


**Lecture 12–13**  
**Agricultural Origins and Development in Asia**



**Seven Areas of Independent Domestication of Plants and Animals**

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**Asia: An enormous continent, home of 3 Vavilovian Centers, Independent Origins of Agriculture**




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**30 Most Important Crops (megatonnes)**

Sugarcane (1168)	Banana (85)	Onion (37)
Rice (551)	Tomato (84)	Canola (35)
Wheat (554)	Cottonseed (58)	Yam (33)
Maize (515)	Orange (57)	Oat (29)
Potato (285)	Grape (55)	Peanut (29)
Sugarbeet (265)	Sorghum (54)	Millet (27)
Cassava (164)	Apple (50)	Sunflower (27)
Barley (143)	Coconut (47)	Rye (23)
Sweet potato (136)	Cabbage (46)	Mango (19)
Soybean (126)	Watermelon (40)	Drybean (18)

**Center of Variation**  
**Asian American African Mediterranean**

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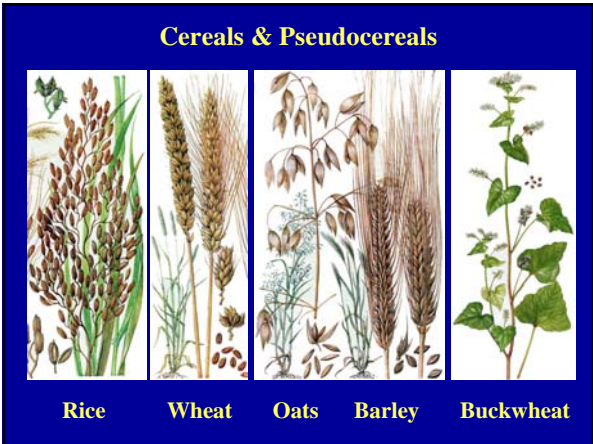
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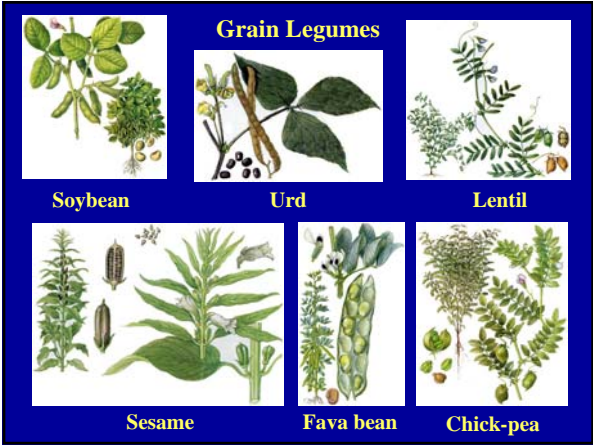
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**Asian Grain Legumes  
Cultivated in North America**

<b>Common in US</b>	
Soybean	<i>Glycine max</i>
<b>Rare in US</b>	
Adzuki bean	<i>Phaseolus angularis</i>
Chickpea	<i>Cicer arietinum</i>
Fava bean	<i>Vicia faba</i>
Lentil	<i>Lens esculenta</i>
Mungbean	<i>Phaseolus aureus</i>
Rice bean	<i>Phaseolus calcaratus</i>
Sesame	<i>Sesamum indicum</i>
Urd (gram) bean	<i>Phaseolus mungo</i>

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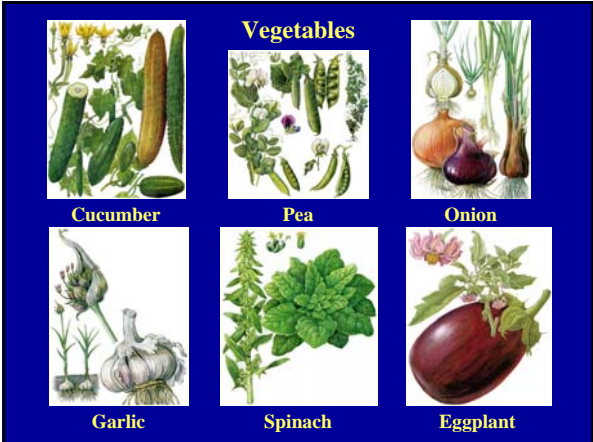
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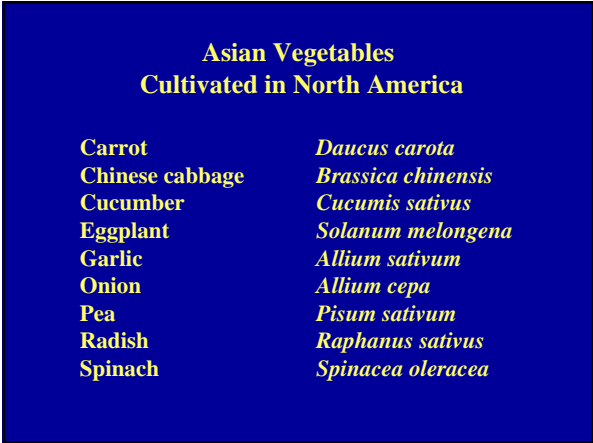
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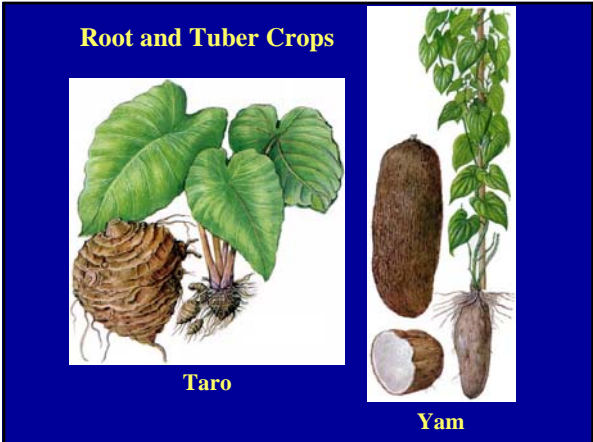
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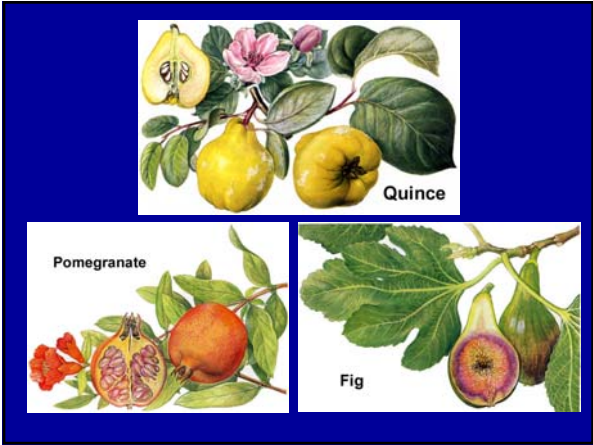
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**Asian Fruits—Temperate Cultivated in North America**

Apple	<i>Malus pumila (M. ×domestica)</i>
Apricot	<i>Prunus armeniaca</i>
Cherry	<i>Prunus cerasus</i>
Fig	<i>Ficus carica</i>
Grape	<i>Vitis vinifera</i>
Orange	<i>Citrus sinensis</i>
Peach	<i>Prunus persica</i>
Quince	<i>Cydonia oblonga</i>
Pear	<i>Pyrus serotina, P. ussuriensis, P. communis</i>
Pomegranate	<i>Punica granatum</i>
Tangerine	<i>Citrus reticulata</i>

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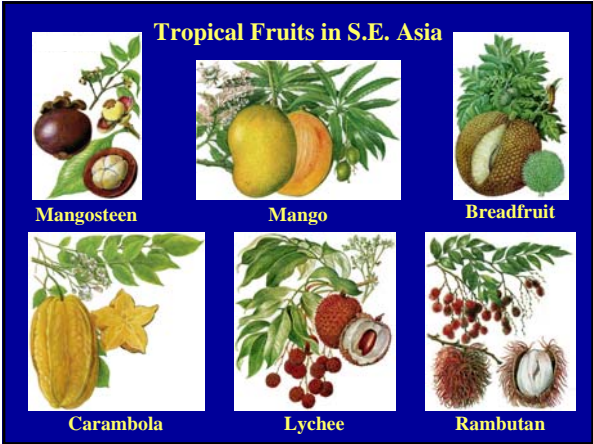
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**Asian Fruits—Tropical**

**Common in Tropical America**

Banana &	<i>Musa cavendishii</i> ,
Plantain	<i>M. paradisiaca</i>
Mango	<i>Mangifera indica</i>
Breadfruit	<i>Artocarpus communis</i>

**Less Common in Tropical America**

Jackfruit	<i>Artocarpus heterophyllus</i>
Carambola	<i>Averrhoa carambola</i>
Lychee	<i>Litchi chinensis</i>
Mangosteen	<i>Garcinia mangostana</i>
Pummelo	<i>Citrus grandis</i>

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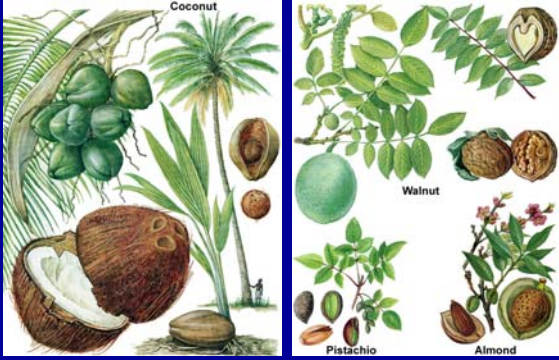
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**Nuts**



The image contains four botanical illustrations. On the left is a 'Coconut' illustration showing a palm tree with coconuts hanging from it, a single coconut, and a cracked coconut. On the right are three smaller illustrations: 'Walnut' showing a branch with green leaves and a walnut, 'Pistachio' showing a branch with green leaves and pistachios, and 'Almond' showing a branch with green leaves and almonds.

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**Asian Nuts**  
**Cultivated in North America**

Almond	<i>Amygdalus communis</i>
Candlenut & Tung	<i>Aleurites spp.</i>
Coconut	<i>Cocos nucifera</i>
Pistachio	<i>Pistachia vera</i>
Walnut	<i>Juglans sinensis</i>

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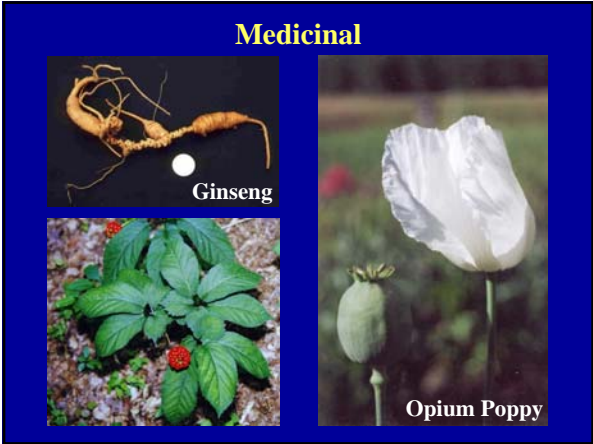
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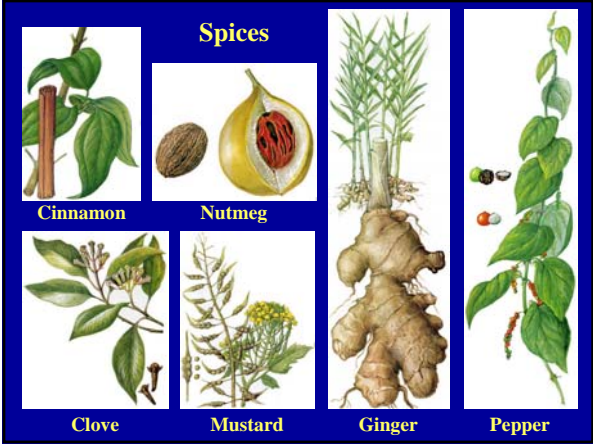
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# History of Horticulture: Lecture 12–13

### 5 Periods of Agricultural History of China

Years ago	Period	Agricultural event	Dynasty
8500–5000	Neolithic	Beginnings	Pre-dynastic
4000–2200	Early dynastic	Early systems	Hsia, Shang, Chao, Warring States
2200–1100	Middle Period	Key developments in technology	Chin, Han, 6 dynasties, Sui, Tang
1100–90	Early modern	Expansion and stagnation	Sung, Yan, Ming, Ching
90–present	Modern	Recent technology	

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### Neolithic Period

Years ago	Event	Crops
8500–7500	First agriculture	Millets ( <i>Setaria</i> , <i>Panicum</i> ); bamboo shoots, grass seed, persimmon, walnuts, pine nuts, chestnuts, mulberry, hemp
7000		First rice in South
6000	Large farming villages	Wheat, barley, brassicas
5000–4000	Agriculture universal	Rice cultivated, water buffalo

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**Chinese Agricultural Beginnings**

**6500–5000 BCE** Domestication of millets  
Pigs, dogs, and chicken

**5000 BCE** Painted pottery, large settlements  
Food crops include:  
Bamboo, persimmon, grass seed,  
walnut, pine nut, chestnut,  
mulberry

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**4000 BCE** Large farming villages.  
Cattle and horses  
*Brassica* seeds found in pots  
Hemp, mulberry and silkworm culture  
Large farming villages

**3500 BCE** Agriculture spread to Manchuria  
Melons, sesame, broad beans  
Wheat and barley introduced from  
Afghanistan

**2500 BCE** Rice farming from Taiwan to central India

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**1400 BCE** Water buffalo

**600 BCE** Row cropping  
Iron plow (ard)

**551–470 BCE** K'ung Fu Tze (Confucious)  
Book of Songs mentions 44 food plants  
(bible mentions 29)

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# History of Horticulture: Lecture 12–13

**Early Civilization: Development of Agricultural Systems: Hsia to Warring States (480 BCE)**

Years ago	Event	Crops	Dynasty
4000–3500	Bronze age, civilized society	Millet, rice, wheat, barley, mulberry (silk)	Hsia (mythical) Chang
3000	Iron age, extensive irrigation, canals	Soybean	Chou
2500	K'ung Fu Tzu (Confucius)	Fiber: silk, hemp, kudzu Grain: millets, barley, wheat, rice Fruits: peach, plum, apricot Veg: brassicas	

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**K'ung Fu Tze (Confucius) 551–470 BCE**

**Book of Songs mentions 44 food plants (Bible mentions 29)**



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**Middle Period: Ch'in to Tang (221 BCE–906 CE)**  
**Chao – Han: Critical Millennium**

Time scale	Agricultural event	Dynasty
221–207 BCE	First emperor & unification Public works: Canals, Great Wall 60 million Chinese Agricultural literature and manuals State agricultural extension Crops from Central Asia	Ch'in
206 BCE–221 CE	Agricultural development & technology Soy products & noodle technology Medical advances; Shen-Nung Herbal Parks and gardens	Han (Empire exceeds Rome)
221–559	Books on agriculture & horticulture Tea introduced Horse collar harness	6 Dynasties
589–618	Great Wall Rebuilt	Sui
618–907	Near eastern crops (spinach, sugar beet, lettuce) Double cropping in rice	Tang

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# History of Horticulture: Lecture 12–13



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**Legendary history (1st century)**  
**Shen-Nung (2737–2697 BCE)**  
**Divine Cultivator**  
**5 grains**  
**Invention of the plough**  
**Soil tests**  
*Pen T'sao Ching*  
*(The Classic Herbal)*



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**Early Agricultural Technology**

<b>500 BCE</b>	<b>Cast iron hoes</b>
<b>400 BCE</b>	<b>Trace harness then collar</b>
<b>200 BCE</b>	<b>Machine to winnow grain</b> <b>Multi-tube seed drill</b>
<b>100 BCE</b>	<b>Wheelbarrow</b>

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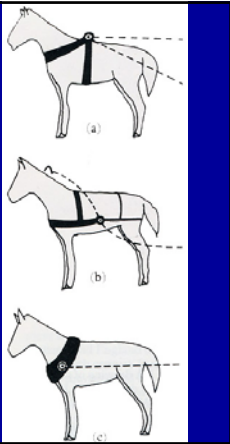
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**Horse Harness**

- A. Throat-and-girth  
Western Antiquity
- B. Trace Harness  
China, 4<sup>th</sup> century BCE
- C. Collar Harness  
China, 3<sup>rd</sup> century BCE



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**Trace Harness, Han Dynasty, 1<sup>st</sup> century BCE**



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**Invention of the stirrup 1635**  
Based on a Yuan Dynasty original (1280–1368)

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History of Horticulture: Lecture 12–13



**Intensive hoeing and row cultivation**  
Han Dynasty (207 BCE–220 CE)

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**Chinese plow, 2<sup>nd</sup> century CE**

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**Multi-tube seed drill**  
invented 2<sup>nd</sup> century BCE  
This model is from a 1742 engraving.



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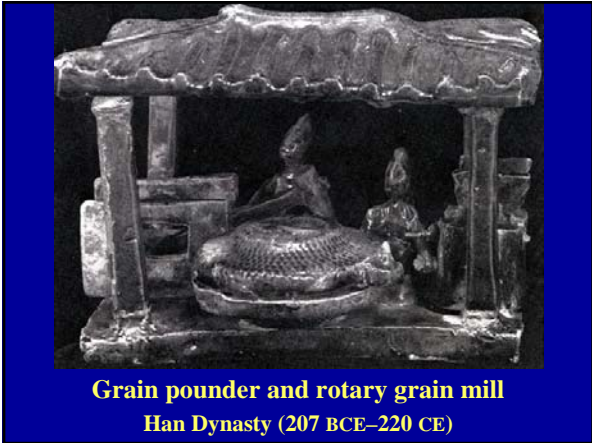
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**Grain pounder and rotary grain mill**  
Han Dynasty (207 BCE-220 CE)

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**Traditional rotary winnowing fan used in modern China**

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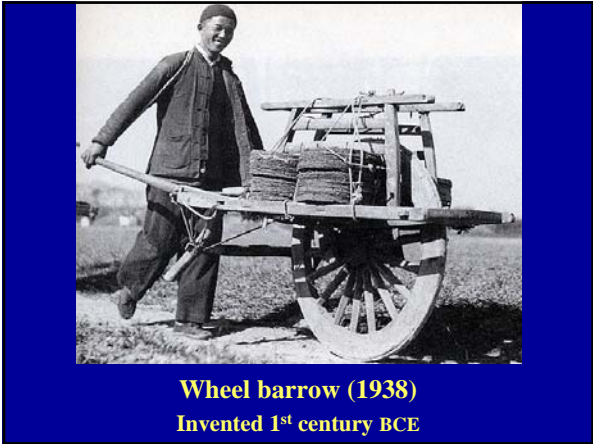
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History of Horticulture: Lecture 12–13



**Wheel barrow (1938)**  
Invented 1<sup>st</sup> century BCE

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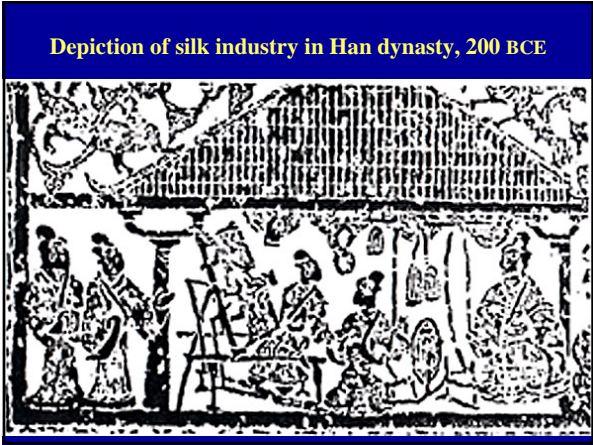
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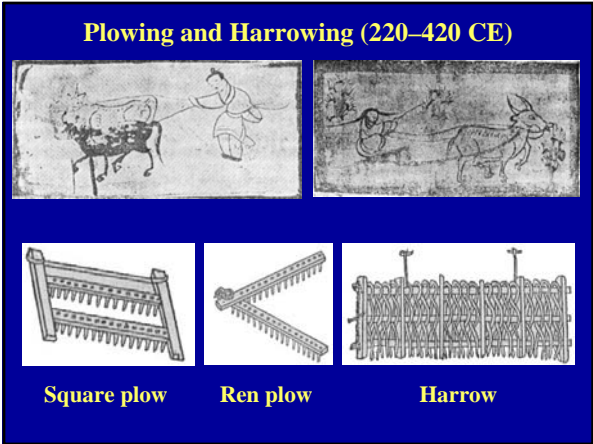
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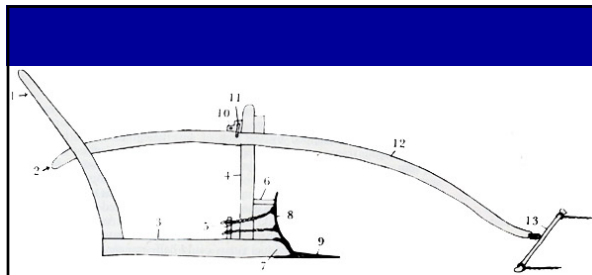
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**Iron plow, Lu Kuei-Meng's  
*The Classic of the Plow*, 880 CE**

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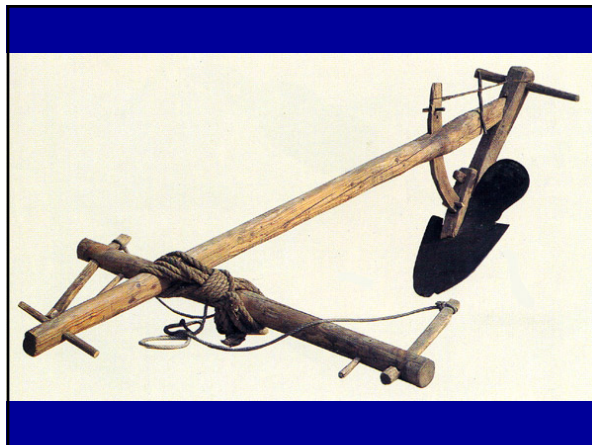
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- Han Dynasty (210 BCE–221 CE)**
- Multiple cropping
  - Pretreatment of seeds
  - Irrigated rice
  - Water trapping in pits
  - Cultivation in pots
  - Ridge cultivation
  - Pot irrigation
  - Scheduling of fertilization, watering, planting
  - Composting of N-containing materials
  - Soil adaptation to crops
  - Iron tools
  - Salting and pickling
  - Fermentation of soybean

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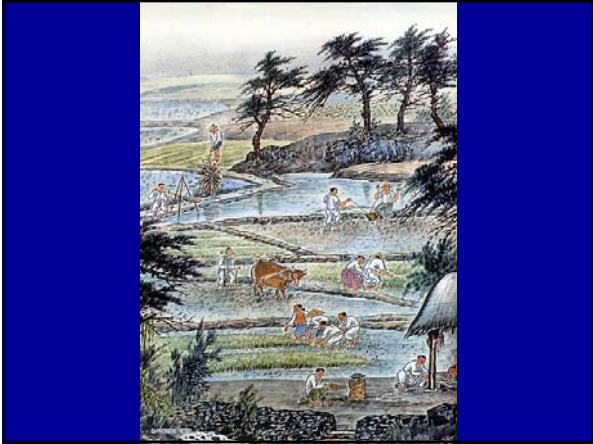
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**Rich Chinese Art**



**Tang Horses & Camels**



**Ming Vases**

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**Early Modern**

Time scale	Political event	Agricultural event	Dynasty
960–1279	Fire power, Ghengis Khan	Agricultural stabilization, elaboration of cuisine	Sung
1280–1369	Kublai Khan		Yuan
1368–1644	Treasure Boats	New World Crops Fan (devil) crops: maize, tobacco, tomato, guava, papaya, jicama	Ming
1644–1912	Decline & Revolution	Potato introduced Traditional organic agriculture based on recycling	Ching

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**Fruit Crop History in China**

Year	Crop	Source
2600 BCE	White mulberry	Poetry ( <i>Sijin</i> ), <i>Shangshu</i>
2000 BCE	Peach, plum, pear, mume, jujube, Chinese chestnut, hazel, orange	Poetry ( <i>Sijin</i> ), <i>Shangshu</i>
1000 BCE	Apricot, longan, litchi, Chinese olive, persimmon, loquat, red bayberry, Chinese hawthorn	Poetry ( <i>Sijin</i> ), <i>Shangshu</i> , <i>Erya</i> , <i>Shanglinfu</i>
100	Grape, pomegranate, carambola, cocos, Chinese walnut	History ( <i>Siji</i> ) <i>Guangzhi</i> , <i>Shanglifu</i>
600	Apple, banana	<i>Yiwuzhi</i> , <i>Qiminyaosu</i>
700	Pecan, pistachio	<i>Youyangzazu</i> , <i>benchaoshiyi</i>
800	Yangtao (kiwifruit)	<i>Benchaoshiyi</i>
900	Fig	<i>Xiyangzazu</i>
1700	Pineapple, papaya	
1800	Guava, <i>Momordica grasvenori</i>	
1880	Sweetberry	
1920	Avocado	
1930	Gooseberry	
1950	Cashew	

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History of Horticulture: Lecture 12–13


**Peach**



Dongfang Shuo, stealing a peach branch from the tree of longevity.



Zhong Kui a legendary character. The peach signifies long life.



“Three Stars” peach in the hand of Shou-hsing God of Longevity.

Source: Miklos Faust, *Horticultural Reviews* 17.

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**Vegetable Crop History in China**

Year	Crop	Source
5000 BCE	Bottle gourd, water nut, acorn, mustard	Relics of Hamudu, Zhejiang
4000 BCE	52 species ( <i>Brassica</i> , faba bean)	<i>Sanhaijin</i>
2100 BCE	Soybean	Calendar for horticulture
770–221 BCE	40 commercial vegetables ( <i>Brasenia schreberi</i> , <i>Brassica campestris rapifera</i> , curled mallow, ginger, Chinese chive, garlic, lotus, cucumber, celery, <i>Malva verticillata</i> , alfalfa, radish)	Professional officer for seedlings; Poetry ( <i>Sijin</i> ) history ( <i>Siji</i> ), <i>Qimingyaosu</i>
100 BCE–581 CE	30 new kinds (wax gourd, sweet melon, taro, water nut, green onion)	
581–960	9 new kinds, mushroom, wolfcherry, edible burdock, spinach, lettuce, watermelon, lily	
1700–1800	Potato, tomato, cabbage, pepper	

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**Ornamental Crop History in China**

Year	Plant	Source
475 BCE	Apricot	Encyclopedia of Chinese Ornamental Horticulture
221 BCE	Magnolia, glossy privet, cinereous smoketree	Encyclopedia of Chinese Ornamental Horticulture
138 BCE	Gladiolus, <i>Osmanthus</i> , mei flower	China floral encyclopedia
400	Cultivated chrysanthemum	China floral encyclopedia
600	Tree peony	China floral encyclopedia
900	Bamboo, willow, orchids, lotus, Chinese cornelian cherry	China floral encyclopedia

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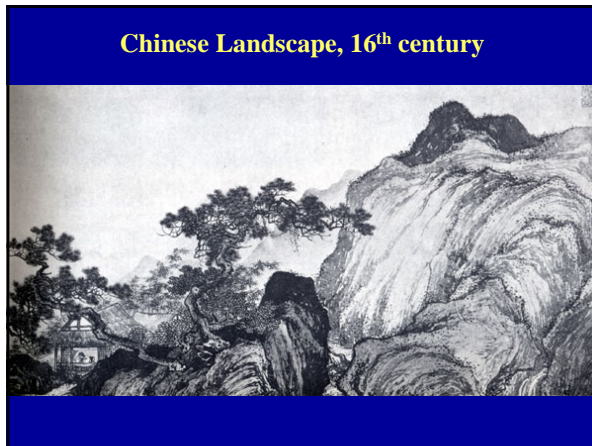
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**Ornamental Horticulture & Chinese Culture**

**Rural retreats and urban gardens**  
**Flower cultivation, one of the 7 arts**  
Peach blossom—emblem of spring  
Lotus—emblem of summer  
Chrysanthemum—emblem of autumn  
Narcissus—emblem of winter  
Plum blossoms—symbolize beauty  
Bamboo—longevity  
Lotus & Peony—highly regarded

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**Lien-Tschen**

**Chinese Philosophy Regarding Naturalism in Gardens**

*The art of laying gardens consists in an endeavor to combine cheerfulness of aspect, luxuriance of growth, shade, solitude and repose in such a manner that the senses may be deluded by an imitation of rural nature.*

*Diversity, which is the main advantage of natural landscape, must therefore be sought by a judicious choice of soil, an alternation of chains of hills and valleys, gorges, brooks and lakes covered with water plants.*

*Symmetry is wearisome, and ennui and disgust will soon be excited in a garden where every part betrays constraint and artificiality. (Wright 1934, p. 139)*

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History of Horticulture: Lecture 12–13

**Japanese Floral Arts**



**Bonzai**



**Ikebana**



**Sakai**

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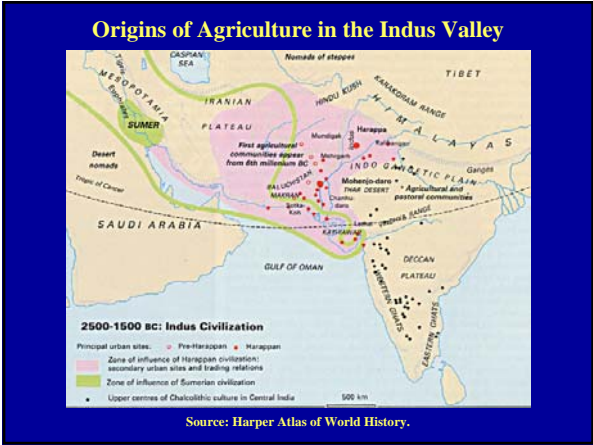
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**Indian Crops**

Grains—rice and millet  
 Pulses & Vegetables  
 Fruit—mango  
 Fiber crops—cotton, (*muslin, calico*)  
 Spices—curry, ginger, cloves, cinnamon

Medicinals  
*Ayurveda* = Hindu  
*Unani* = Moslem

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# History of Horticulture: Lecture 12–13

## Contacts Between East & West

**Evidence of Early Trade with Egypt**

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## Silk

Strands of silk on Egyptian mummy hair 1000 BCE

Empress Hsi Ling-shi

Mulberry harvesting 476–221 BCE

**Filling in the Blanks On the Ancient Silk Road**

Pattern at top was woven in silk in Han dynasty of China, which first sanctioned trade in silk with foreigners in 2nd century B.C. Silk's secret was hidden by long chain of intermediaries that may have reached as far as Egypt in 10th century B.C. Caterpillar of silk moth, Bombyx mori, top right, excrete liquid that becomes filer when exposed to air; fibers reflect light through layers of translucent protein.

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## The Conquests of Alexander the Great (356–323 BCE)

King of Macedonia; conqueror of Greece, Persian Empire, Egypt

Source: Harper Atlas of World History

**The Hellenic and Hellenistic world on the eve of the Roman Conquest (189 BC)**

Regions under Roman rule  
 Roman conquests after ~188 (Peace of Apamea)

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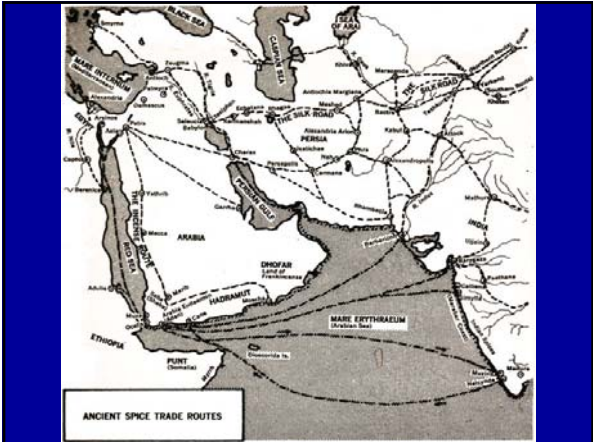
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History of Horticulture: Lecture 12-13



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Genghis Khan

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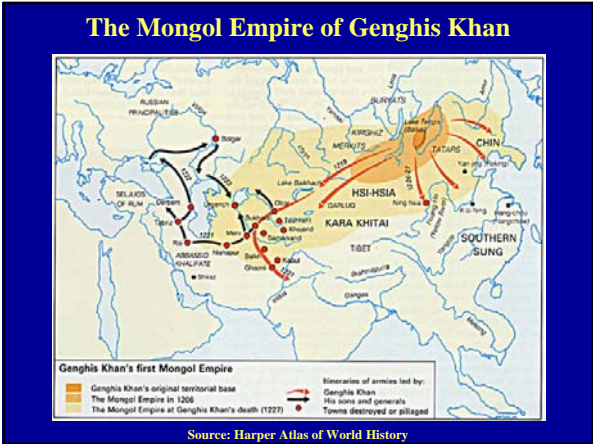
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The Mongol Empire of Genghis Khan



Source: Harper Atlas of World History

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**Introduction of New World Crops**  
(later half of 15<sup>th</sup> century from Philippines and Macao)  
Sweet potato (know under Aztec name *camotl*, 1594)  
Peanut (1538)  
Maize (1555)  
Tomato (1500s)—fan eggplant  
Chile peppers (1500s)  
Tobacco (1500s)

Fan (foreign devil or barbarian) plants  
Introduced end of Ming dynasty (1600s)  
Guava—fan pomegranate  
Papaya—fan quince  
Jicama (yam bean)—fan kudzu

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**Present Day Technology**

**Revival in Genetics and Breeding**  
Tissue culture technology  
Haploid breeding  
Hybrid Rice

**Biotechnology**

**Protected Culture Advances in Horticulture**  
Advances in plasticulture  
Energy-saving greenhouses  
Grafting technology for vegetable production

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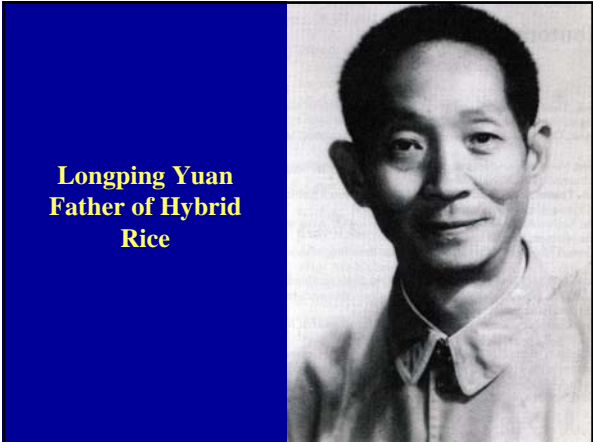
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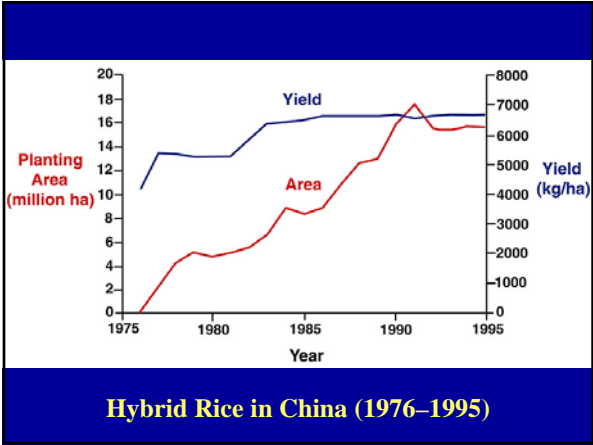
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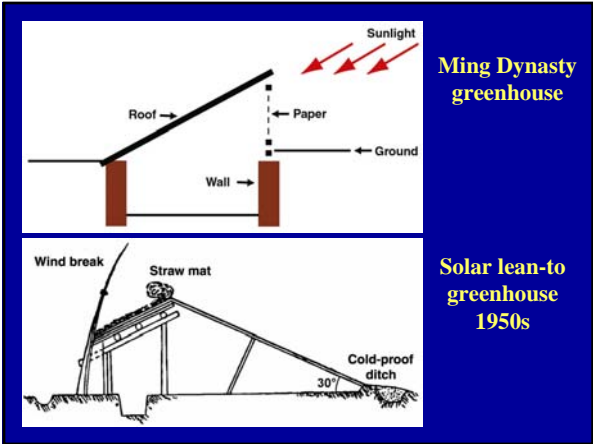
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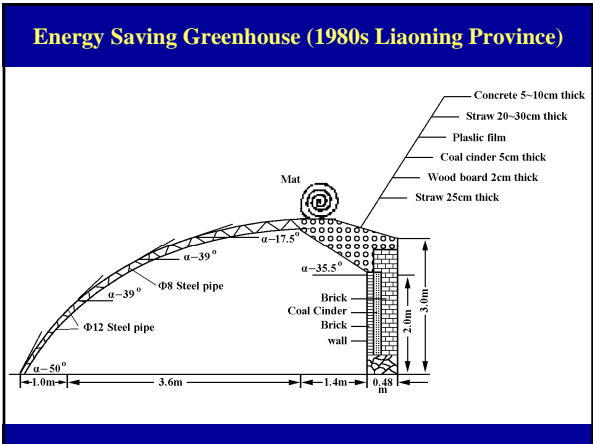
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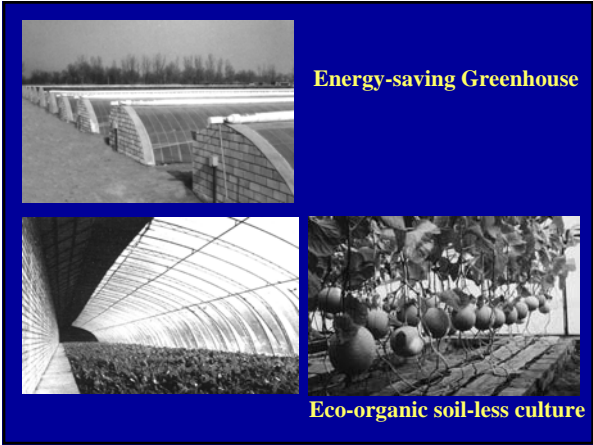
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**Protective Area in China**

Year	High tunnel	Low tunnel	Greenhouse area (ha)		
			Heated	Solar lean-to	Energy-saving solar lean-to
1981	1,253	4,940	300	706	--
1985	11,766	46,473	2,296	6,760	420
1990	30,273	98,213	3,800	18,380	8,286
1995	186,620	333,893	4,793	69,413	104,413
1997	190,580	424,160	6,806	78,200	141,340
1999	459,773	568,586	14,660	152,293	200,000

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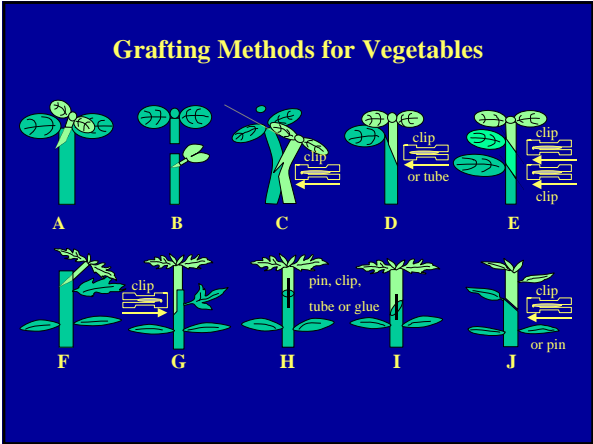
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**Vegetable Grafting, Japan & Korea, 2000**

Crop	Japan				Korea			
	Field + Tunnel		Greenhouse		Field + Tunnel		Greenhouse	
	Area (ha)	Graft (%)	Area (ha)	Graft (%)	Area (ha)	Graft (%)	Area (ha)	Graft (%)
Watermelon	14,017	92	3,683	98	13,200	90	21,299	98
Cucumber	10,160	55	5,440	96	1,728	42	5,964	95
Melons	6,142	0	8,258	42	1,047	83	9,365	95
Tomato	6,459	8	7,141	48	258	0	4,752	5
Eggplant	11,815	43	1,785	94	650	0	413	2
Pepper	2,684	--	1,468	--	75,574	0	5,085	5

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**Conclusions**

Asian agriculture had powerful influences in the West from Antiquity

- Asian crops
- Agricultural technology
- Esthetics (naturalism)

Western technology had powerful influences in the East

- New world crops
- Agricultural science

This interaction continues

Biotechnology	Vegetable grafting
Organic agriculture	Protected culture
Medicinal plants	Mechanization

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