

Chapter 11 Food & Agriculture

1. Where did agriculture originate?
2. Why do people consume different foods?
3. Where is agriculture distributed?
4. Why do farmers face economic difficulties?



Agriculture

Agriculture – the purposeful tending of crops and raising of livestock in order to produce food and fiber.



- **The Persistence of Agriculture**
- The US only has 2 million farmers, less than 2% of population
- Mechanization and farm consolidation have forced out many small scale farmers.
- Yet US farm production is at an all time high.
- **IN MOST OF THE WORLD-AGRICULTURE REMAINS THE LEADING EMPLOYMENT SECTOR-40% of the world's population are farmers**





Agriculture & Rural Land Use – Key Topics

Commercial Agriculture



Primarily for purpose of selling products for money, often monocultures for economies of scale

Subsistence Agriculture



Primarily for direct consumption by a local population, usually small scale and low tech

Whittlesey (1936) identified 11 main agriculture regions

DEVELOPING COUNTRIES (Intensive Land Use, Labor Intensive, Subsistence)

- Pastoral nomadism
- Shifting cultivation
- Intensive subsistence (wet rice dominant)
- Intensive subsistence, crops other than rice dominant
- Plantation

DEVELOPED COUNTRIES (Extensive Land Use, Capital Intensive, Commercial)

- Mixed crop and livestock
- Dairying
- Grain
- Ranching
- Mediterranean
- Commercial gardening

Intensive Land Use

Small-area farms or ranches
High inputs of labor & high output per acre



Rice paddies, southeast China

Cattle ranch, northeast Colorado



Extensive Land Use

Large-area farms or ranches
Low inputs of labor & low output per acre

Labor-Intensive Agriculture

Large amount of human work is applied per unit of output



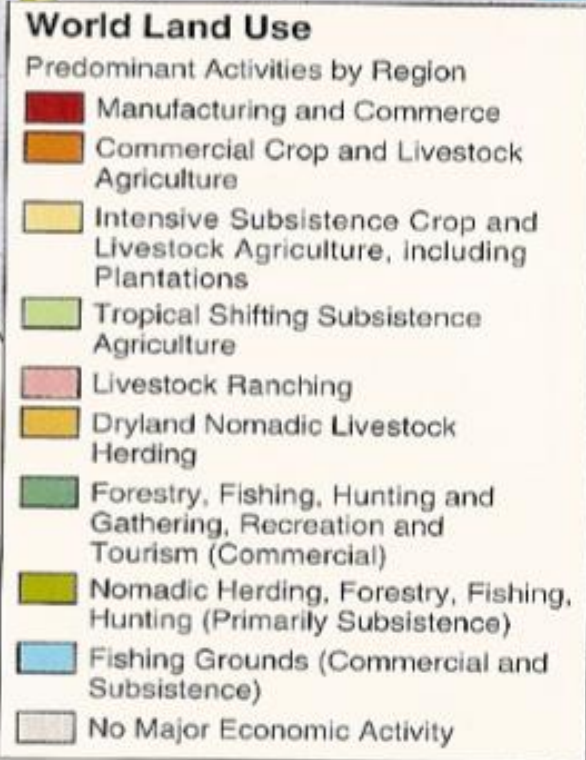
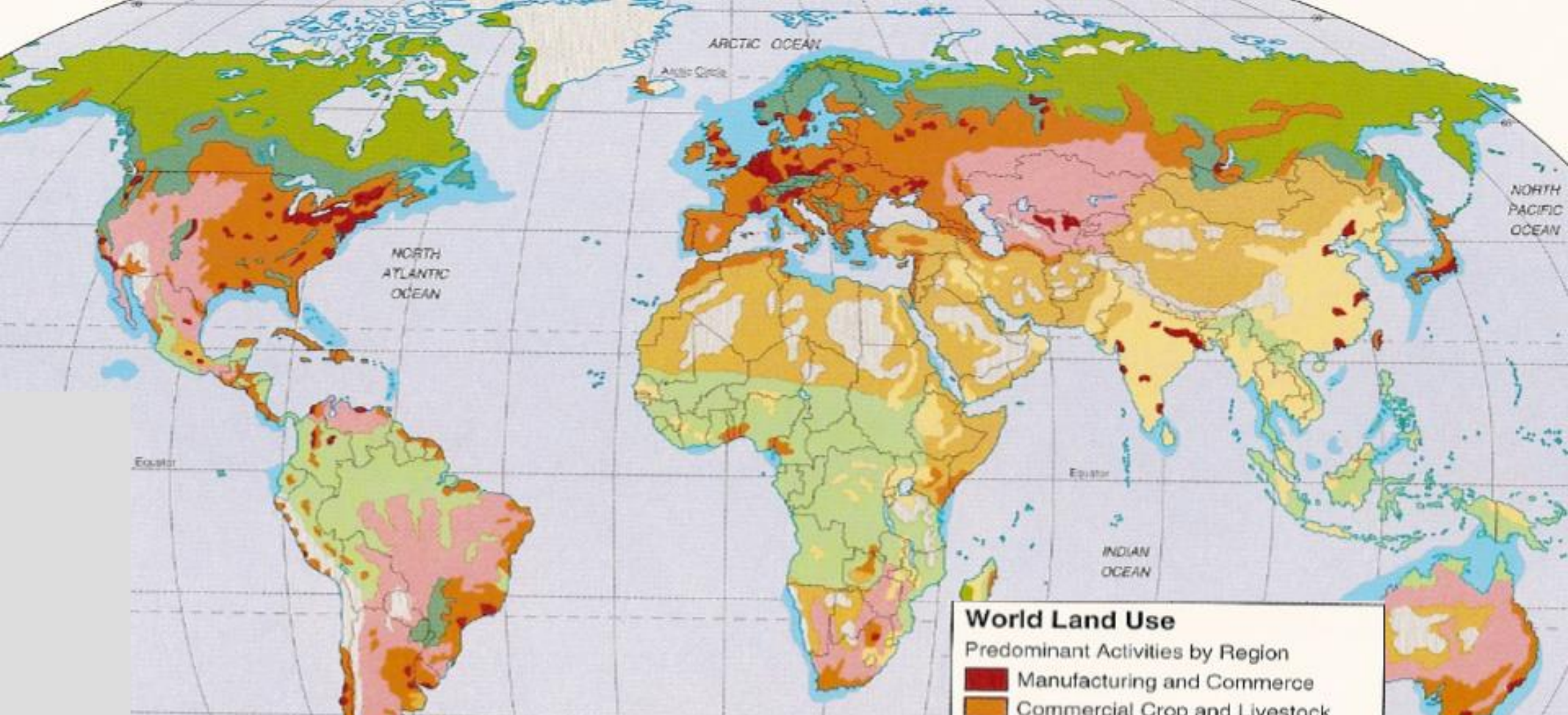
Top picture – Labor-intensive corn raising in central Mexico.

Bottom picture – Corn exported from capital-intensive U.S. farms to the Mexican market

Capital-Intensive Agriculture

Large amount of capital (equipment and buildings used to produce other goods) is applied per unit of output





Subsistence – predominantly low-income regions

Intensive subsistence – subtropical monsoon areas

Shifting cultivation – tropical forests & savannas

Nomadic herding – semiarid and arid lands

Commercial – predominantly high-income regions

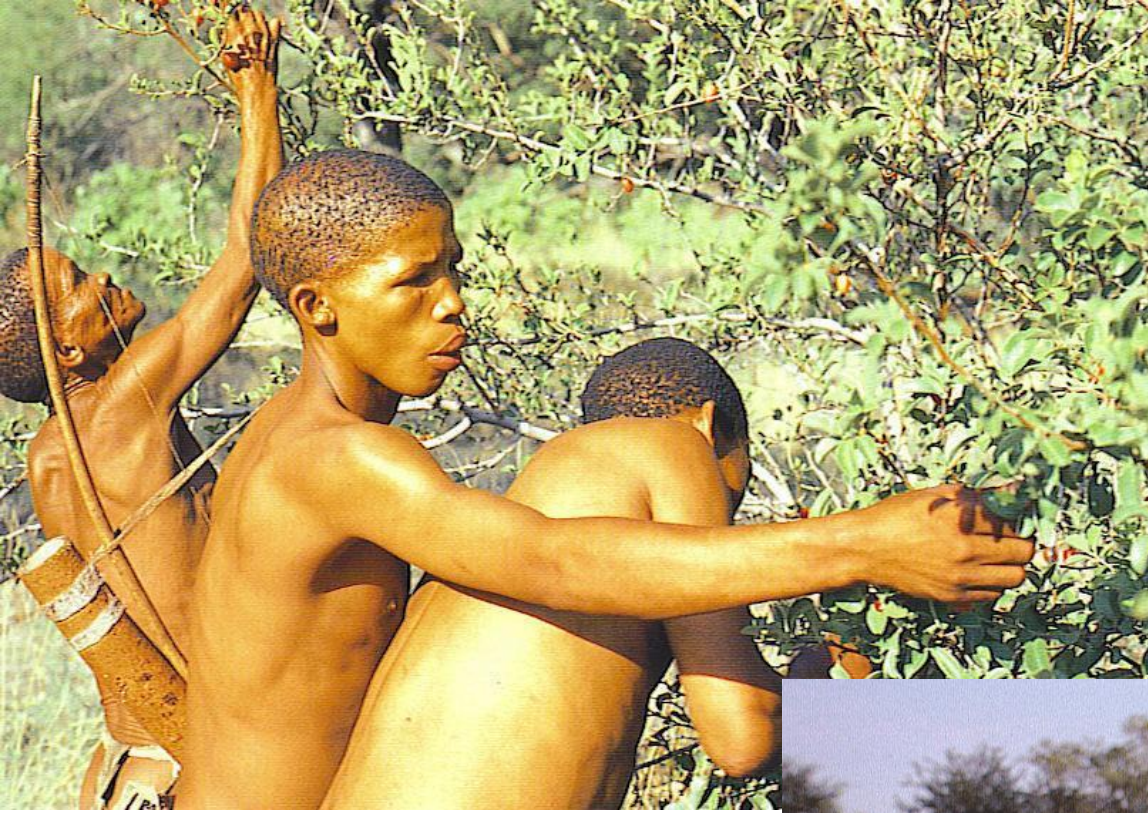
Crop farming – more humid climates

Livestock ranching - drylands

Before Farming

- Food production, preparation and consumption plays a major role in all culture.
- Food taboos by custom or religion, food intolerances- dairy, eggs or fish, peanuts, etc.
- Hunting & Gathering or Fishing was the only way to acquire food for most of our existence.
 - San of southern Africa
 - Aboriginals of Australia
 - Native Americans of Brazil



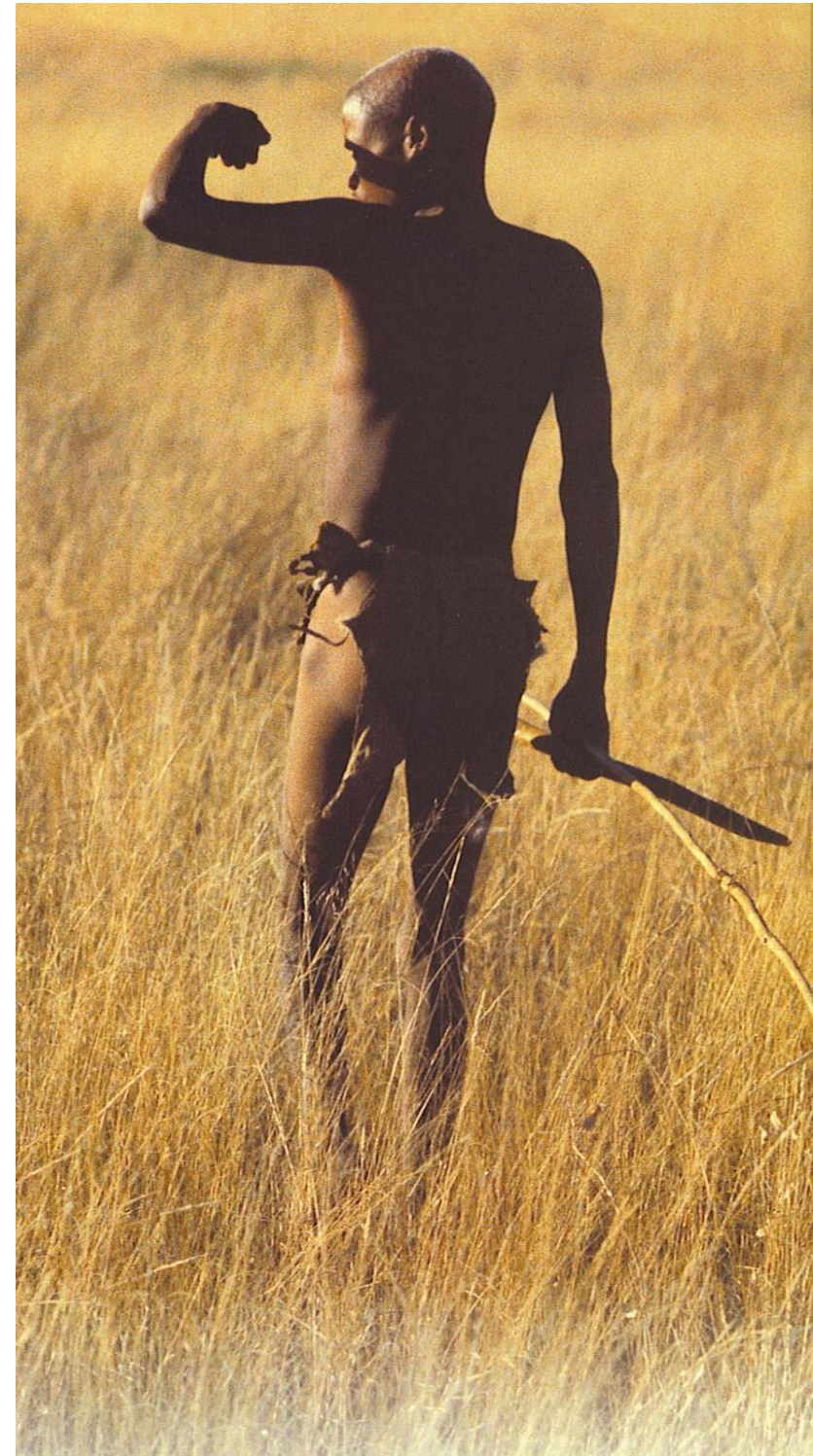


**Bushmen of the
Kalahari still live
By hunting and
gathering**



Hunting & Gathering Societies

- Settlements are **NOT PERMANENT**
- Populations remain small
- Early hunter-gatherers lived in wetter & better environments and had an easier life than those of the modern day.
 - Eastern North America- forests, wildlife & nuts
 - Pacific Coast Americas- salmon fishing
 - Aleuts of tundra caribou herds
 - Interior North America- buffalo herds



Hunting & Gathering Societies

- Technology improved slowly
- Bone & stone tools & weapons
- Learned to control fire-protection-cooking
- Metallurgy evolved with copper, bronze, gold and later iron for arrowheads, knives, axes and other utensils.
- Even pre-agricultural societies had complex tools, utensils & weapons

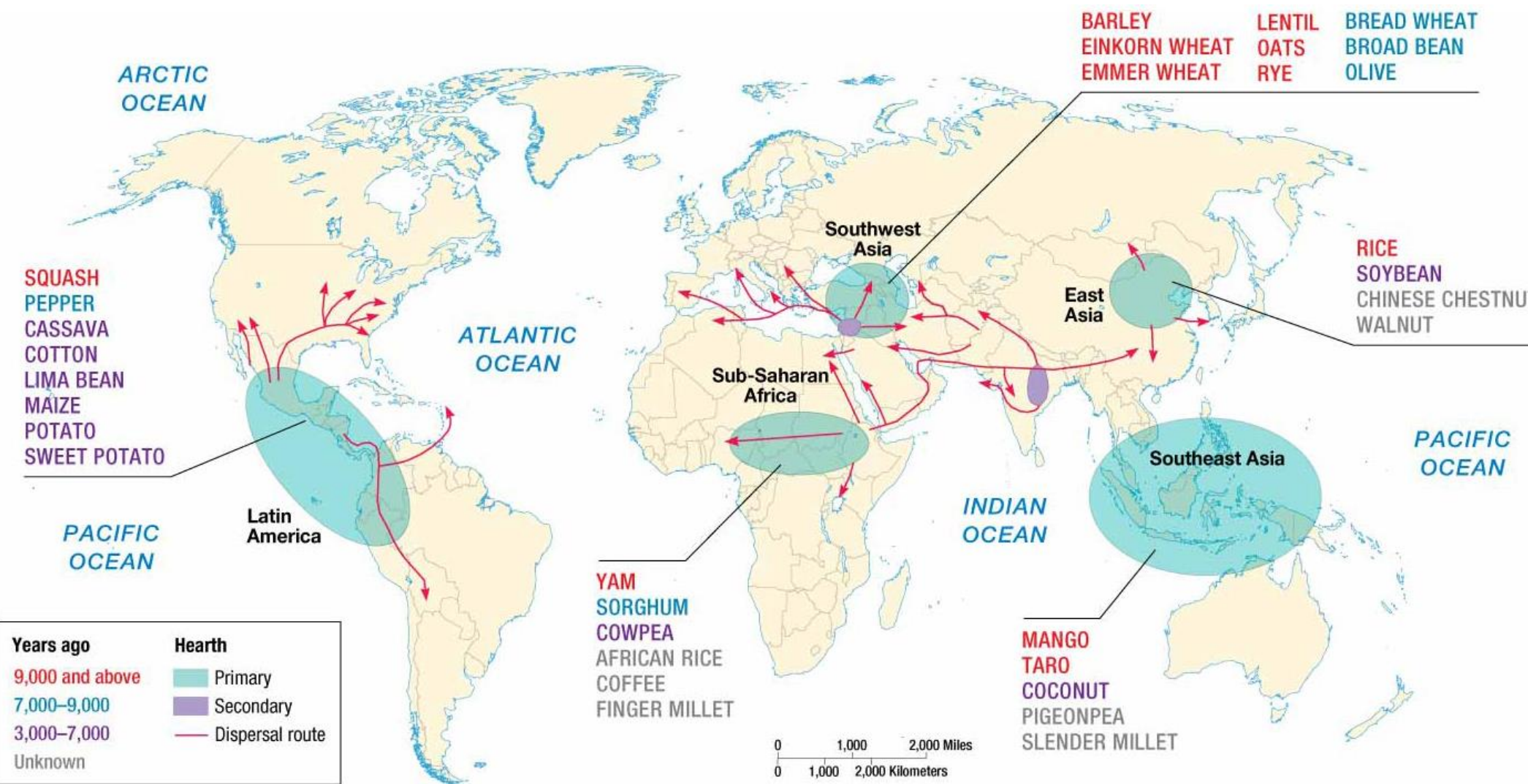


First Agricultural Revolution (Neolithic Revolution)

Invention of farming & domestication of livestock (8,000–14,000 years ago) + diffusion from several source regions = *shift from hunter-gatherer to agricultural societies*



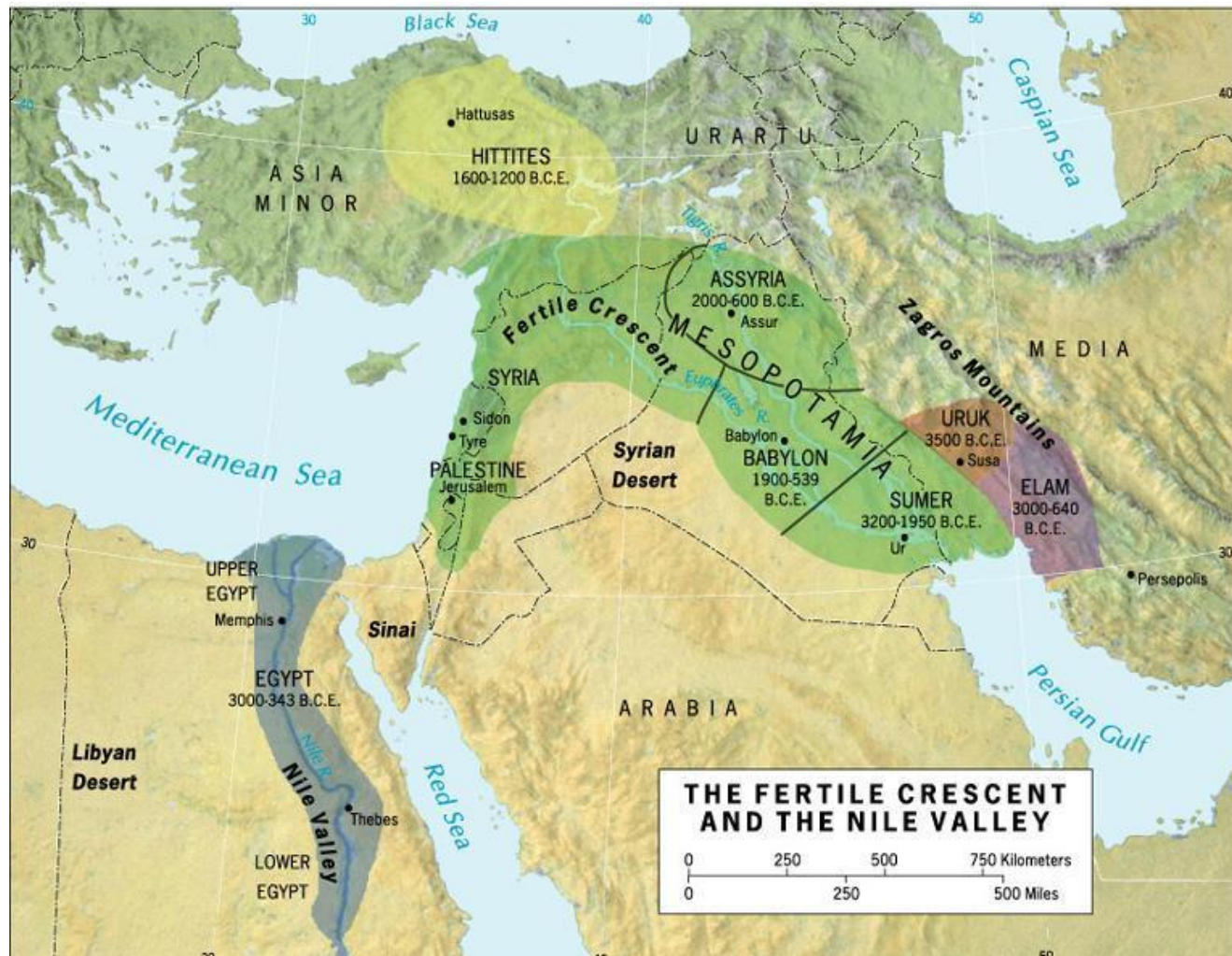
Probable culture-hearths of agriculture

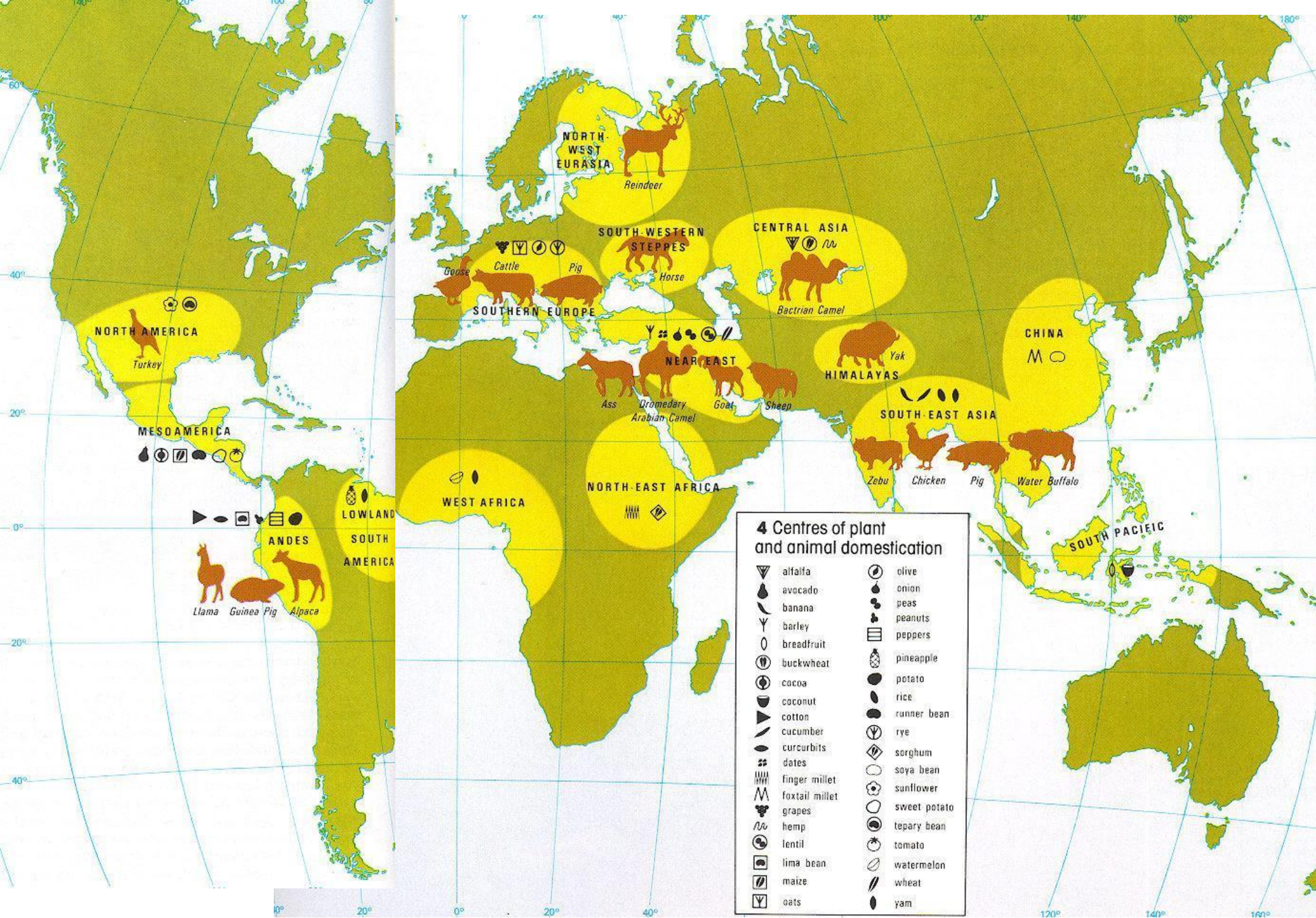


The Fertile Crescent –

Where the planned cultivation of seed crops began.

- because of seed selection, plants got bigger over time
- generated a surplus of wheat and barley
- first integration of plant growing and animal raising (used crops to feed livestock, used livestock to help grow crops)





4 Centres of plant and animal domestication

	alfalfa		olive
	avocado		onion
	banana		peas
	barley		peanuts
	breadfruit		peppers
	buckwheat		pineapple
	cocoa		potato
	coconut		rice
	cotton		runner bean
	cucumber		rye
	curcubits		sorghum
	dates		soya bean
	finger millet		sunflower
	foxtail millet		sweet potato
	grapes		tepany bean
	hemp		tomato
	lentil		watermelon
	lima bean		wheat
	maize		yam
	oats		

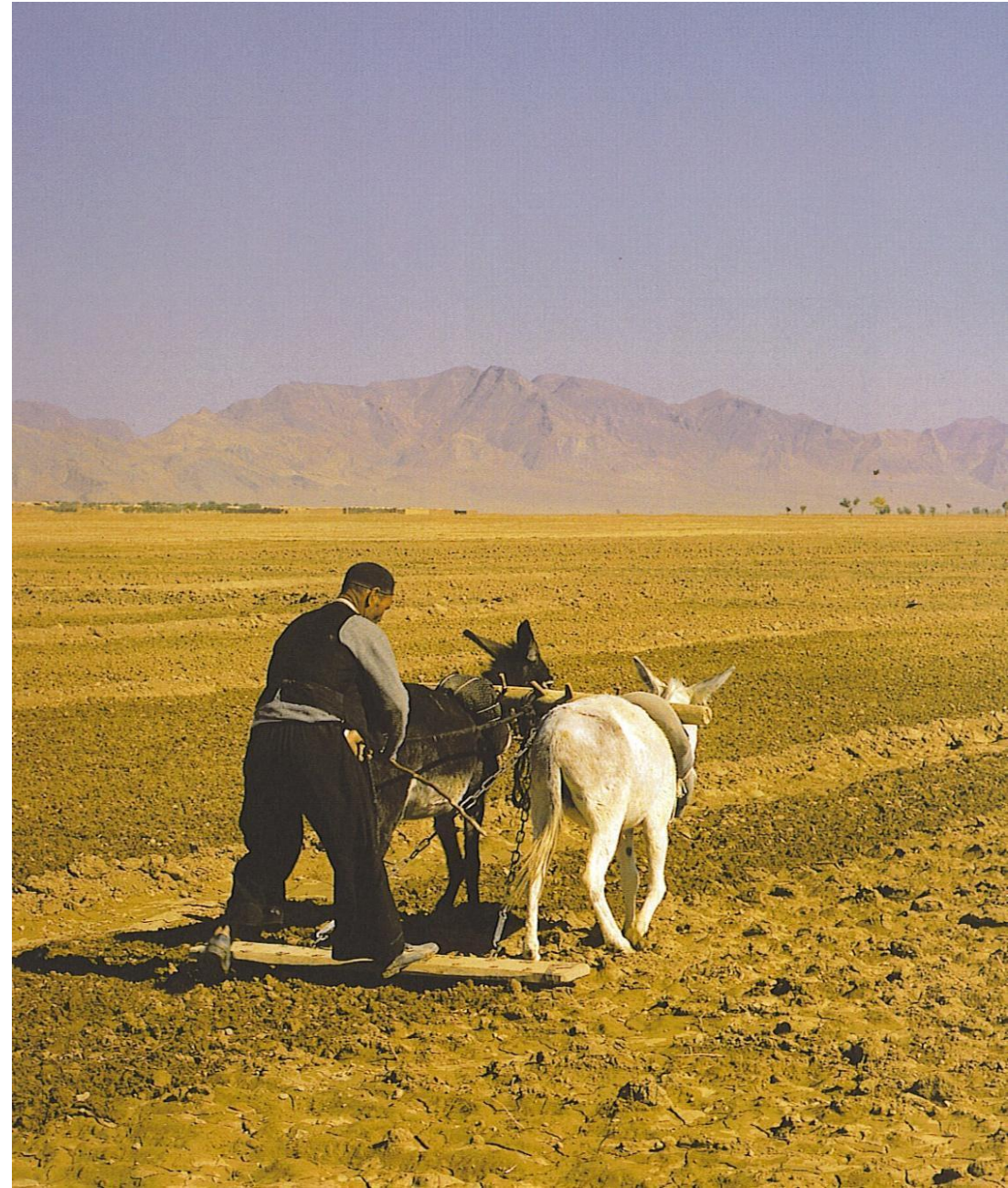
The First Agricultural Revolution-Animal Domestication

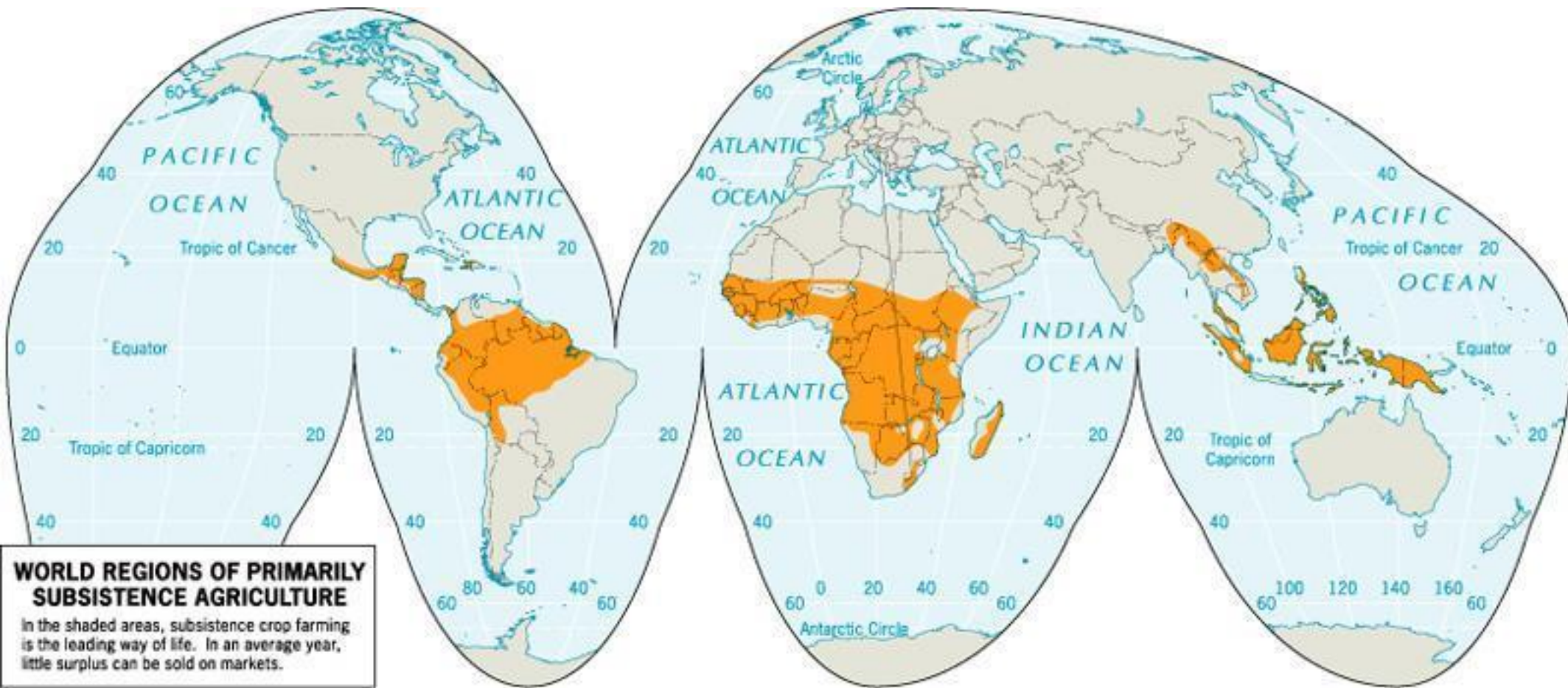
- Animals such as goats, pigs and sheep were domesticated about 8,000 yrs. ago.
- Domesticated animals in captivity are very different from their wild counterparts.
- Southeast Asia-pigs, water buffalo, chickens, ducks and geese were domesticated.



Subsistence Farming

- World-wide most farmers are subsistence-growing just enough to feed their families.
- They find building material and fuel in the natural environment-no cash economy
- Small fields-intensive farming on land they often don't own.
- Methods and tools used are generally very low tech.
- Found in South & Central America, Africa, South Asia, and South East Asia

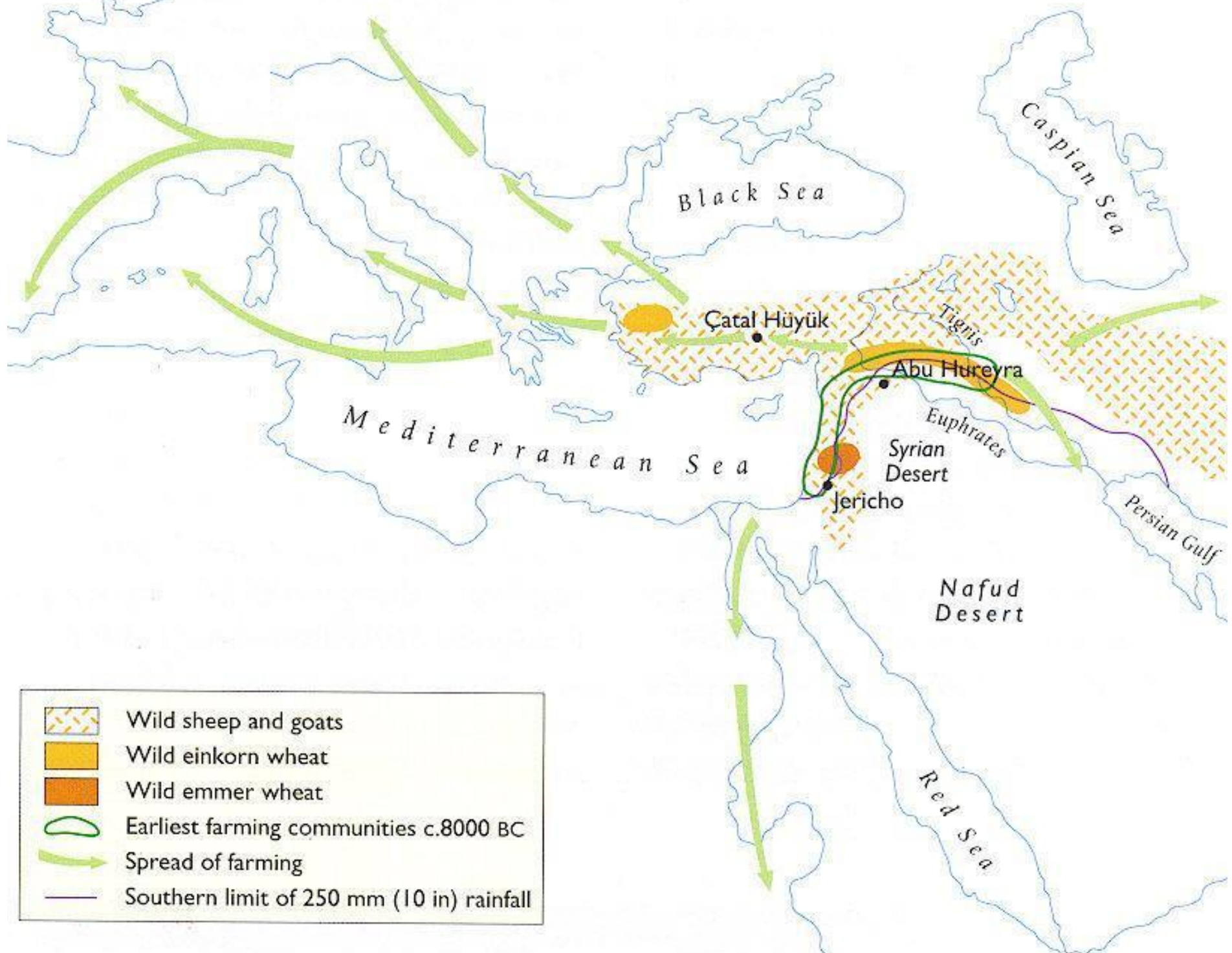


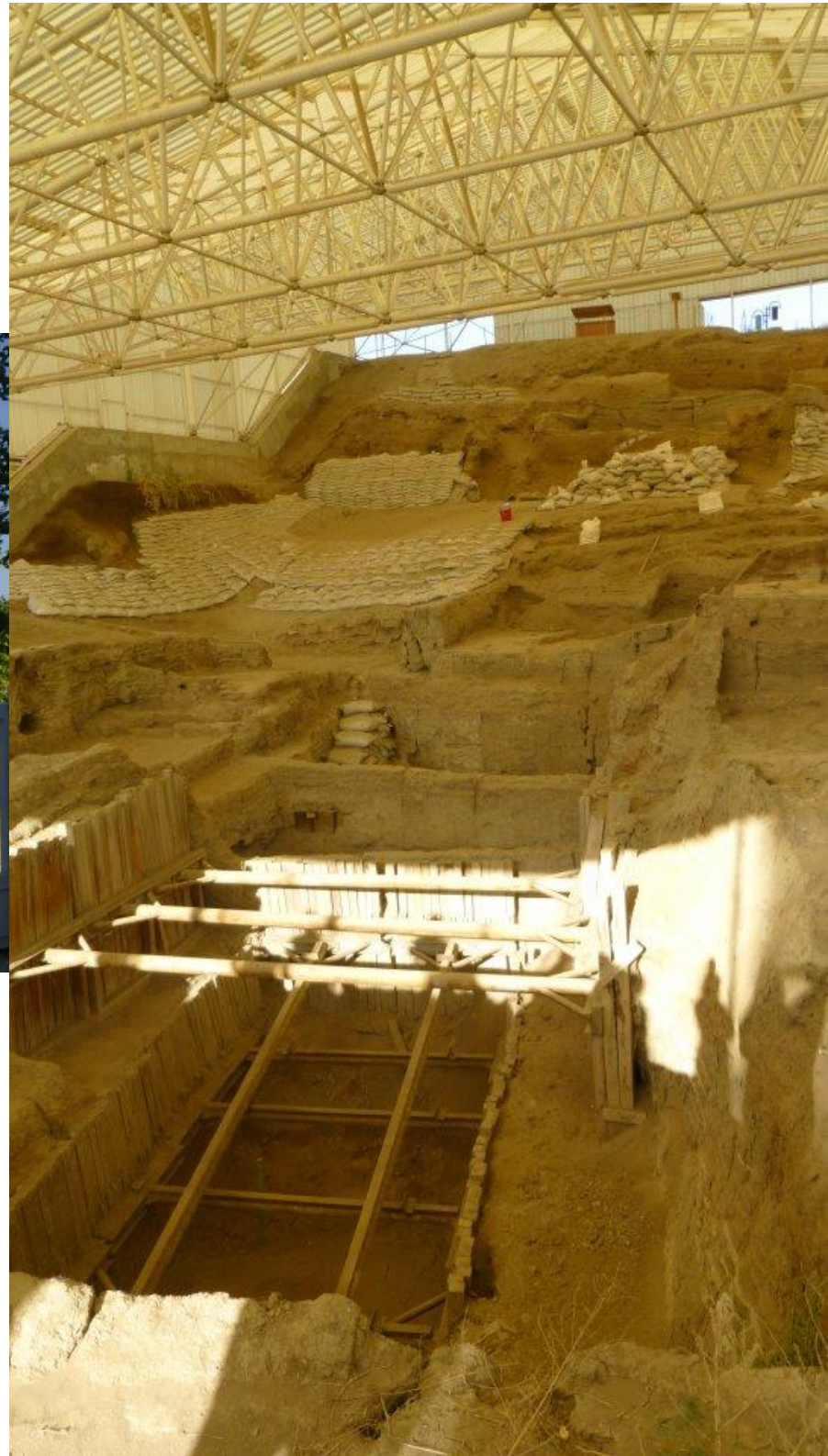


World Regions of Primarily Subsistence Agriculture

On this map, India and China are not shaded because farmers sell some produce at markets; in equatorial Africa and South America, subsistence farming allows little excess and thus little produce sold at markets.

THE SPREAD OF EARLY FARMING FROM 8000 BC





Why is this building important?



A burial

"This building is small, but it was very important. In many ways it is a typical building, with an oven set into the south wall of the main room (across from you). Under the platforms in the north part of this room we also found many burials."

Studying human bones reveals that men and women had similar diets.

Bir insan gömütü



Wall paintings



Duvar resimleri

"The house also had some unusual features. In one of the graves, we found a body with no arms or legs. Also unusual is that the highest platform was surrounded by paintings of different types."

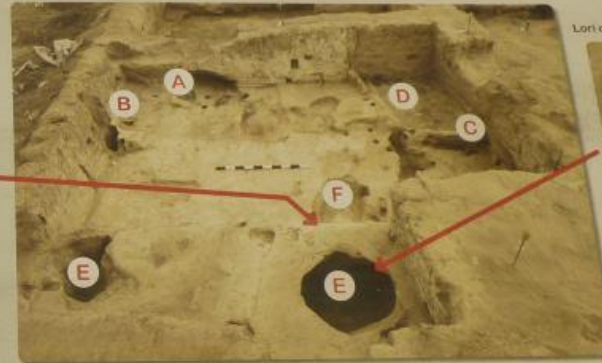
Stone debris found in the store rooms indicates they made tools indoors.

"In the small store rooms we found collections of stone tools and animal figurines. And in the soil placed in the room when it was abandoned, we found lots of bull horns."

-Prof. Ian Hodder
Project Director

Building 49

Bina 49



Lori documenting a burial



Lori bir insan gömütü

"Bu ev aynı sahiptir. O ve bacaklı rastladık. mun (E) ç olması d

Depo od bulunan y artıkları, k aletleri üretilmiş bir göm

- | | | |
|--------------------------|---|----------------------------|
| oven | A | fırın |
| small bench | B | küçük seki |
| store rooms | C | kiler |
| animal figurines | D | hayvan figürinleri |
| platform burials | E | platform gömütleri |
| burial of limbless torso | F | kolsuz ve bacaksız iskelet |



Second Agricultural Revolution

Technological changes (starting 1600s in Western Europe; spread by 1800s to North America)

Began with new methods: crop rotation, better horse collars

Later innovations: replace human labor with machines, supplement natural fertilizers & pesticides with chemical

Beginnings of commercialization of agriculture (production of surplus for trade); enabled widespread urbanization

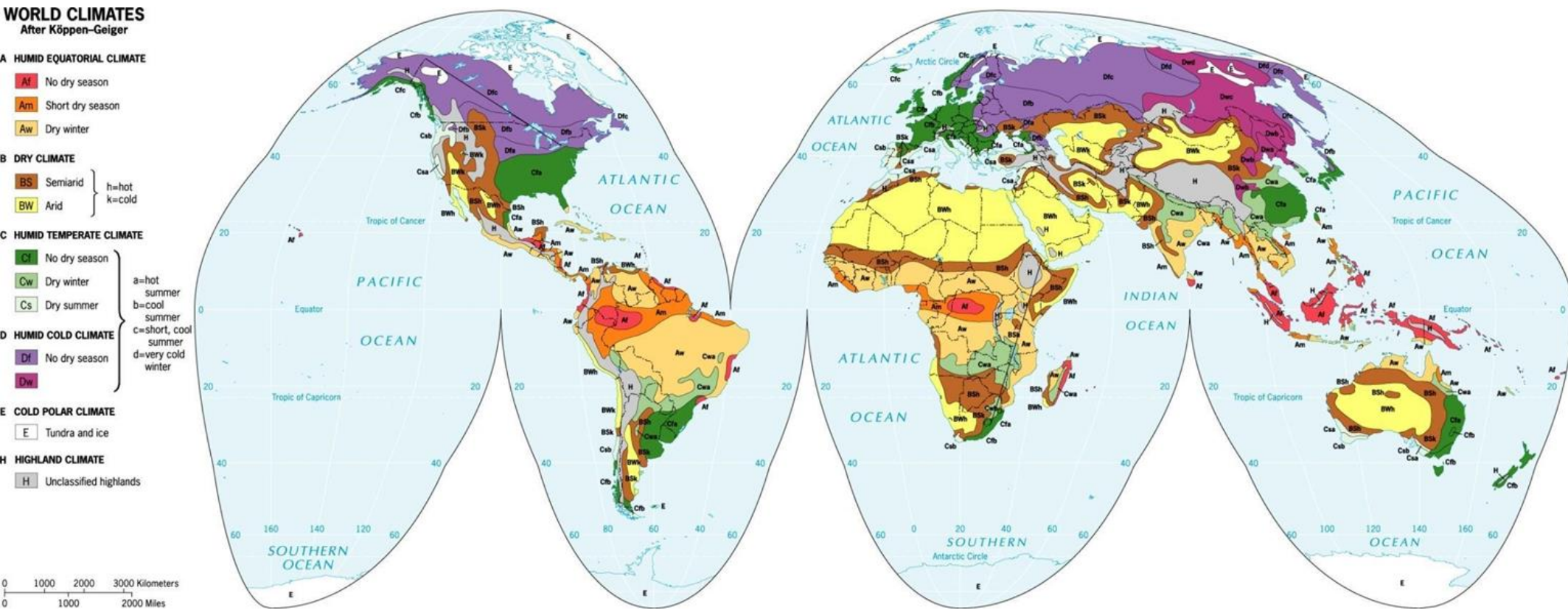


Agriculture and Climate

- **Climate Regions** (based on temperature and precipitation) help determine agriculture production.
- **Agriculture Regions** – drier lands usually have livestock ranching and moister climates usually have grain production.

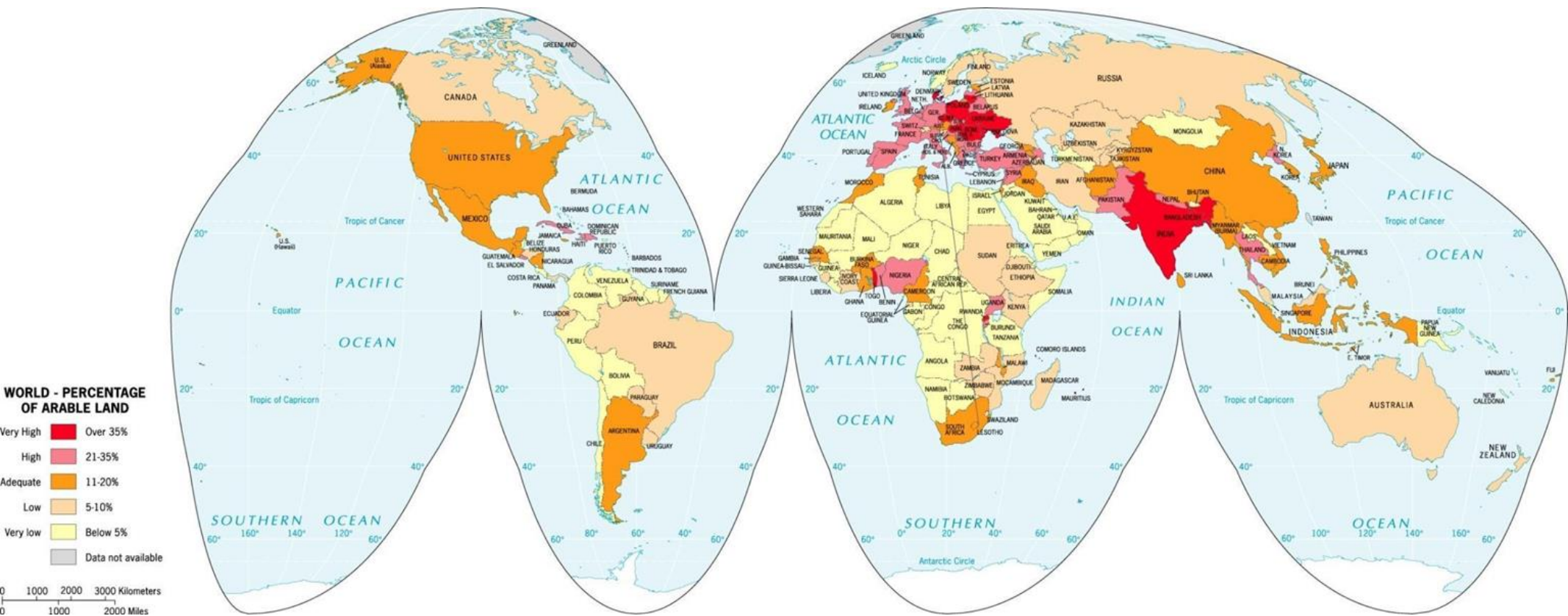
World Map of Climates

Köppen Climate Classification System



- Agricultural Societies are classified as:
 - Subsistence or Primitive
 - Intermediate or Traditional
 - Developed or Modern
- Colonial Powers-Bad Points
 - Tried to compel subsistence farmers to modernize by charging them taxes
 - Made them devote valuable land to cash crops like cotton
- Colonial Powers-Good Points
 - Conducted soil surveys
 - Built irrigation systems
 - Established lending agencies to loan money to farmers

Arable Land Percent Arable by Country



Does the percent of land that is arable in a country determine the agricultural output or the calorie consumption in a country?

Agriculture

- Commercial Agriculture

Term used to describe large scale farming and ranching operations that employ vast land bases, large mechanized equipment, factory-type labor forces, and the latest technology.

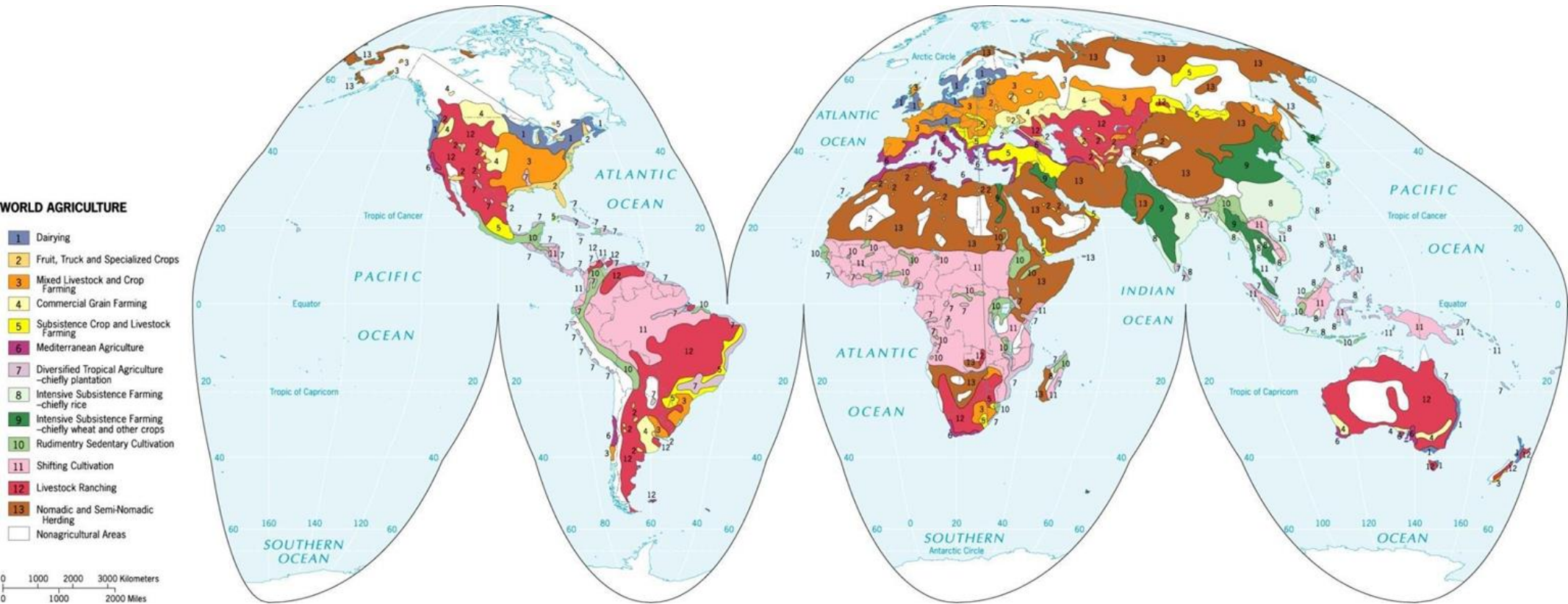
- roots are in colonial agriculture
- today, global production made possible by advances in transportation and food storage

Advances in Transportation & Food Storage

- Containerization of seaborne freight traffic
- Refrigeration of containers, as they wait transport in Dunedin, New Zealand



World Map of Agriculture



Cash Crop and Plantation Agriculture
Cotton and Rubber
Luxury Crops
Commercial Livestock, Fruit, and Grain Agriculture
Subsistence Agriculture
Mediterranean Agriculture
Illegal Drugs

TOP TEN Wheat Producing Countries



LEGEND

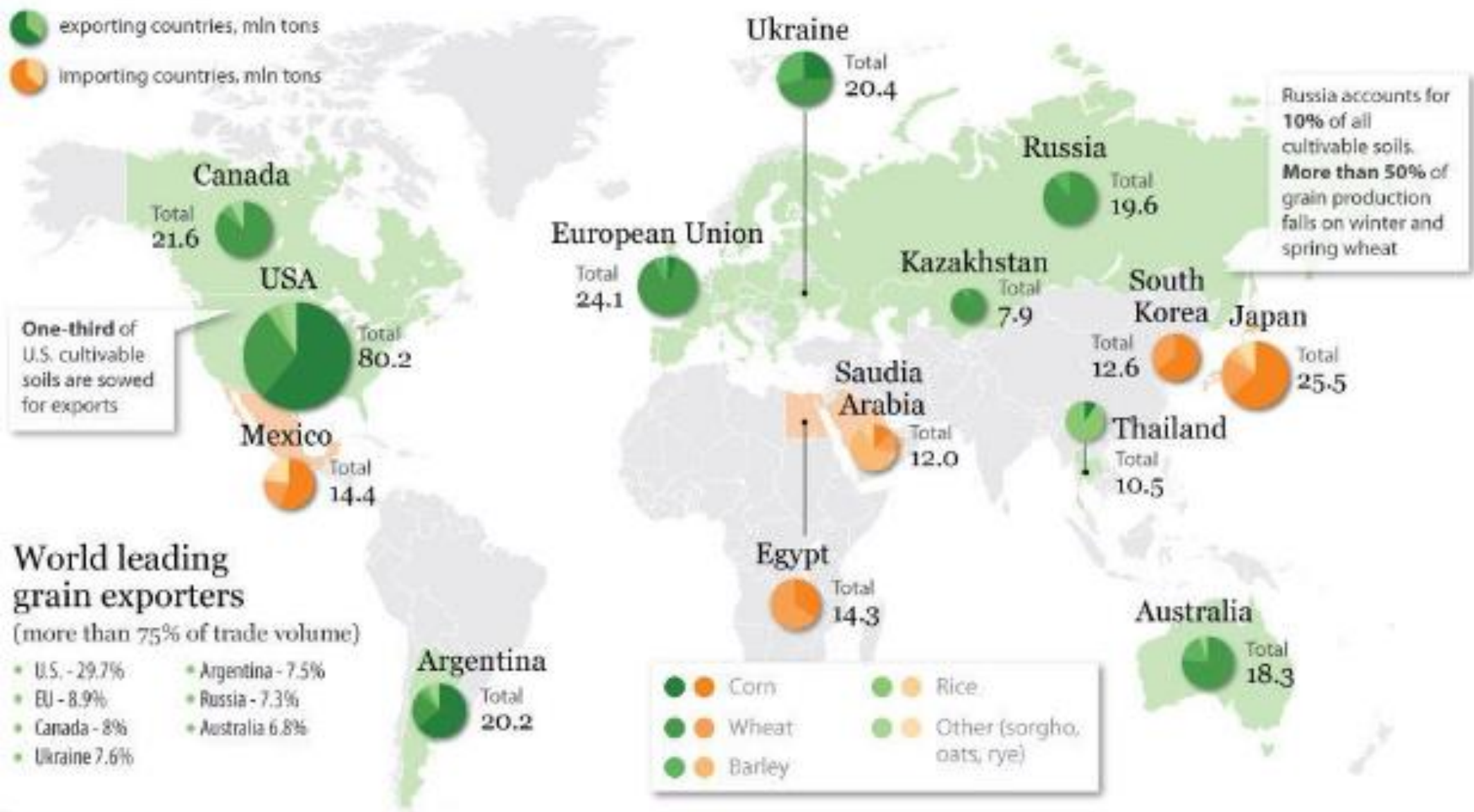
Country	Million Metric Tons (2012)	Country	Million Metric Tons (2012)
China	125.6	Australia	29.9
India	94.9	Canada	27.0
United States	61.8	Pakistan	23.5
France	40.3	Germany	22.4
Russia	37.7	Turkey	20.1

0 1500 3000 4500 Kilometers
 0 1500 3000 US survey miles

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 (Updated on 7th Oct, 2013)

Source: Food and Agriculture Organization figures from FAOSTAT database.

World grain exporters and importers



Agribusiness & the Changing Geography of Agriculture

- **Commercialization of Crop Production**

With the development of new agricultural technologies, the production of agriculture has changed.

- eg. Poultry industry in the US

- production is now concentrated

- farming is turning into manufacturing

Third Agricultural Revolution

Since 1960s

- hybridized grains for better yields (“Green Revolution”)
- greater reliance on synthetic fertilizers
- genetically engineered crops
- vertical integration of ownership (e.g., Cargill, ConAgra, ADM)
- globalization of production

A partial list of ConAgra's brands

Swiss Miss Hunt's

Van Camp's Marie Callender's

Wesson Hebrew National

Slim Jim Egg Beaters

Rosarita Chef Boyardee

ReddiWip Pam

Peter Pan Orville Redenbacher's

Healthy Choice Banquet

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Nourishing Ideas.
Nourishing People.

What's New

[Cargill reports third quarter fiscal 2007 earnings](#) Apr. 16, 2007
Cargill today reported net earnings of \$653 million in the 2007 third quarter ended Feb. 20, up 48 percent from \$370 million in the same period a year ago ...

[Cargill grants Zinov exclusive rights to market SafeLane™ Surface Overlay in Russia and the CIS](#) Apr. 12, 2007
Cargill today announced it has signed an agreement granting Zinov PLC, the specialty chemical company focused on oilfield process chemicals and descaling solutions, exclusive rights to market SafeLane™ Surface Overlay in Russia and the 10 other countries of the Commonwealth of Independent States (CIS) ...

[Cargill to introduce Omega 3 ingredient at Vitabiotics International](#) Apr. 5, 2007
Cargill will introduce its new Omega 3 food ingredient at Vitabiotics International, May 8-10, 2007, in Geneva, Switzerland ...

Customers We Serve

Crop & Livestock
Cargill produces and distributes crop nutrients and feed ingredients to farmers, livestock producers and animal feeders. We originate and process grain, oilseeds and other agricultural commodities for distribution to makers of food, feed and other products.

Food
Cargill collaborates with food manufacturers, food service, distributors and retailers with a focus on customer and consumer benefits. Cargill offers insights in food and beverage ingredients, meat and poultry products, and food applications that help customers succeed.

Health & Pharmaceutical
Science-based, health promoting ingredients for pharmaceutical and dietary supplement companies.

Industrial
Sustainable oil, soil and starch products and services, industrial applications for agricultural products, and steel products and services.

Financial & Risk Management
With operations on four continents and a long

Feature

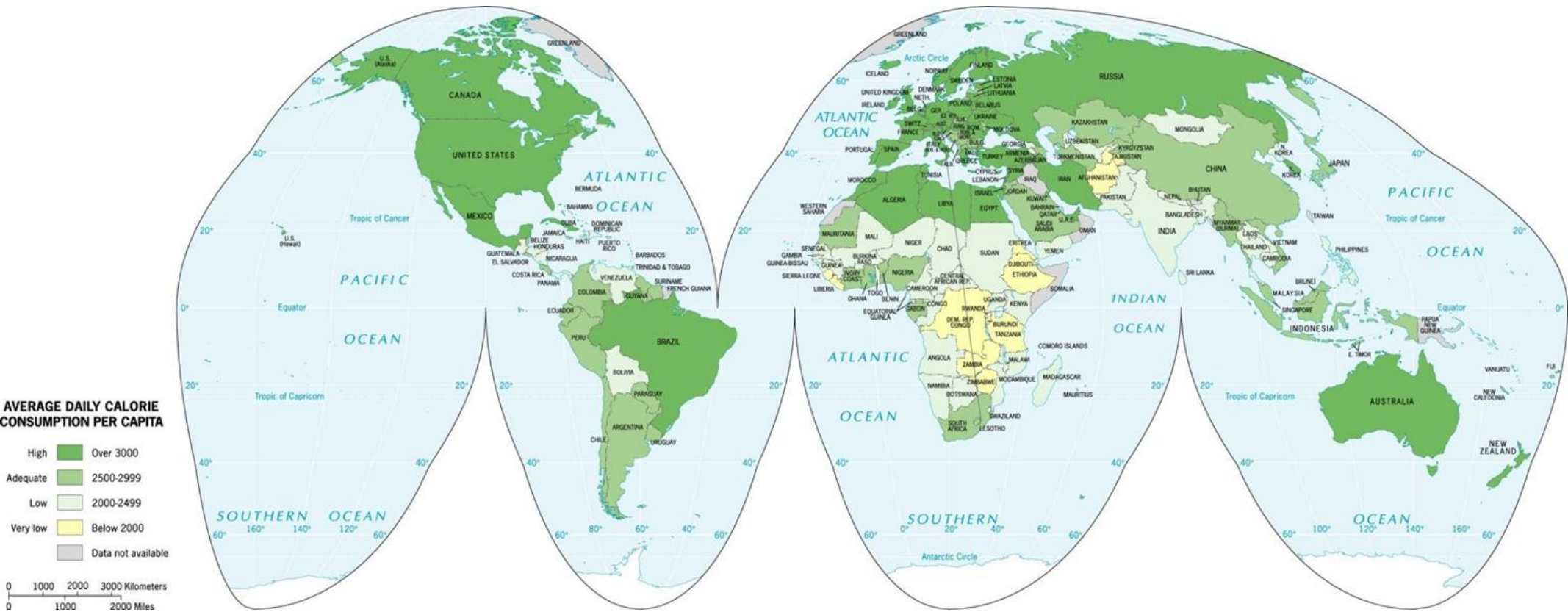
Cargill Industrial Starches
Starches for the paper making, corrugating, and industrial markets.

Food Ingredient Portfolio
Discover Cargill's unmatched breadth of ingredients. (PDF: 2MB)

Third Agriculture Revolution (Green Revolution)

- invention of high-yield grains, especially rice, with goal of reducing hunger.
 - increased production of rice
 - new varieties in wheat and corn
 - reduced famines due to crop failure,
now most famines are due to
political problems
 - impact (in terms of hunger) is greatest
where rice is produced

Average Daily Calorie Consumption per Capita



Opposition to Green Revolution

- Opposition argues Green Revolution has led to:
 - vulnerability to pests
 - Soil erosion
 - Water shortages
 - Micronutrient deficiencies
 - Dependency on chemicals for production
 - Loss of control over seeds

Opposition to Green Revolution

- Genetically engineered crops are yielding some ethical problems. In the semi-periphery, farmers typically keep seeds from crops so that they can plant the seeds the next year. Companies that produce genetically engineered seeds do not approve of this process; generally, they want farmers to purchase new seeds each year.
- Many semi-periphery farmers can not afford the new seeds, fertilizers, pesticides or herbicides.
- Some of the poorest areas of the world have benefited the least from the Green Revolution-especially Africa.
- Small farms can't take advantage of the innovations-
India 4 acres, Bangladesh 1.8 acres, China ½ acre



Nourishing Ideas.
Nourishing People.



What's New

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Health & Pharmaceutical

Science-based, health promoting ingredients for pharmaceutical and dietary supplement companies.

Industrial

Sustainable oil, salt and starch products and services, industrial applications for agricultural products, and steel products and services.

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With operations on four continents and a long

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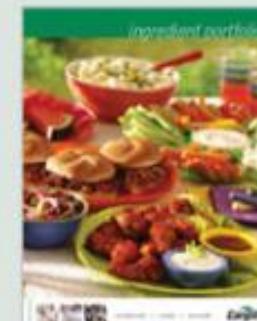
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“Green Revolution” – 1960s -1980s



**Rice
plant**

Sources: FAO, IRRI (research organization devoted to rice) – part of global CGIAR effort at improving yields of staple crops worldwide

Rice - staple food for 2.5 billion Asians - provides 2/3 of calories for Asians with rice-based diets

Green Rev – Raised yields

*** Improved rice strains**

*** Greater use of fertilizer**

*** Increase use of irrigation**

Asia’s rice production grew at annual rates of 3.0% until 1980s

Yield growth rate exceeded high pop. growth rates of the time

Green Revolution Plusses:

Countries self-sufficient in rice or even exporters (Thai, Viet).

Poor people benefited as yield increases caused real price of rice to drop.

Problems

Successes led to less concern about food security, and less

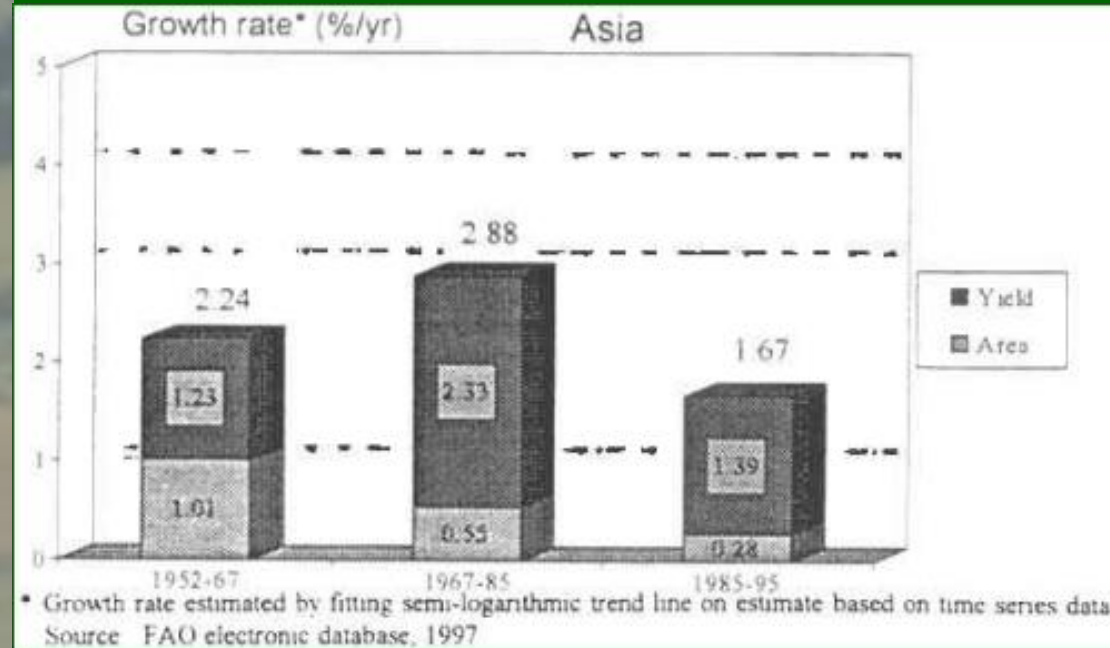
investment in irrigation, agric research, and rural infrastructure.

Growth rate in rice production declined during 1985-95 due to drop in growth rate of rice yields.

In most places, despite increasing use of fertilizers, further increases in yields became harder to achieve and more costly.

www.fao.org: *Mobilising science for global food security*

“Post-Green Revolution” (since 1980s)



Globalization of the Cut-Flower Industry

Kenya has become the European Union's biggest source of flower imports and overtaken Israel as market leader. It has a 25% market share, beating Colombia and Israel, which each have about 16%.

Two thirds of these blooms go to the Netherlands, which dominates the trade in cut flowers worldwide through its auction halls where Dutch wholesalers buy flowers for re-export to markets as far away as the United States and Japan.

Valentine's Day is a big date for Kenyan growers, thanks to the country's perfect match of high altitudes and equatorial sunshine. Roses make up 74% of Kenya's flower exports, followed by carnations which are the most popular flower in Britain at less romantic times because they last longest. *Source – www.bbc.co.uk*

***Flower industry workers in
Kenya (left) and Colombia
(right)***



Third Agricultural Revolution

Benefits

Reduced uncertainties in agriculture

Greater global exchange of ag products

Increased yields

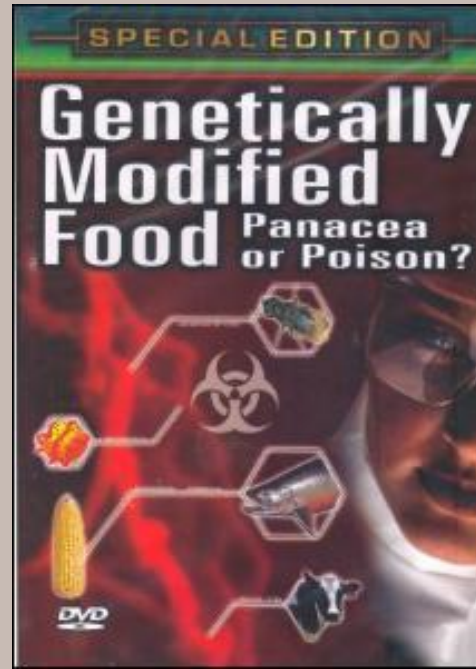
Costs

Increased dependence on fossil fuels

Reliance on chemical inputs

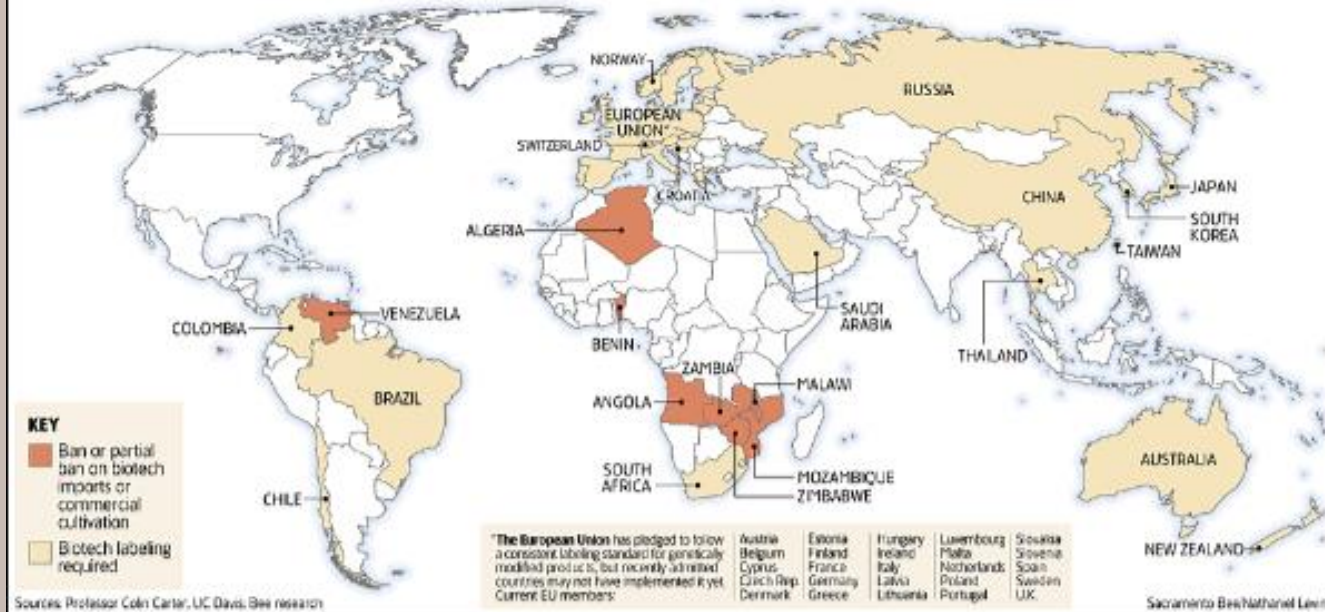
Less global diversity of food products

Concentration of pollutants



Look for the label

These countries ban or require the labeling of foods that contain biotech ingredients.



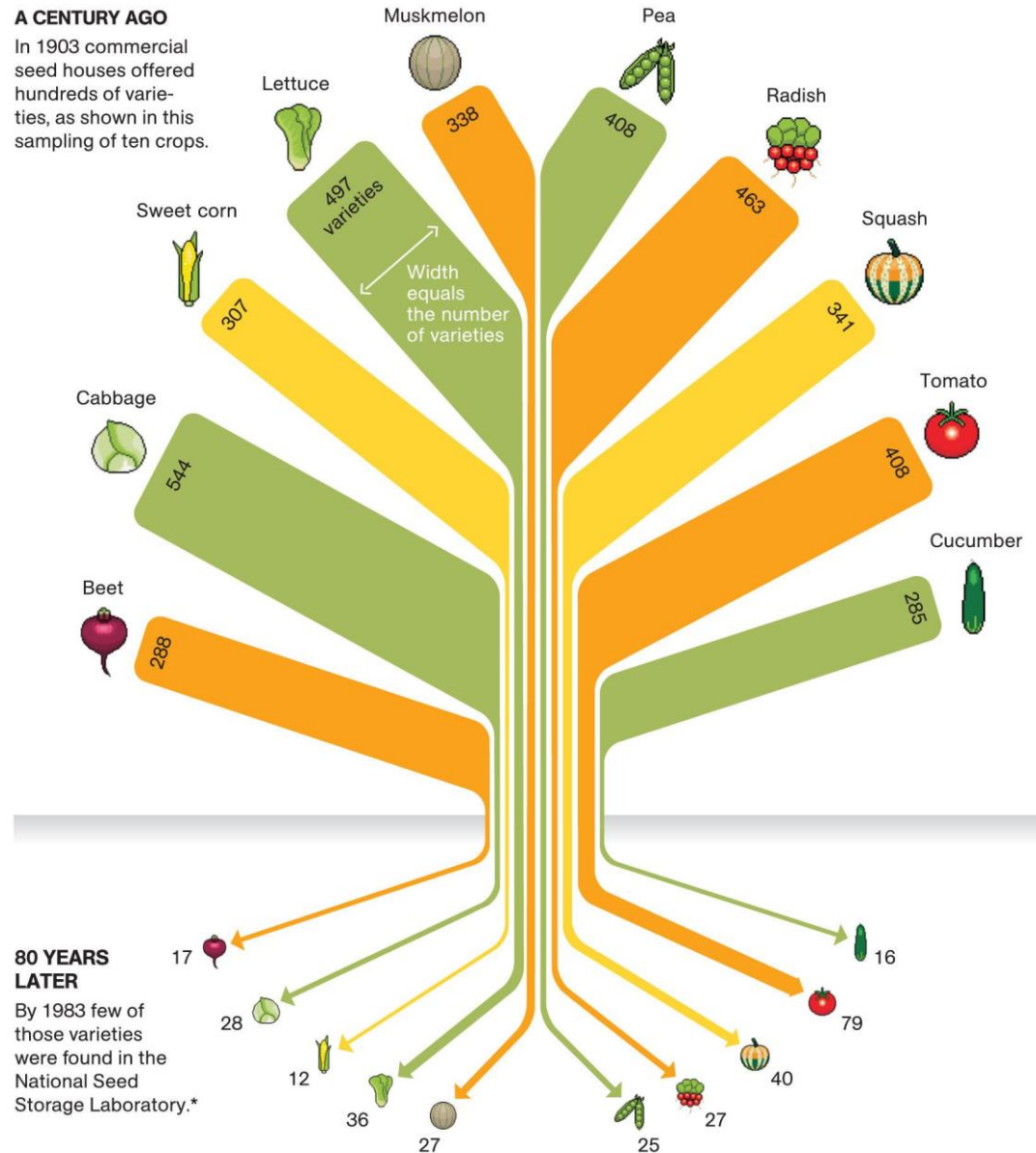
OUR DWINDLING FOOD VARIETY

As we've come to depend on a handful of commercial varieties of fruits and vegetables, thousands of heirloom varieties have disappeared. It's hard to know exactly how many have been lost over the past century, but a study conducted in 1983 by the Rural Advancement Foundation International gave a clue to the

scope of the problem. It compared USDA listings of seed varieties sold by commercial U.S. seed houses in 1903 with those in the U.S. National Seed Storage Laboratory in 1983. The survey, which included 66 crops, found that about 93 percent of the varieties had gone extinct. More up-to-date studies are needed.

A CENTURY AGO

In 1903 commercial seed houses offered hundreds of varieties, as shown in this sampling of ten crops.



80 YEARS LATER

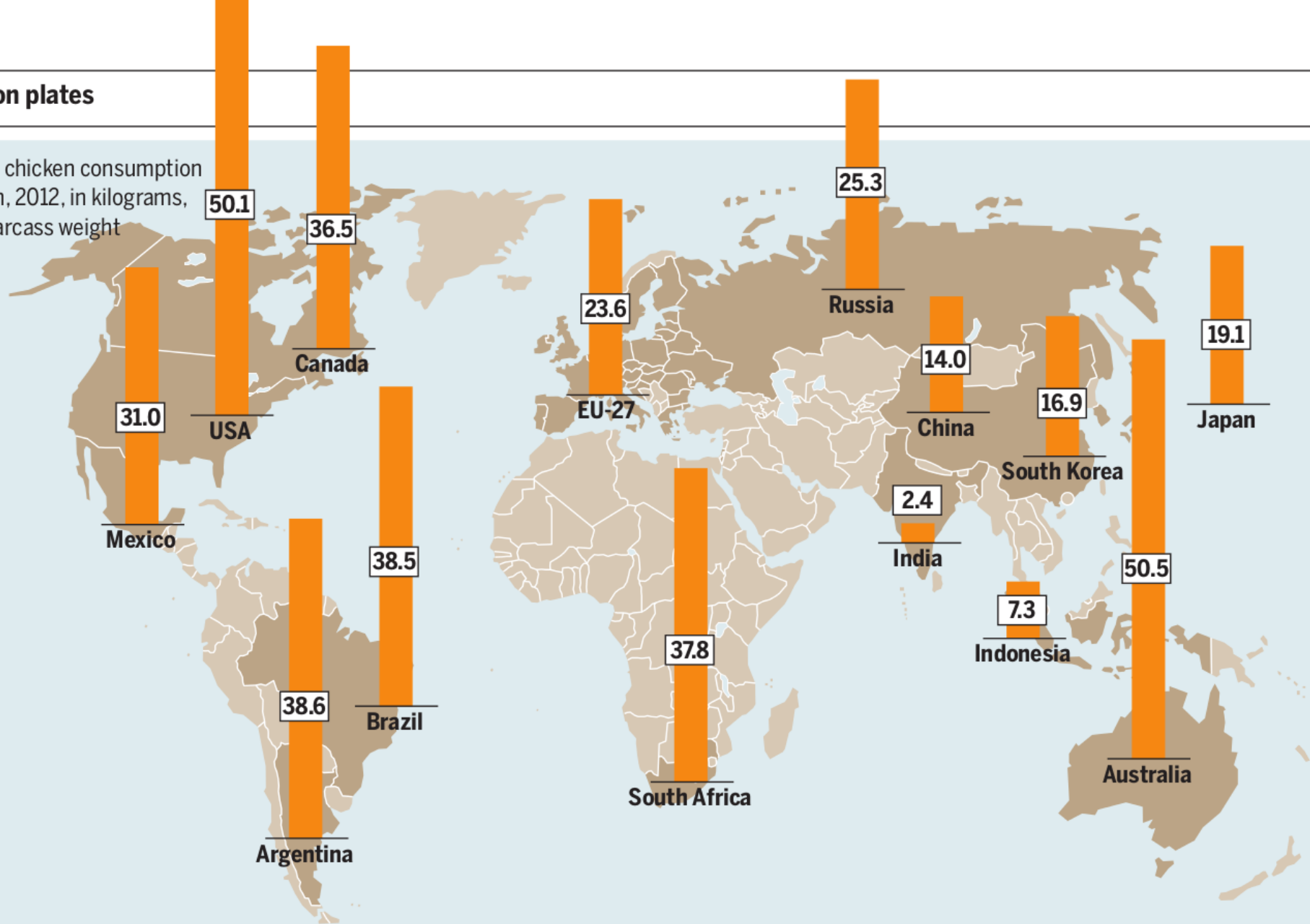
By 1983 few of those varieties were found in the National Seed Storage Laboratory.*

*CHANGED ITS NAME IN 2001 TO THE NATIONAL CENTER FOR GENETIC RESOURCES PRESERVATION.

JOHN TOMANIO, NGM STAFF. FOOD ICONS: QUICKHONEY
SOURCE: RURAL ADVANCEMENT FOUNDATION INTERNATIONAL

Chickens on plates

Estimated chicken consumption per person, 2012, in kilograms, dressed carcass weight



Serving Sizes Around the World

<http://www.mnn.com/health/fitness-well-being/stories/serving-sizes-around-the-world-infographic>