

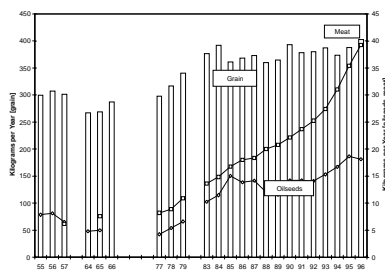
Agriculture

- Rural Area ≠ Agriculture Sector
 - “Urban population” 1/3; “Rural population” 2/3
 - But agriculture labor force is around 1/2
- Why?
 - Many working in the urban areas without urban residence permit (counted as rural residents)
 - Many rural residents working in rural industry not in agriculture

The Importance of the Agriculture Sector

- The traditional sector, largest in terms of employment
- The disaster sector under central planning
- The first reform success sector
- Economic linkages to other sectors
 - Releasing excess labor
 - Providing savings
 - Generating consumer demand

Per Capita Agriculture Output



Rural Organization

Natural Units	1962-84	1984-present
Market town	Commune (2000hh)	Township
Large village	Brigade (200hh)	Village
Small village or neighborhood	Teams (50 hh)*	
Household	Household	Household*

Basic Features of Agricultural Collectives

- Property Rights: The land was pooled and worked in common
 - Land is “collectively owned”
- Management: The collective served as the basic accounting unit
- Distribution: Net income was distributed to households on the basis of “work points”
 - Households accumulate work points over one year
 - The collective after paying taxes, deducting “collective accumulation” (retained public funds) distribute income to households by the year end, in grain and cash

Benefits of Agricultural Collectives

- Achieves government’s goal of product mix
 - Grain is priority in planning: “Take grain as the key link”
- Mobilization of resources for big projects
 - Consolidation of scattered land
 - Big construction projects such as irrigation system
- Local public goods
 - Water supply
 - Education
 - Health care (“barefoot doctors”)
 - Some insurance (risk pooling) functions
- Non-agricultural activities
 - Rural industry (small factories and workshops)

Costs of Agricultural Collectives

- Terribly inefficient in agricultural production
- Why? Incentive problems
- Features of agricultural production
 - Output takes long time (usually one year) to produce
 - A long sequence of tasks (sowing, weeding, watering, harvesting, etc.)
 - Important input is effort, which is hard or costly to measure
 - Work point only measures time spent
 - Adjustment was made according to age, gender, health, but imperfect (manual work)

Outcome of Agricultural Collectives

- Grain production growth between 1957 and 1978
 - Annual growth rate: 2.2% (from 200mt to 300mt)
 - Per capita growth rate: 0.2% (300 kg per capita)
- Non-grain agriculture products growth even lower
 - Cotton growth rate: 1.5%
 - Oilseed growth rate: 0.5%
 - Per capita growth rates below zero
 - Per capita consumption of poultry, eggs and fish also declined
- Some other social indicators improved
 - Infant mortality: declined
 - Life expectancy: increased
 - Literacy rate: increased
 - Rural infrastructure (roads, irrigation): increased

Agriculture Reform: Household Responsibility System

- Main features
 - Form 1: linking the remuneration of a small group or household to the output of a specific plot of land
 - Form 2: an individual household pays a fixed amount to the government and keeps the rest
- Individual household farming
 - Form 2 is essentially individual household farming
 - But it is not a privatization of farming, in legal sense
 - Land is still owned by the village collectives

Agriculture Reform: Household Responsibility System

- Why it works? Incentives
- Form 1: share cropping

$$\max u(\alpha y_i(e_i) - c(e_i))$$

$$\alpha (dy_i(e_i)/de_i) = c'(e_i)$$
- Form 2: residual claimant

$$\max u(y_i(e_i) - F_i - c(e_i))$$

$$dy_i(e_i)/d(e_i) = c'(e_i)$$
- Tradeoff: incentives vs. risk sharing
(Stiglitz (1974), "Incentives and Risk Sharing in Sharecropping")

Agriculture Reform: Household Responsibility System

- Labor days per hectare

	1953	1978	1985
Rice	250	421	328
Wheat	120	461	281
Cotton	300	980	643

Patterns of Agriculture Reform

- Start as an experiment by peasants themselves
- The first recorded practice: December 1978
- Xiaogang Production Brigade, Fengyang County, Anhui Province
- 20 peasants representing 20 households put their fingerprints on an "agreement:"
 - to divide the commune's land among the households
 - to fulfill the procurement quota of grain to the state
 - in case trouble, surviving households have obligations help others
- Spread to other counties in Anhui
- The central government encouraged the practice only in 1982
- Spread to entire China by 1984

Agriculture Reform: Household Responsibility System

- What hasn't changed?
 - Land still owned by the village collectively
 - Use right is transferable but not ownership right
 - Land can't be used as collateral in loans
 - Redistribution of land to accommodate demographic changes
- Why?
 - How important is land as collateral
 - The role of land as a means of security and insurance
 - Pragmatic side of China's reform

The Side-Effect of Reform

- Decline of some rural public services
 - Health care: barefoot doctors disappeared, hospital beds stagnated, village and township paramedics declined, private facilities increased but expensive
 - 1978: 70% covered by inexpensive socialized facilities
 - 1990s: less than 1/3
 - Elementary school: despite nationwide 9 year compulsory education, rural education is in trouble
 - Supply side: local public finance constraint
 - Demand side: school drop out due to current economic concerns

Will China Starve the World?

- Lester Brown: "Who Will Feed China?" (1995)
Washington Post: "How China Could Starve the World?" (August 28, 1994)
Growth => Increase demand for food
=> Import massive amount of grain
=> Rises in world food prices and no one can supply
- Scott Rozelle: "How China Will NOT Starve the World" (1996)
- Evidence (2004)
 - Production: 469 million ton
 - Net import: 19 million ton

China's Food Demand Projections

	Brown			USDA			World Bank		
	Production	Demand	Import	Production	Demand	Import	Production	Demand	Import
1995	355	375	20	355	375	20	355	375	20
2000	342	405	63	362	387	25	411	420	9
2005	329	437	108	382	414	32	445	459	14
2010	317	472	155	403	443	40	483	502	19
2020	294	549	255	449	506	57	568	600	32

Agricultural Economics

- Demand
 - Calories and protein came mainly from grain
 - Changing diet: shifting from grain to meat, vegetables, fruits, fish, poultry, etc.
 - Forecasting future demand critical for world market
- Supply
 - Grain production is land intensive: China is a land scarce country
 - Meat production requires a lot of grain: high conversion ratio for pork (4:1) (but low for poultry (2:1))
 - Comparative advantage of labor intensive products: vegetables, some fruits, etc.

Agricultural Economics

- Government policies
 - Before 1996: redistribution from rural to urban (agriculture product prices below world prices)
 - After 1996: redistribution from urban to rural (agriculture product prices above world prices)
 - Agriculture tariffs (average)
 - Wheat: 24%
 - Maize: 29%
- China both imports (wheat and maize) and exports (rice) grain. A net importer.
- Net self sufficiency rate in grain: set to 95%

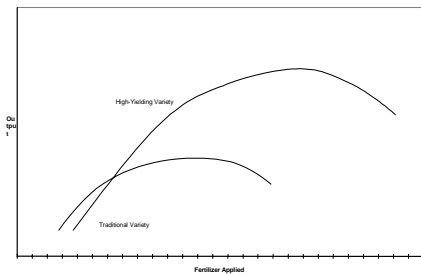
Agricultural Technology Change

- Expanding land through intensification of land use
 - Land improvement through “terracing”: carve small flat plots on hills
 - Multi-cropping: multi-cropping index over 150
 - Rotation
 - Intercropping
 - Relay cropping
- Changing crops
 - Grain crops: Rice, wheat, maize, potatoes, etc.
 - Economic or cash crops: Cotton, oil seeds, sugar crops, tobacco, vegetables, fruits, etc.
- The Green Revolution

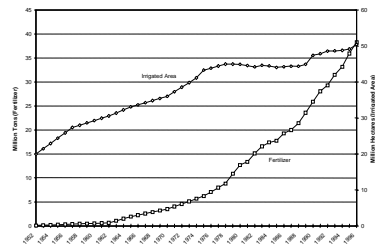
Agricultural Technology Change

- The Green Revolution crops: High yield varieties
- Three complementary ingredients to make the green revolution work
 - Improved seeds
 - hybrid rice and wheat
 - Research and development (R&D)
 - Multi-level research facilities
 - Fertilizer
 - Domestic production (imported big factories and small local factories)
 - Imports
 - Water
 - Irrigation facilities
 - Rice growing region (south of Huai river) vs. wheat growing region (north of Huai river) (Huai river is between Yangtze River and Yellow River)

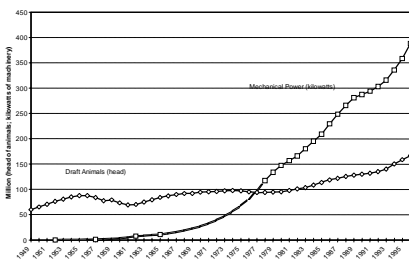
Complementarity: Fertilizer and Seeds



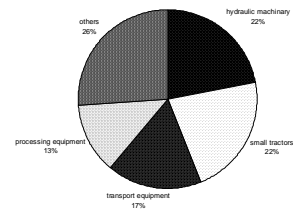
Fertilizer and Irrigated Area



Rural Motive Power



Composition of Rural Motive Power



Sources of Agriculture Growth

- Inputs (land, labor, capital)
- Productivity
 - Institutional change (introduction of household responsibility system)
 - Price change (increase of procurement prices for grain)
 - Technical innovation
 - Using different types of inputs (seeds, fertilizers, irrigation)
 - Shifting cropping patterns (multiple cropping, non-grain crops)
 - Change to other high value products (off season vegetables, organic products)

Agriculture Growth Accounting

- 1978-84 (grain: from 300mt to 400mt)
 - Total crop output growth: 42%
 - Input growth: 19% (or 46% of growth)
 - Productivity growth: 21% (or 49% of growth)
 - Household responsibility system: 20% (or 47 of growth)
- 1984-87
 - Total crop output growth: 4.2%
 - Input growth: -0.4% (or -10% of growth)
 - Productivity growth: 2% (or 49% of growth)
 - Multiple cropping: 0.9% (21% of growth)
 - Ratio of non-grain crops: 1.2% (28% of growth)

Agriculture Supply Responses

- Disentangle the relative effects of institutional change and price changes
- 1978-84
 - Total crop output growth: 42%
 - Household responsibility system: 18% (or 42% of growth)
 - State procurement price increase: 7% (or 16% of growth)