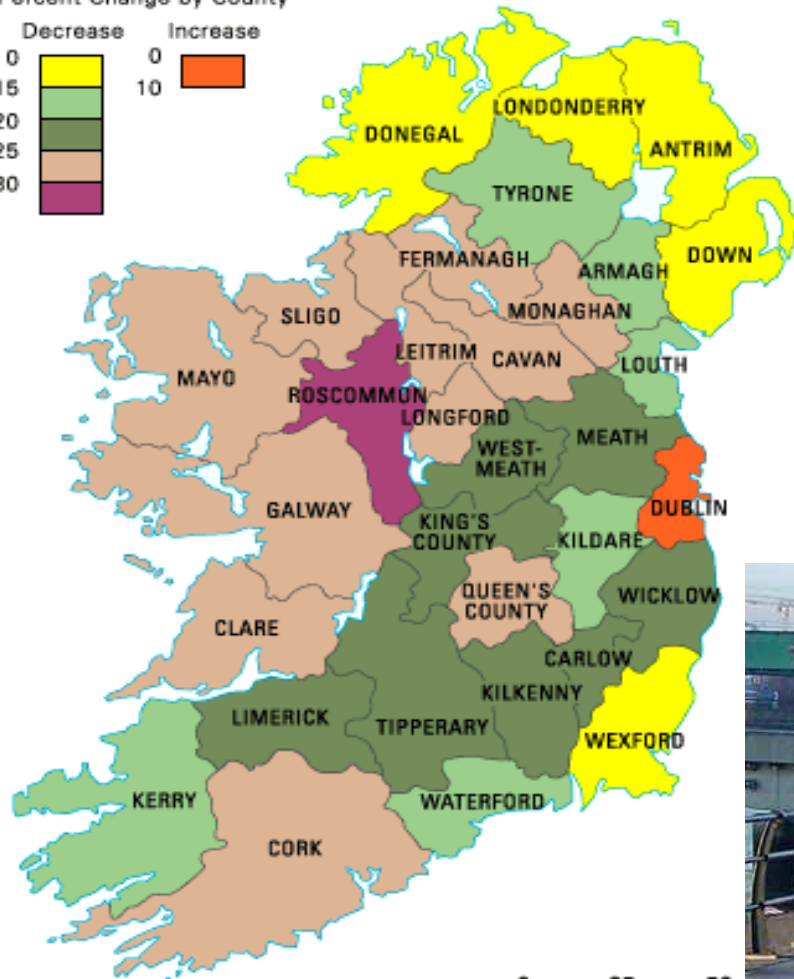
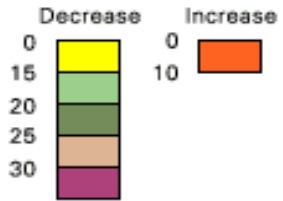
1840 - 9 million

1845 - Potato blight - *Phytophthora infestans* decimates potato crop prompting the Irish potato famine - 1 million dead and several million emigrated

1860 - 4.5 million

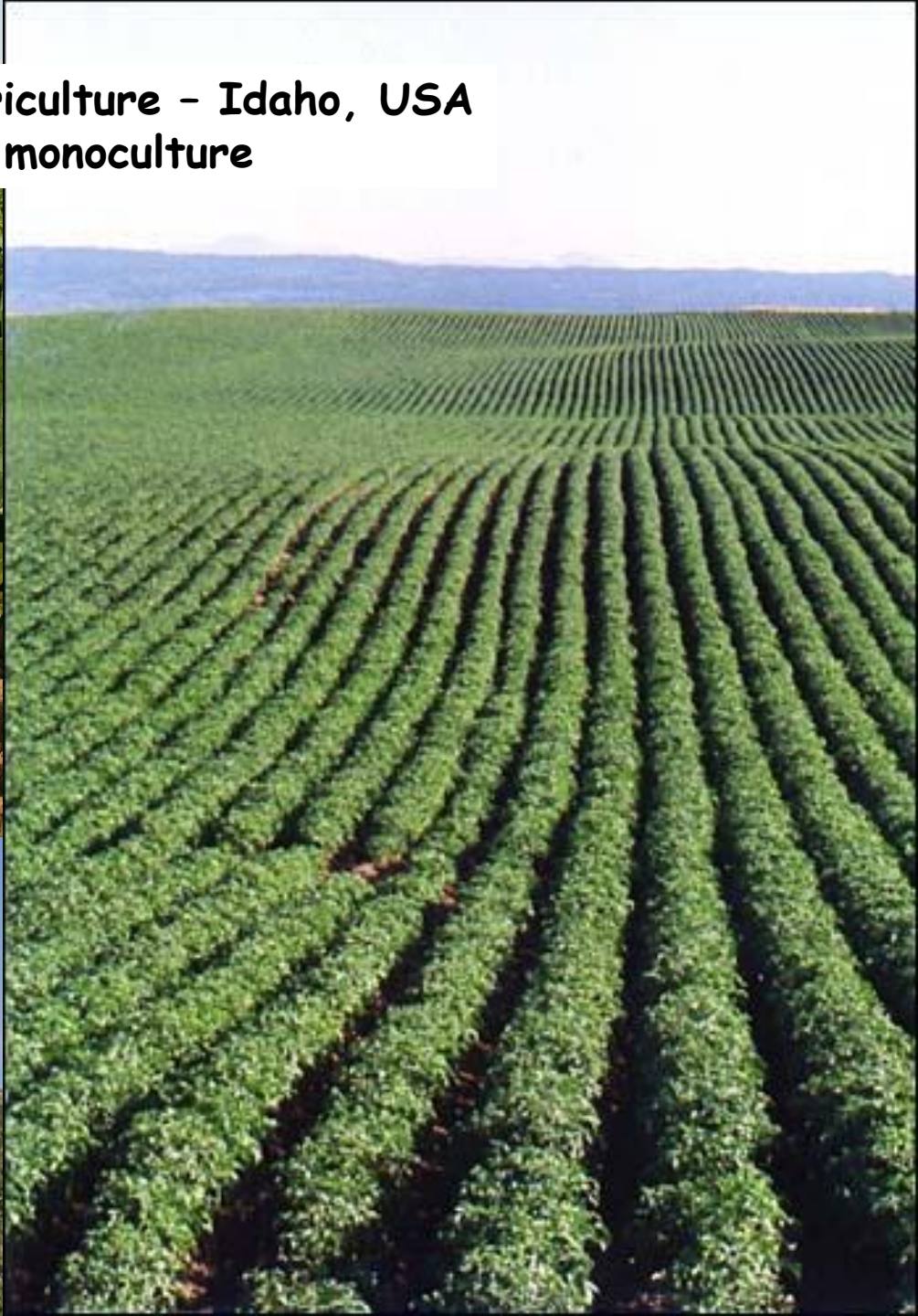
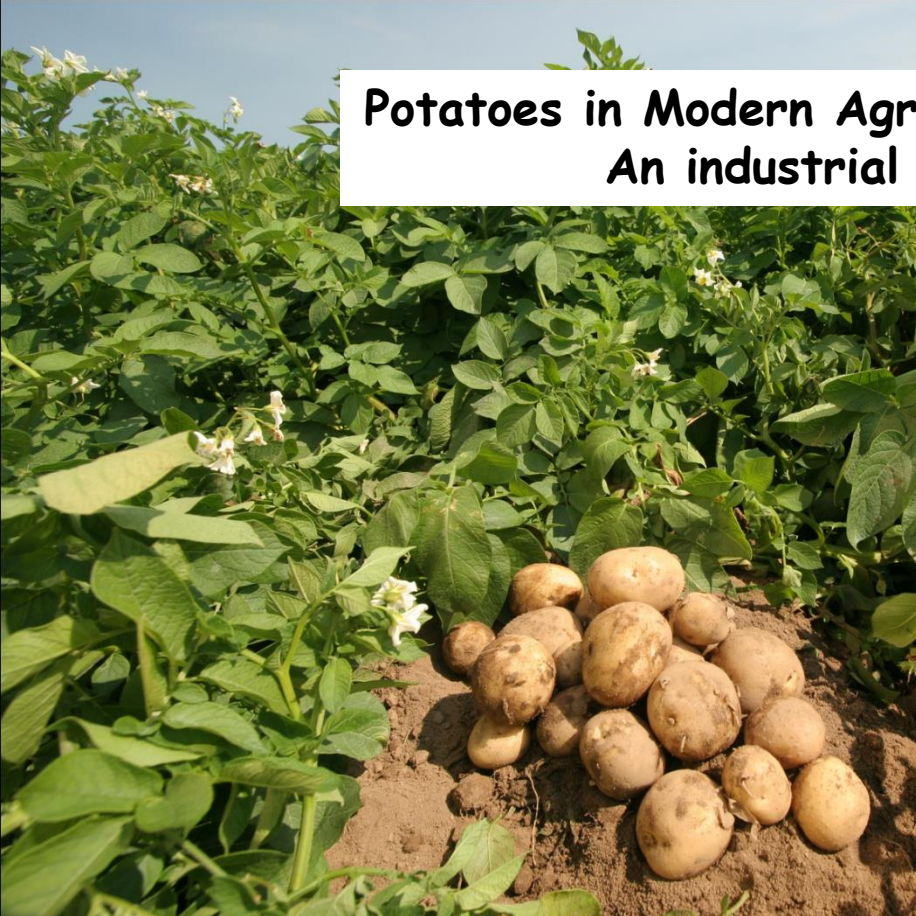
The Irish Potato Famine + Emigration to the USA

Percent Change by County



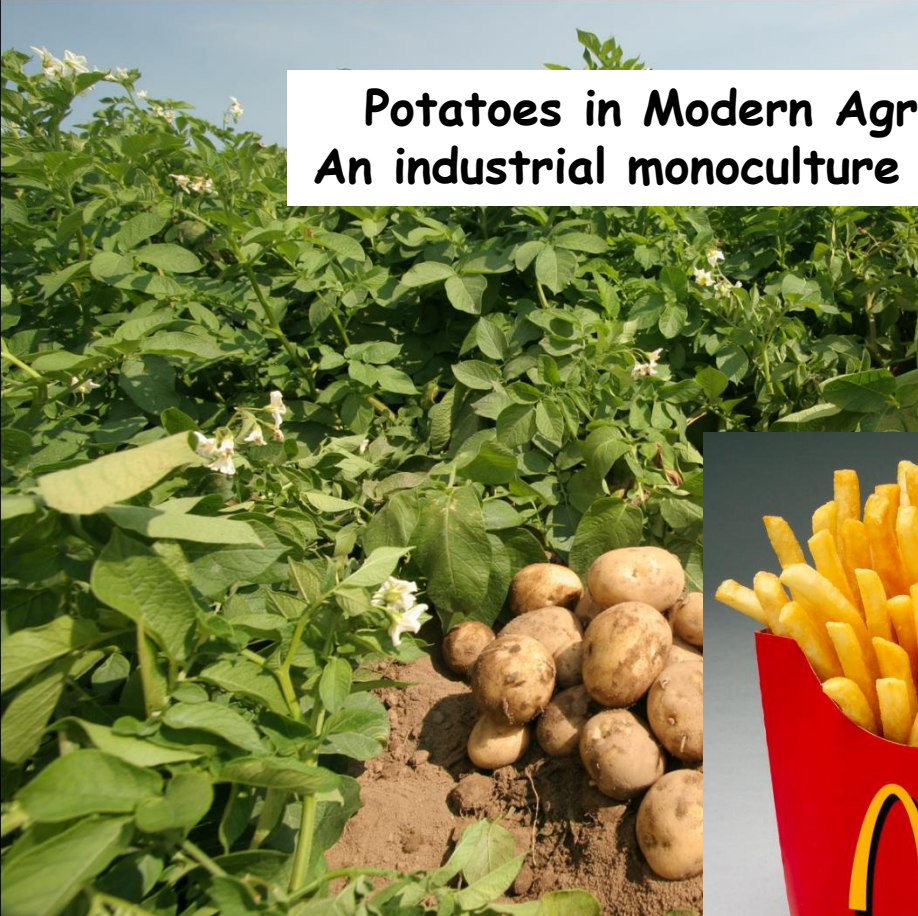
Potatoes in Modern Agriculture - Idaho, USA

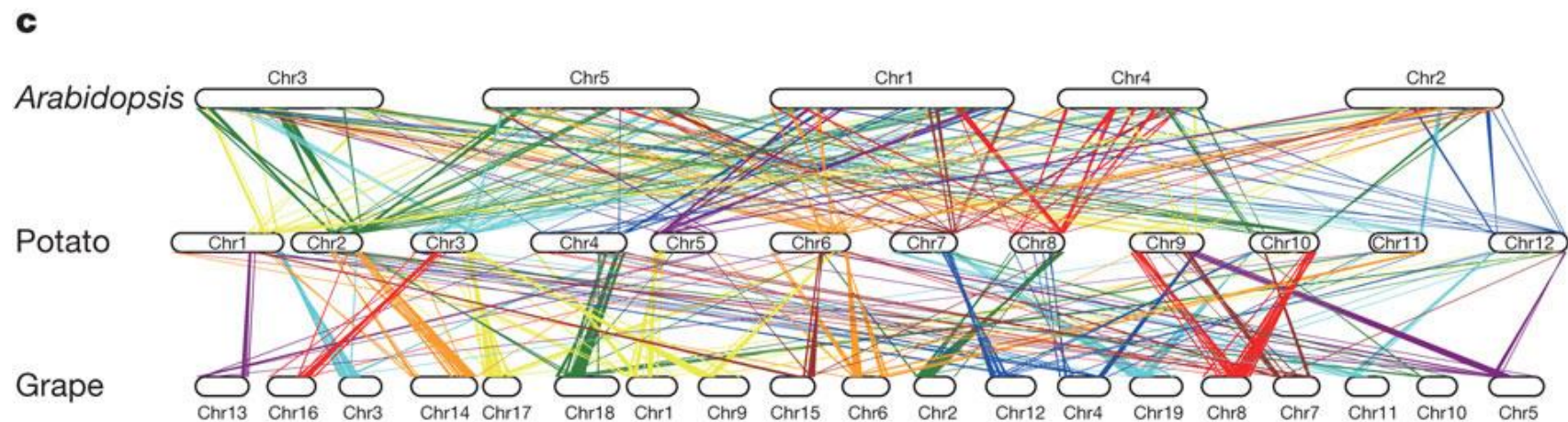
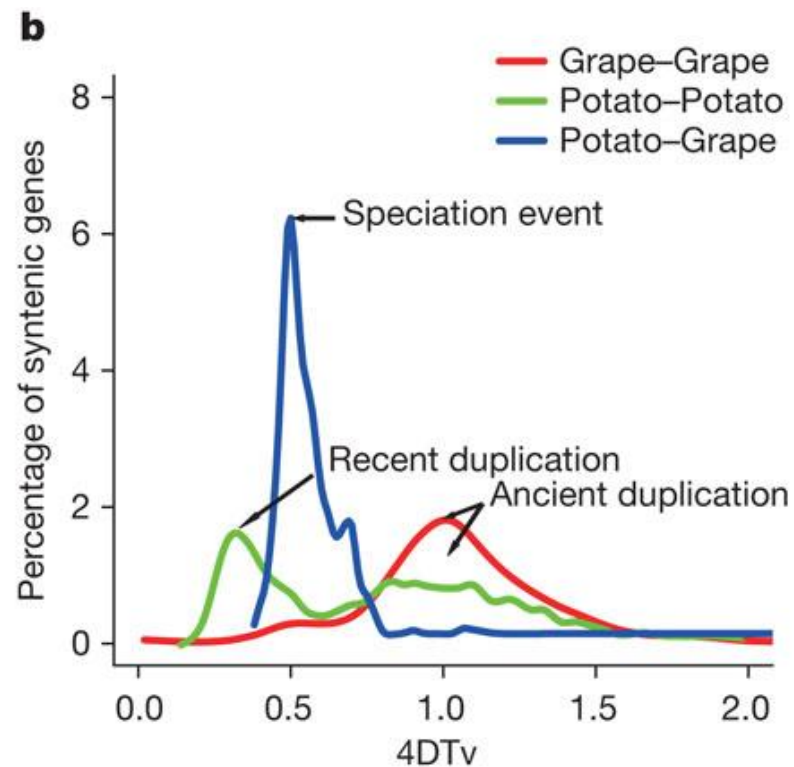
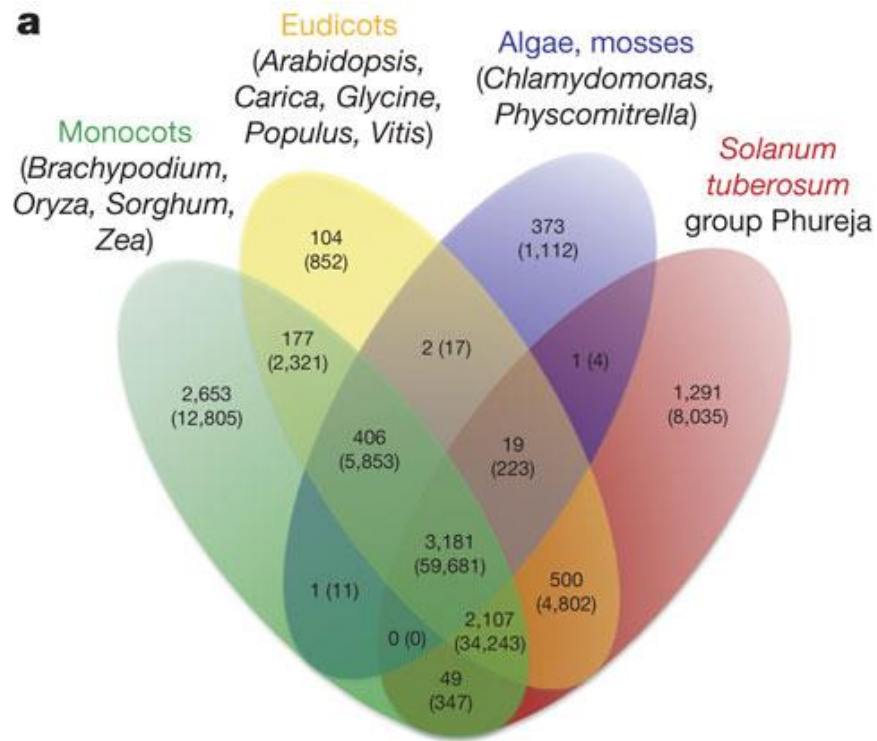
An industrial monoculture



Potatoes in Modern Agriculture - Idaho, USA

An industrial monoculture feeding global fast food





Pre-Inca Andean tubers to Fast Food Nation



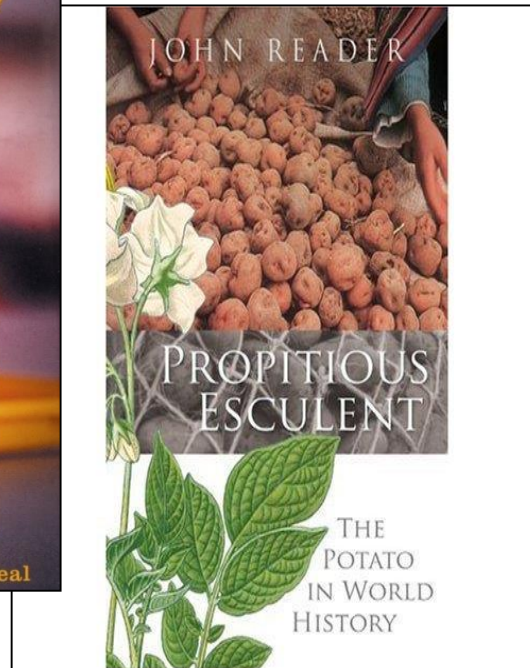
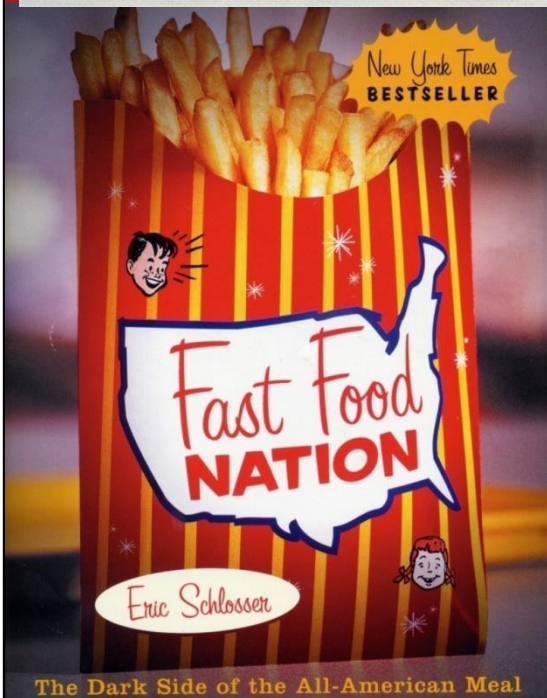
The world's most important non-grain food crop

Central to global food security.

Clonally propagated

A highly heterozygous, autotetraploid

suffers acute inbreeding depression.



Tulip
Tulipa
Liliaceae







Grengiols



Morges, Fête de la Tulipe



Tulipa grengiolens

Taxonomy and distribution

- Genus *Tulipa*

T. uniflora

- 75 species

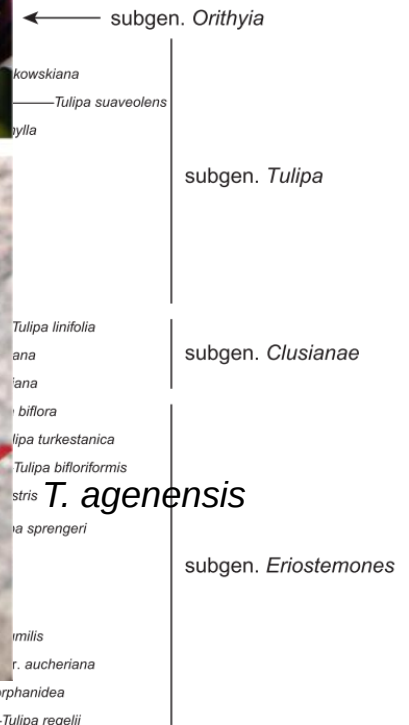
- Family Liliaceae



T. clusiana

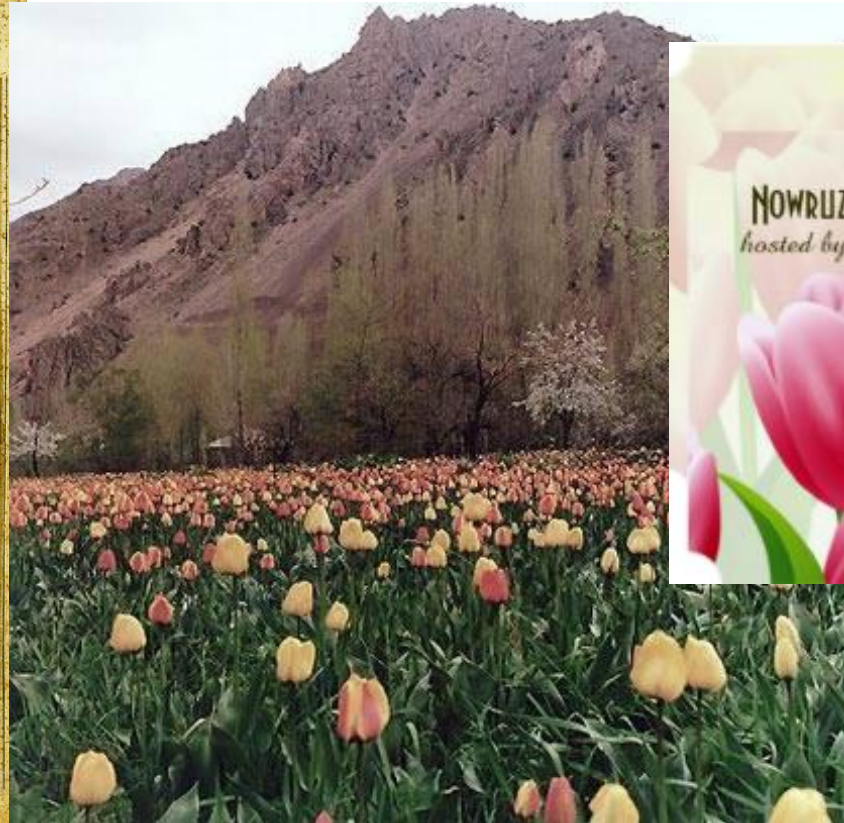
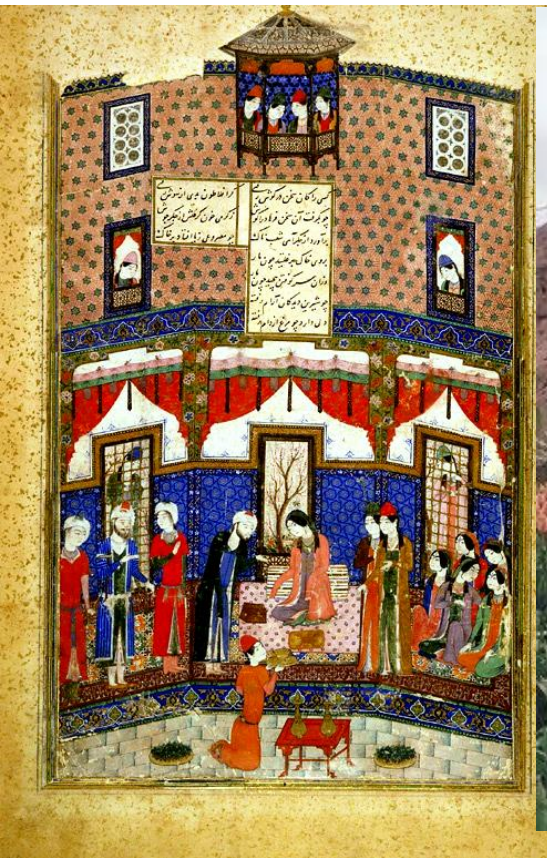


T. turkestanica



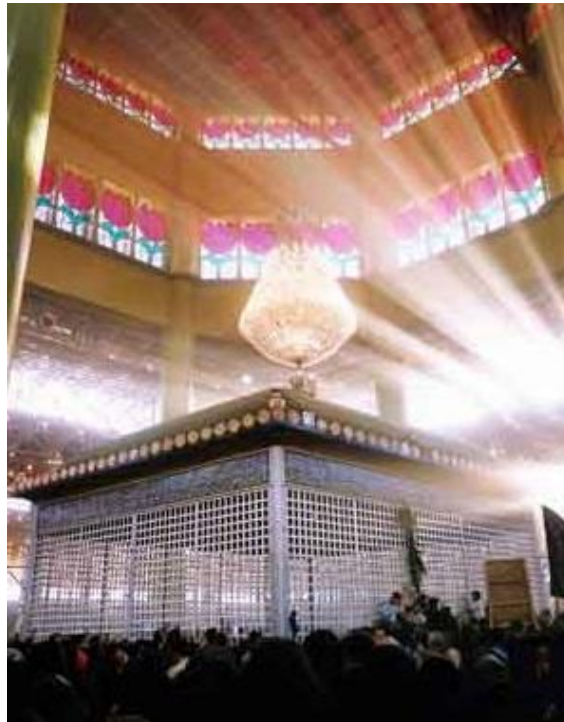
Christenhusz et al. 2013 — 0.001

Tulips in Persia



Tulips in Iran

Symbol of the Revolution and martyrdom



Wild Tulipa species

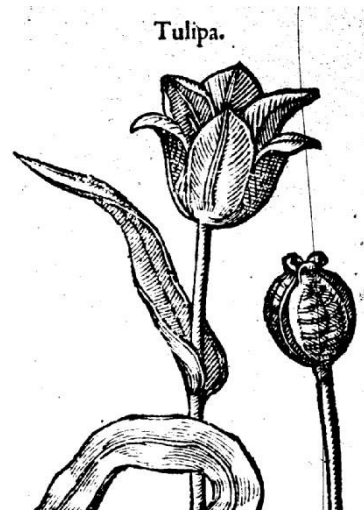
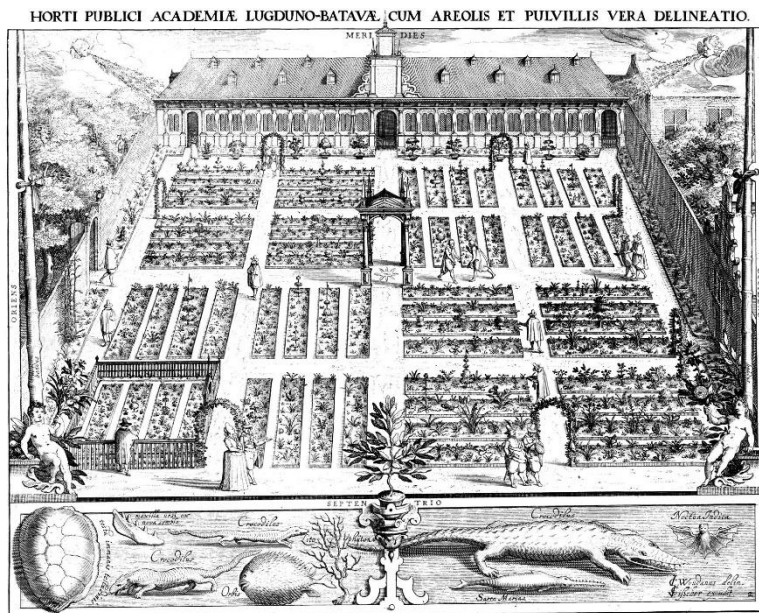


The Ottoman Tulip

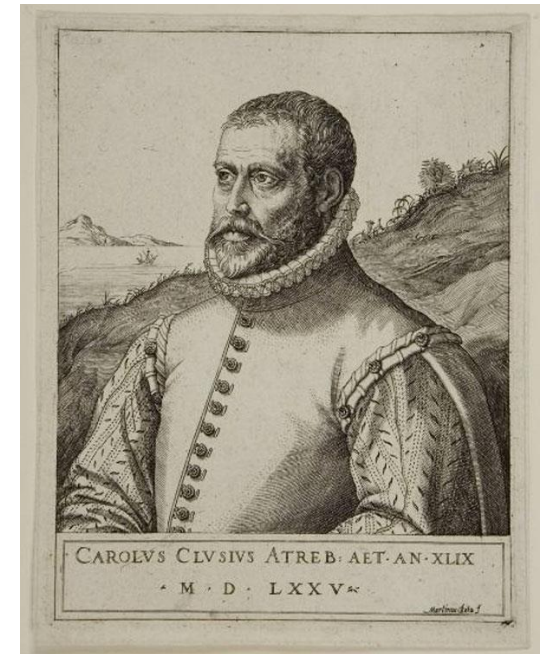


Tulips in the Netherlands

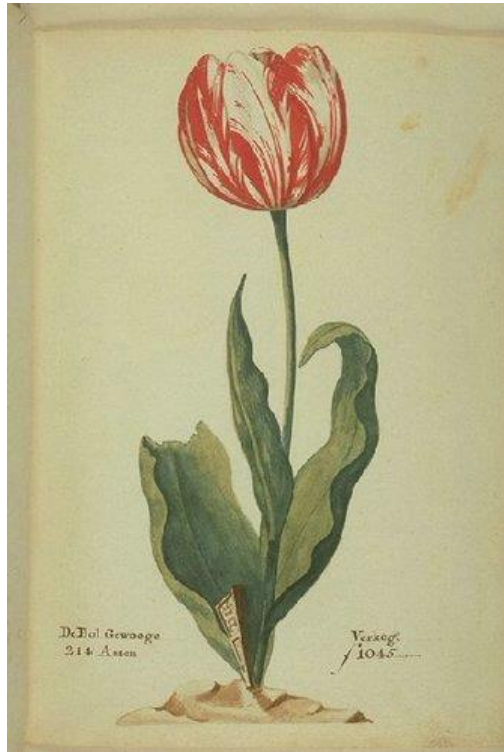
- Supposedly introduced by Carolus Clusius (1526-1609) in 1593



Carolus Clusius (1576)



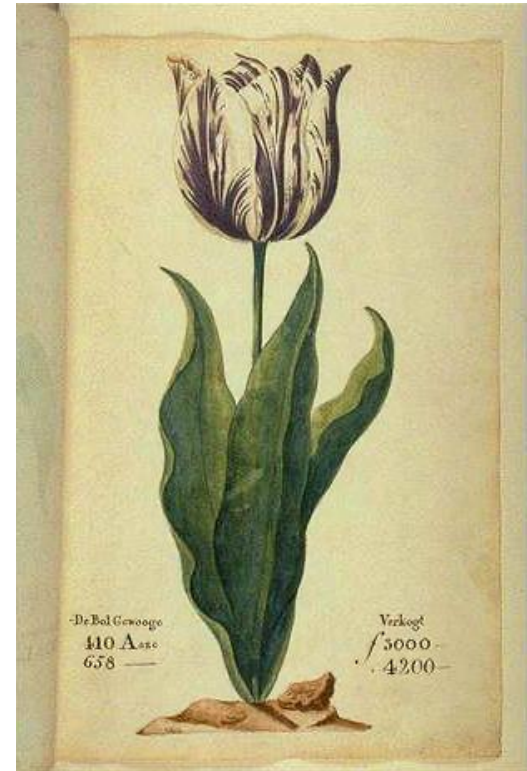
Tulip trade & the 1634-1637 Dutch Tulipomania



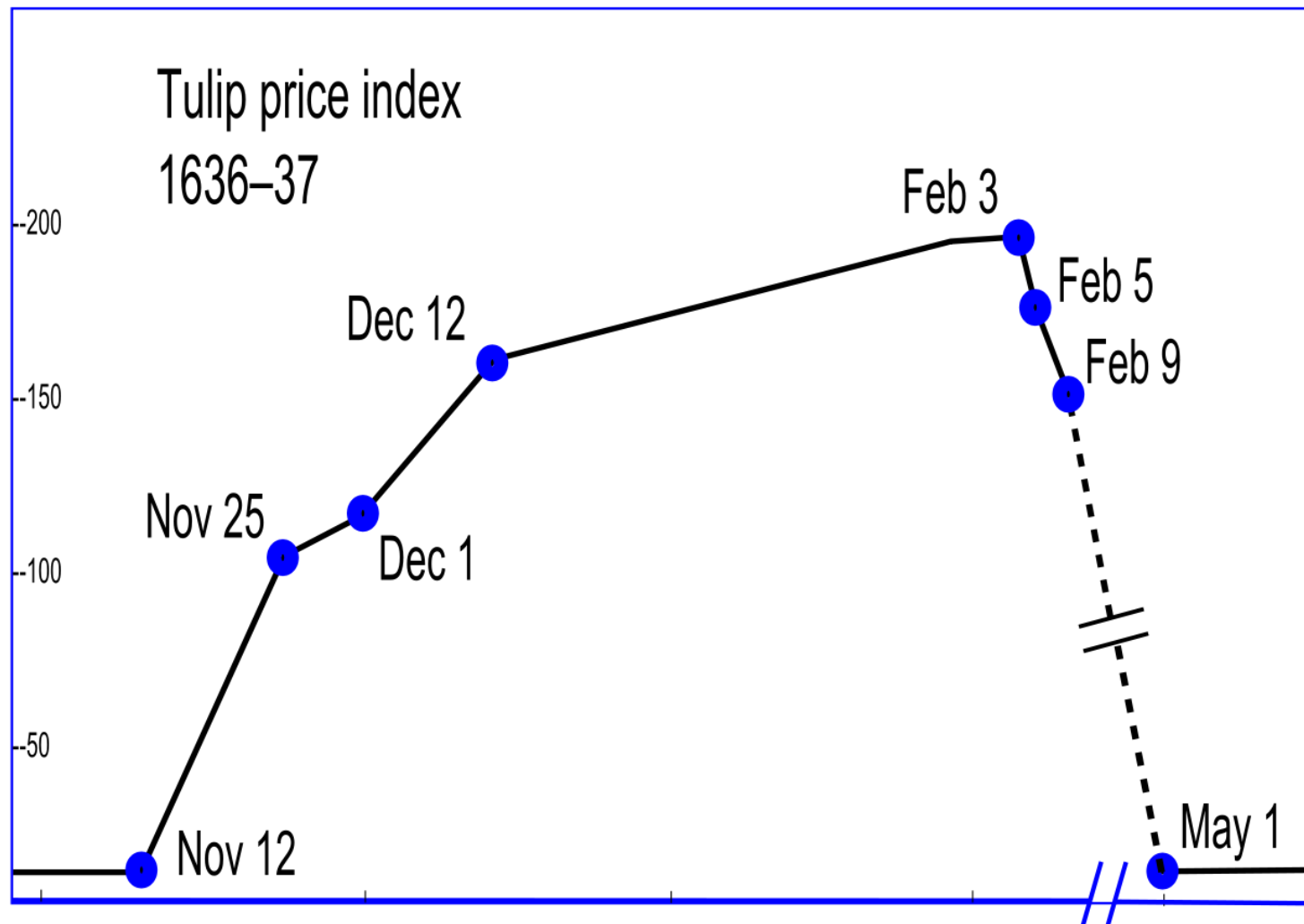
Admirael van der Eijck: 1045 guilders



Semper Augustus: 12 acres of land
and a mansion in Amsterdam



Viceroy: 3000-4200 guilders



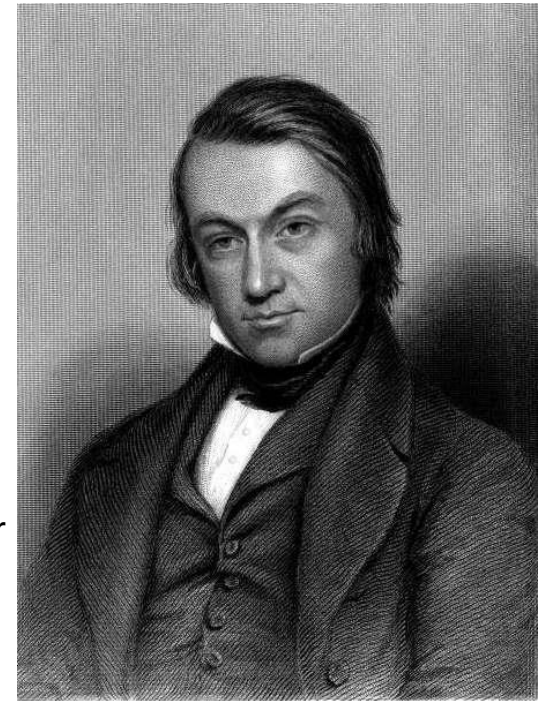
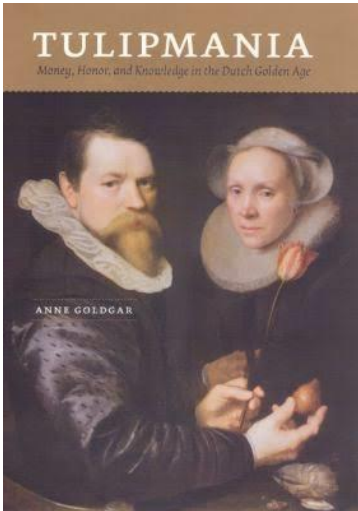
Thompson
(2007)



Jan Brueghel the Younger (c. 1640) Satire on Tulip Mania

the first speculative bubble?

- Charles Mackay (1841) Extraordinary Popular Delusions and the Madness of Crowds
- “A golden bait hung temptingly out before the people, and, one after the other, they rushed to the tulip marts, like flies around a honey-pot. Every one imagined that the passion for tulips would last for ever (...). Nobles, citizens, farmers, mechanics, seamen, footmen, maidservants, even chimney sweeps and old clotheswomen, dabbled in tulips”
- Anne Goldgar (2008) Tulipmania. Money, Honor and Knowledge in the Dutch Golden Age



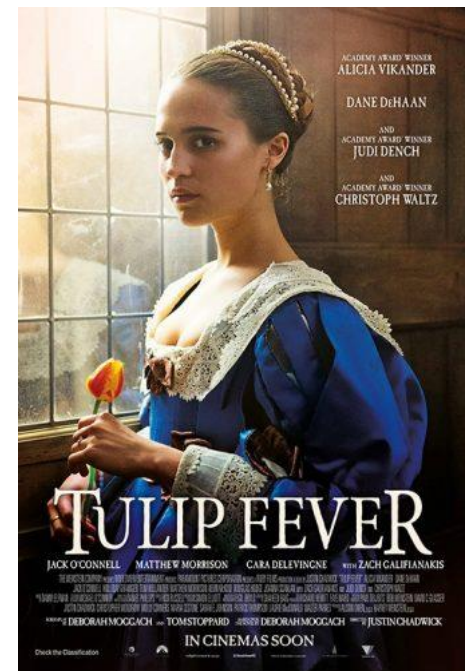
The Black Tulip



Alexandre Dumas



Vincent van Gogh (1883)
Flower Beds in Holland



Queen of the Night



Semper Augustus



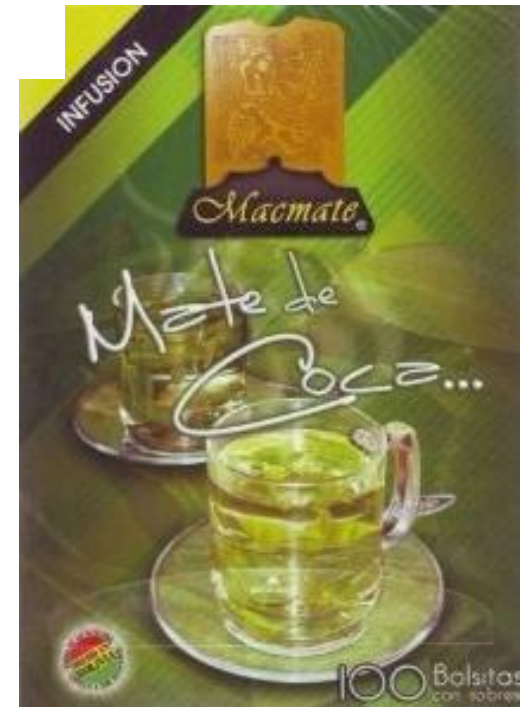
Modern tulips – 'mass-produced eye candy', 'flowers for kids', accessible, cheap, uncomplicated, and now ubiquitous Spring companions.

Coca
Erythroxylum coca
Erythroxylaceae





Coca production and use in the Andes

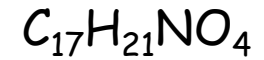
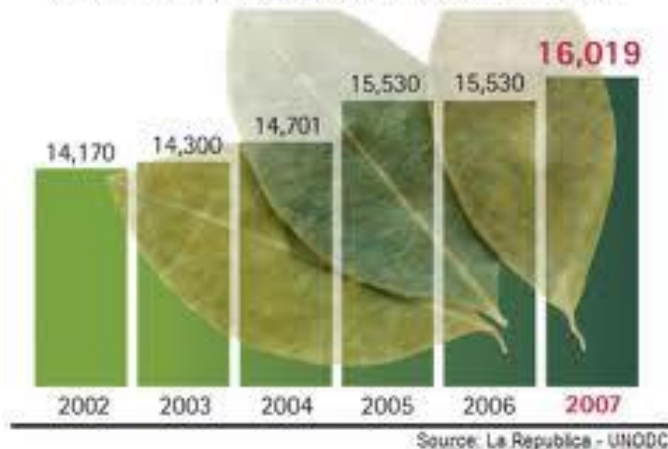


Cocaine & the War on Drugs



COCA CROP INCREASE IN THE VRAE

Coca cultivation has expanded 11.5% in 2002 - 2007



- 34 million users in the USA
- 1/3 Gross Domestic Product of Bolivia, Colombia and Peru

Coca. Rarely have the leaves of such an innocuous and unprepossessing looking shrub commanded such a value as Coca, come to dominate the economies of a set of Andean countries, and spawned such widespread and disruptive violence and social problems.



Sugarcane

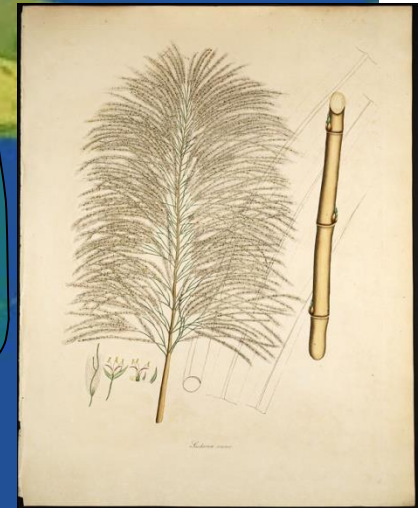
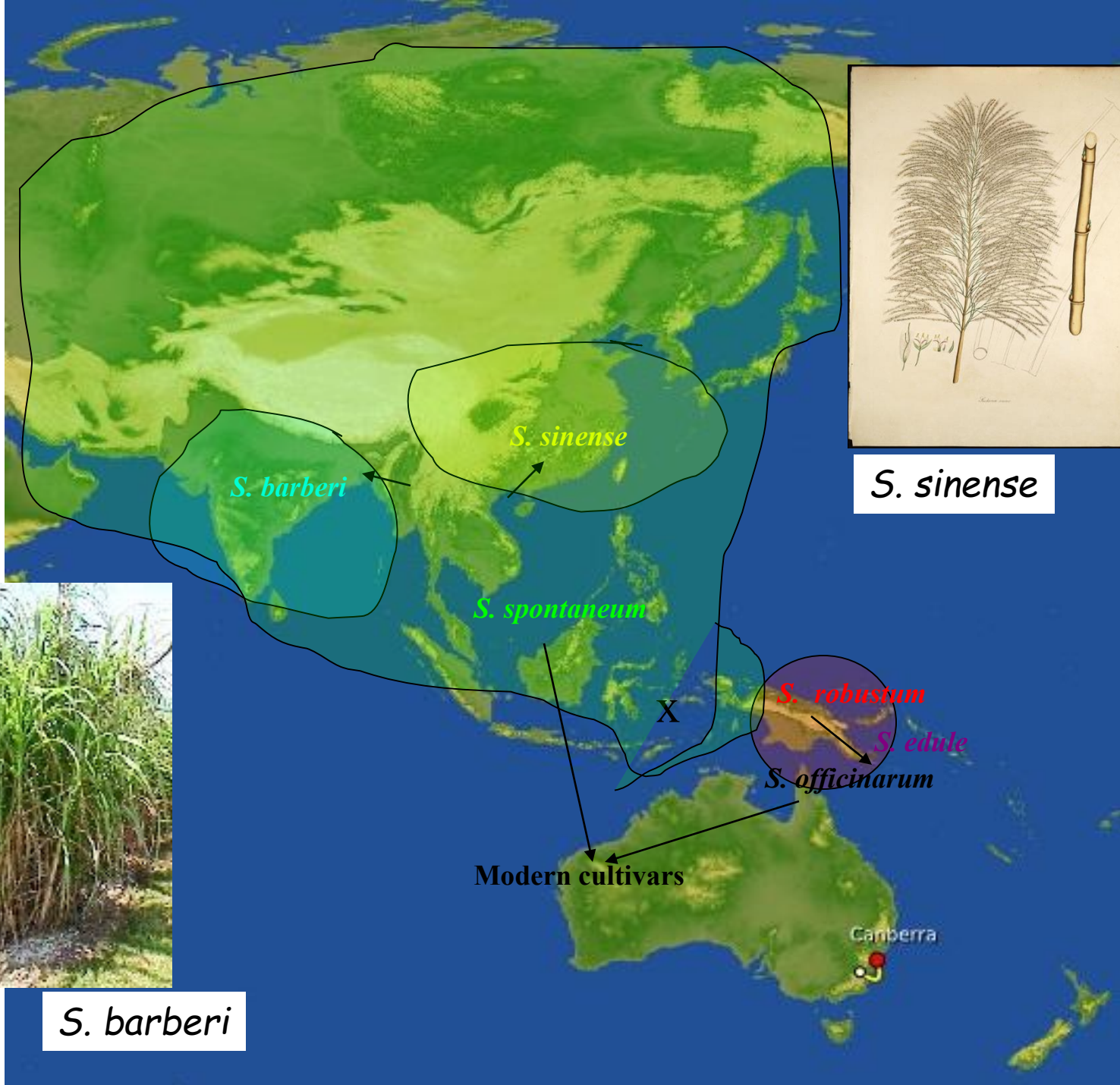
Saccharum officinarum x *S.spontaneum*

Poaceae: Andropogoneae:



Sugar:
the 'unnecessary
food'.... yet
Europe imports >
1 billion tones
each year





S. sinense

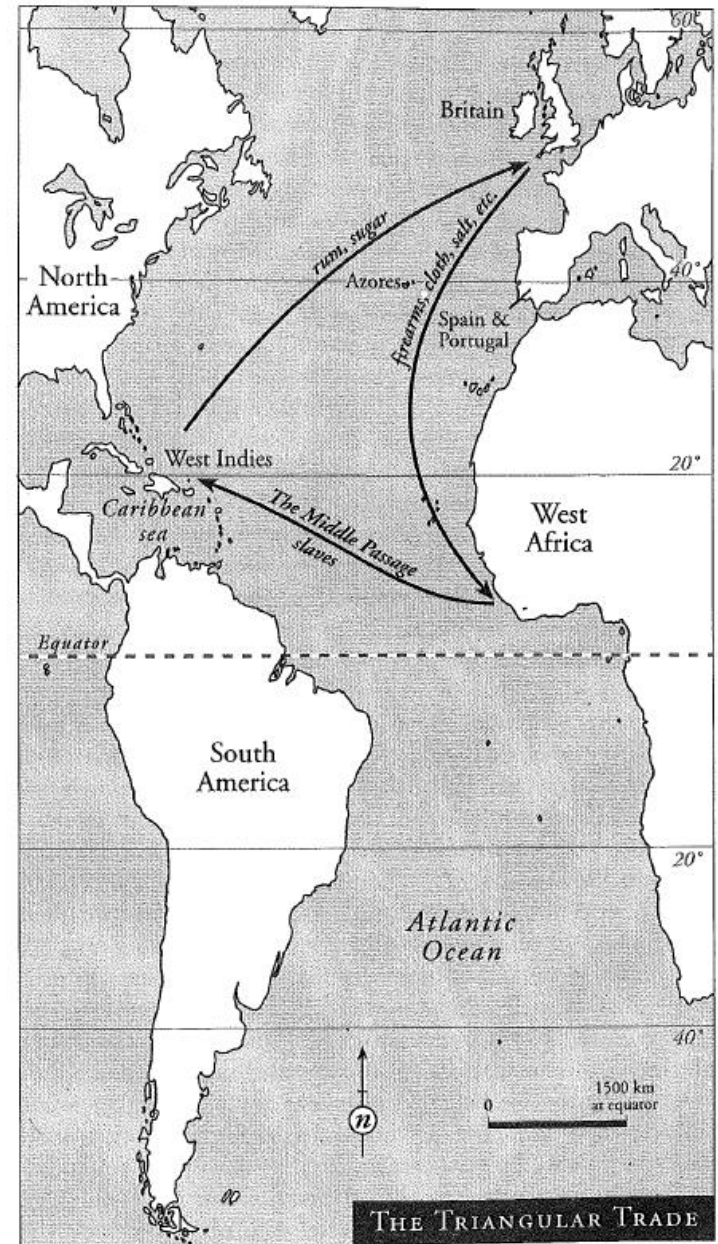
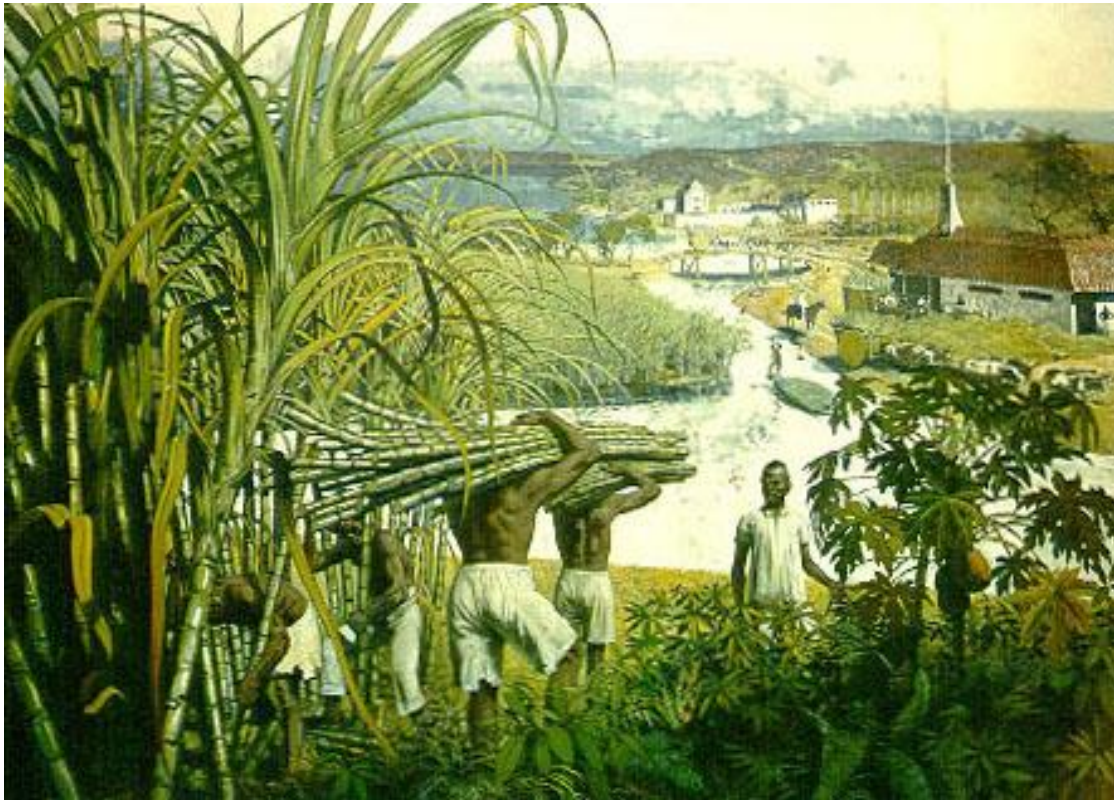


S. barberi

Sugarcane, slavery and the Africanization of the Caribbean

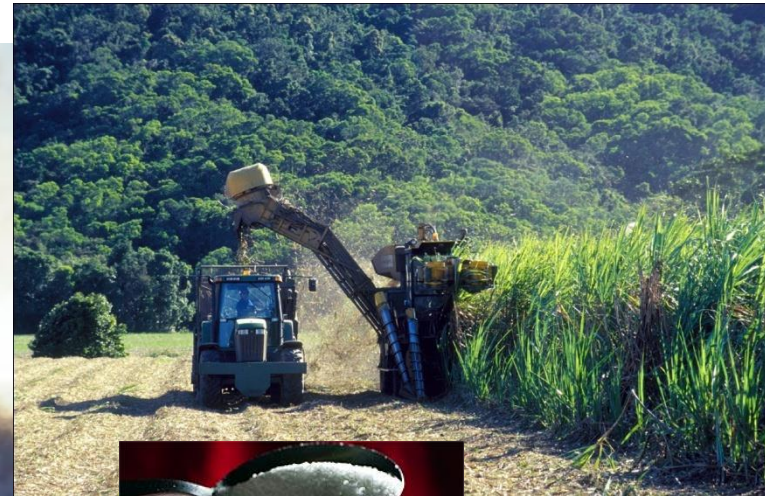
10-12 million slaves imported from Africa into the New World between 1450 and 1900

In 1700 every ton represented one slave's life, a ratio that increased to 2 tonnes by 1800



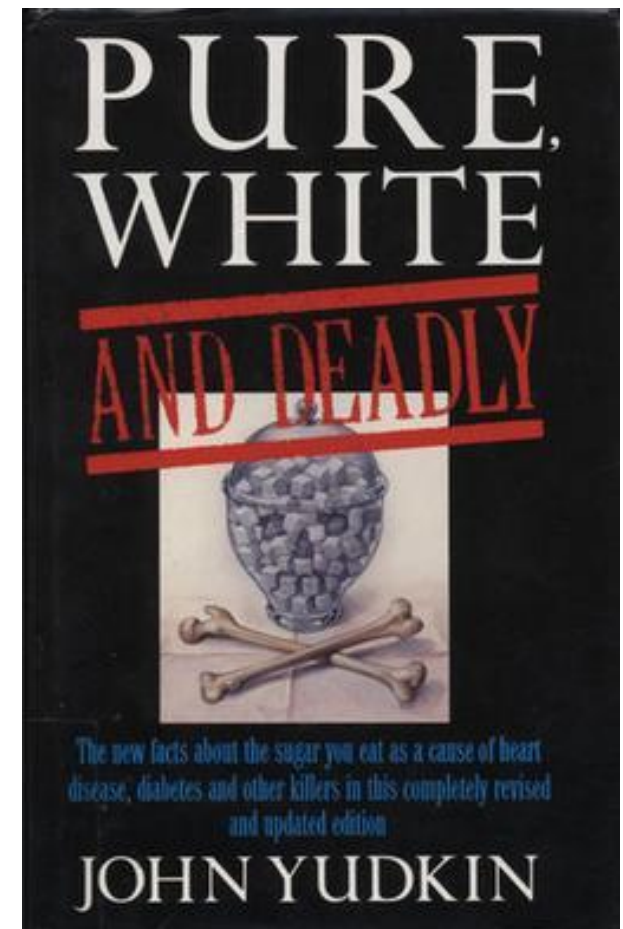


Sugarcane, a plant with sucrose-rich stalks from SE Asia, that produces an 'unnecessary food', but one to which westerners have become accustomed and possibly addicted, led to the shipping of millions of human slaves from Africa to the Caribbean, the Africanization of the Caribbean, and is now an important industrial crop cultivated across 20 million ha throughout the tropics, most of which is refined into sugar, but more recently refined to make ethanol, as a renewable substitute for fossil fuels.





<https://topdocumentaryfilms.com/big-sugar/>



Plants that Changed the World



Cotton



Chicle



Rubber



Cannabis



Coffee



Tea



Oil Palm



Tobacco



Mahogany

Lecture 1 Introduction - Plants that Changed the World - References

Harris, S.A. 2015. *What Have Plants Ever Done For Us? Western Civilisation in Fifty Plants*. University of Chicago Press.

Hellin, J. & Higman, S. 2003. Chapter 6, Coca eradication and alternative development. In: *Feeding the Market: South American Farmers, Trade and Globalisation*. ITDG Publishing, London.

Hobhouse, H. 2002. Sugar and the slave Trade. Chapter 2 in: *Seeds of Change. Six Plants that Transformed Mankind*. Pan Books, London.

Howell, C.H. 2009. *Flora Mirabilis. How plants have shaped world knowledge, health, wealth and beauty*. National Geographic Society, Washington.

Pavord, A. 1999. *The Tulip: The Story of a Flower that has Made Men Mad*. Bloomsbury, London.

Pollan, M. 2001. *The Botany of Desire. A Plant's-Eye View of the World*. Random House, New York.

Reader, J. 2008. *Propitious Esculent: The Potato in World History*. William Heinemann.

Ruddiman, W.F. et al. 2015. Defining the epoch we live in. Is a formally designated Anthropocene a good idea? *Science* 348: 38-39.

Yudkin, J. 1972. *Pure, White & Deadly*.

Documentary Film: Big Sugar: Sweet, White & Deadly

<https://topdocumentaryfilms.com/big-sugar/>

Online Case studies in Crop Domestication

http://www.botany.wisc.edu/courses/botany_940/06CropEvol/CropEvol.html

For Next Week:

- Pick a plant that you think has had important impacts on human history
- Outline in a few sentences how and why it is important
- Tell the class about it next week