

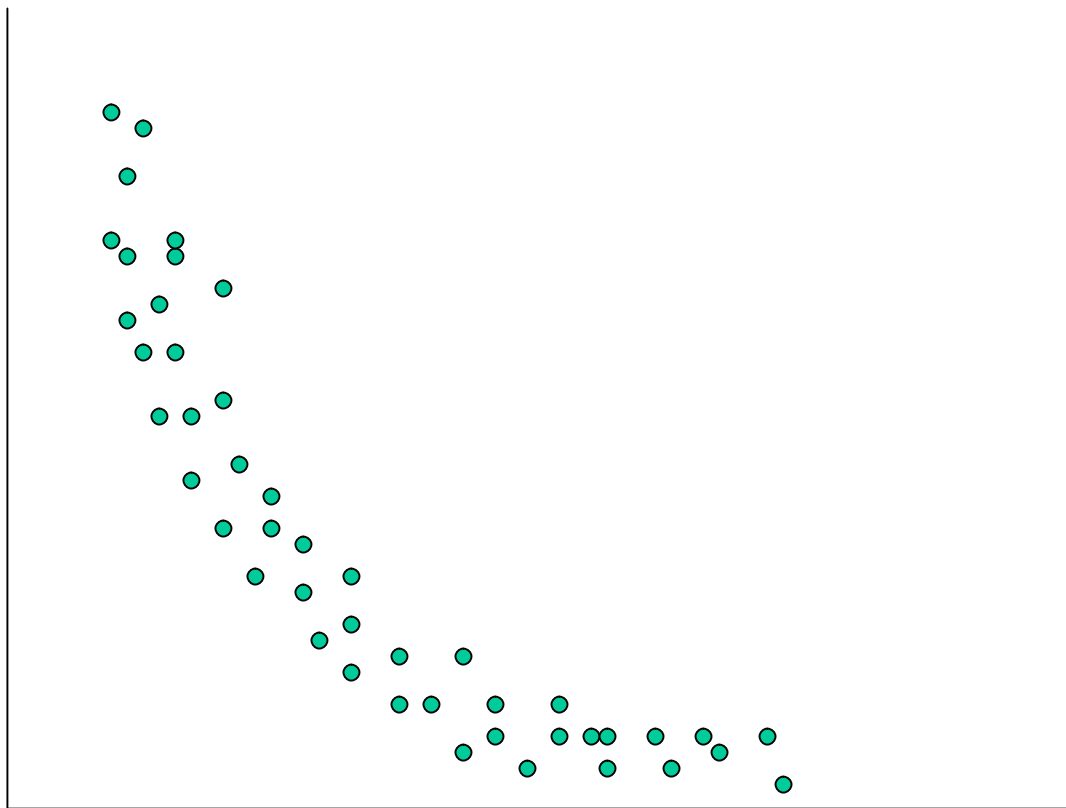
China's Agriculture and the Path Towards a Modern Industrial State

Scott Rozelle, Stanford University

Jikun Huang, Center for Chinese Agricultural Policy

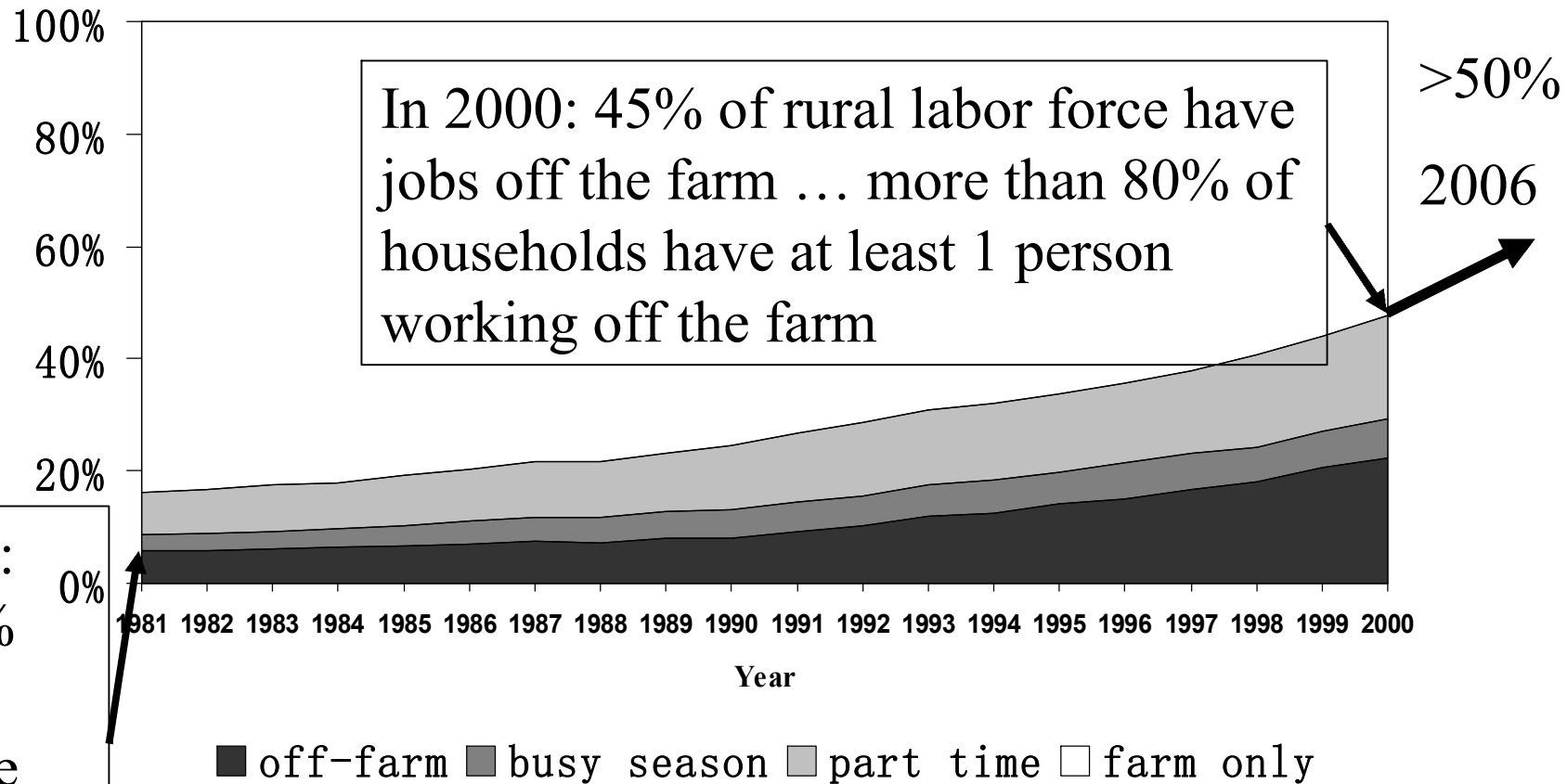
Transformation Path

Percent
of Pop'n
in Ag.
Sector



Income per Capita

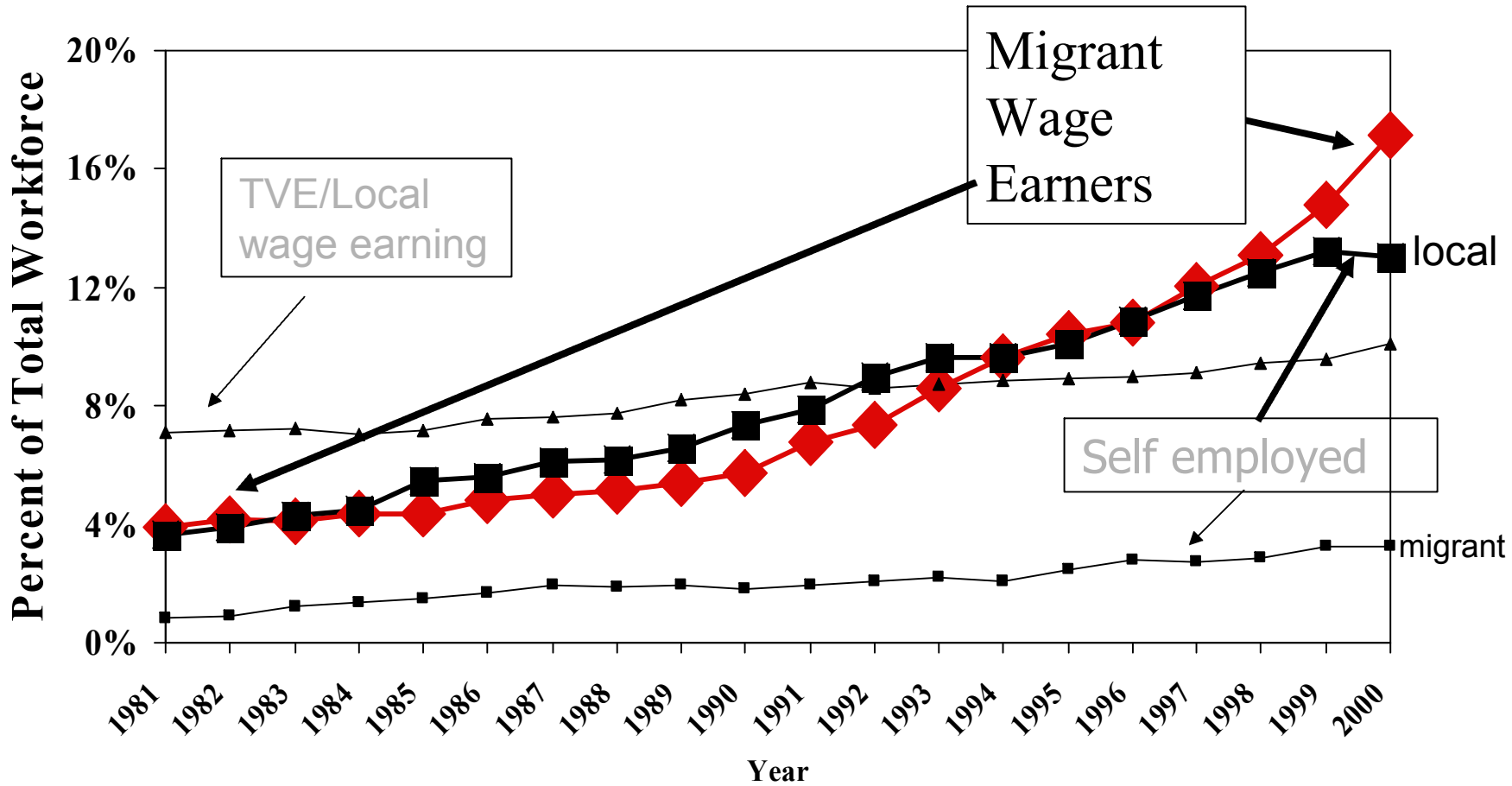
Overall Increase in Off-farm Work



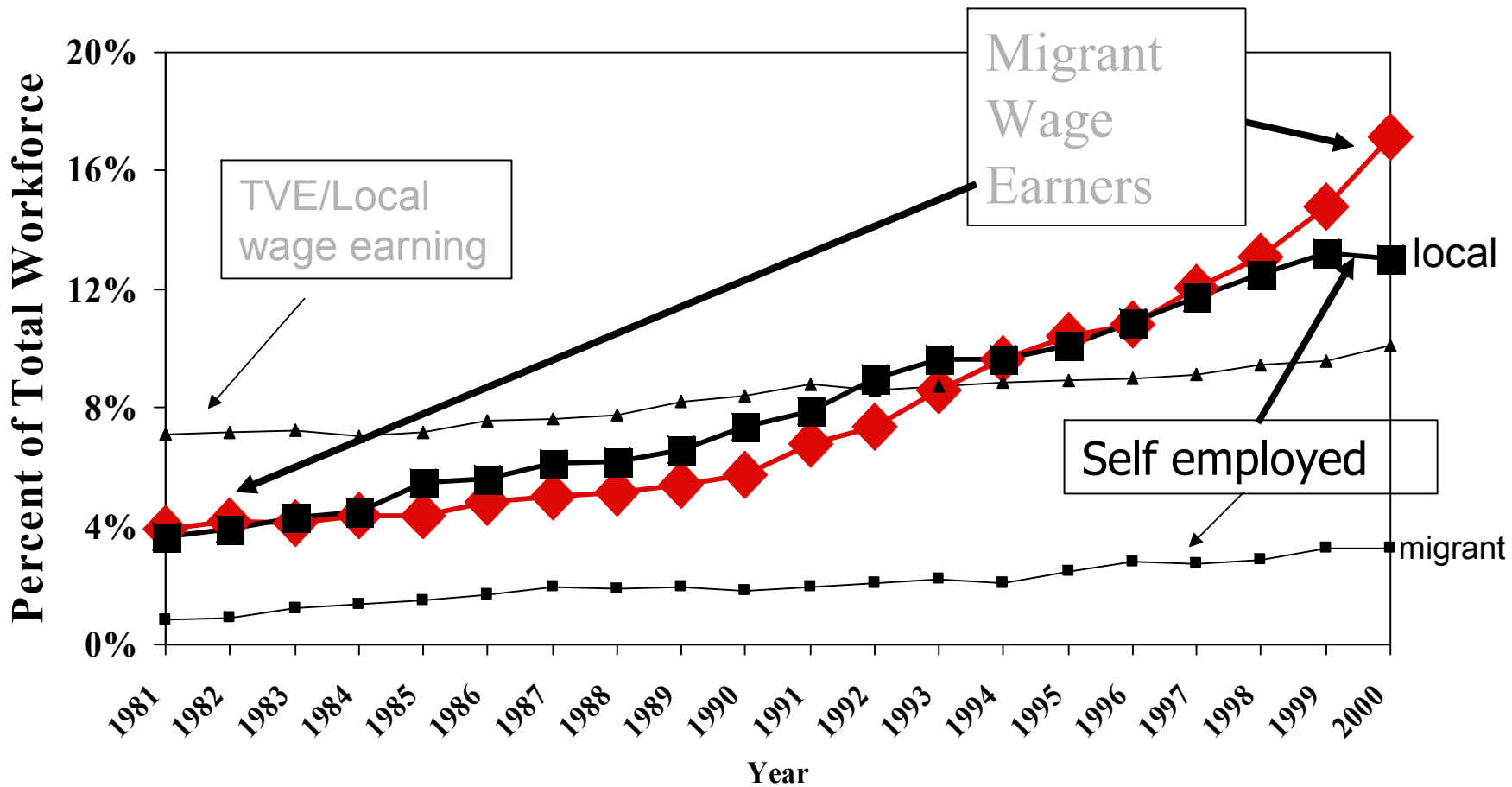
Percent of Workforce Off-farm, by Age Range

Age Range	1990	2000	2006
16-20	23.7	75.8	85-90%
21-25	33.6	67.2	85-90%
26-30	28.8	52.5	> 70%
31-35	26.9	47.6	
36-40	20.5	43.3	
41-50	20.8	37.6	

Migration-fastest growing segment

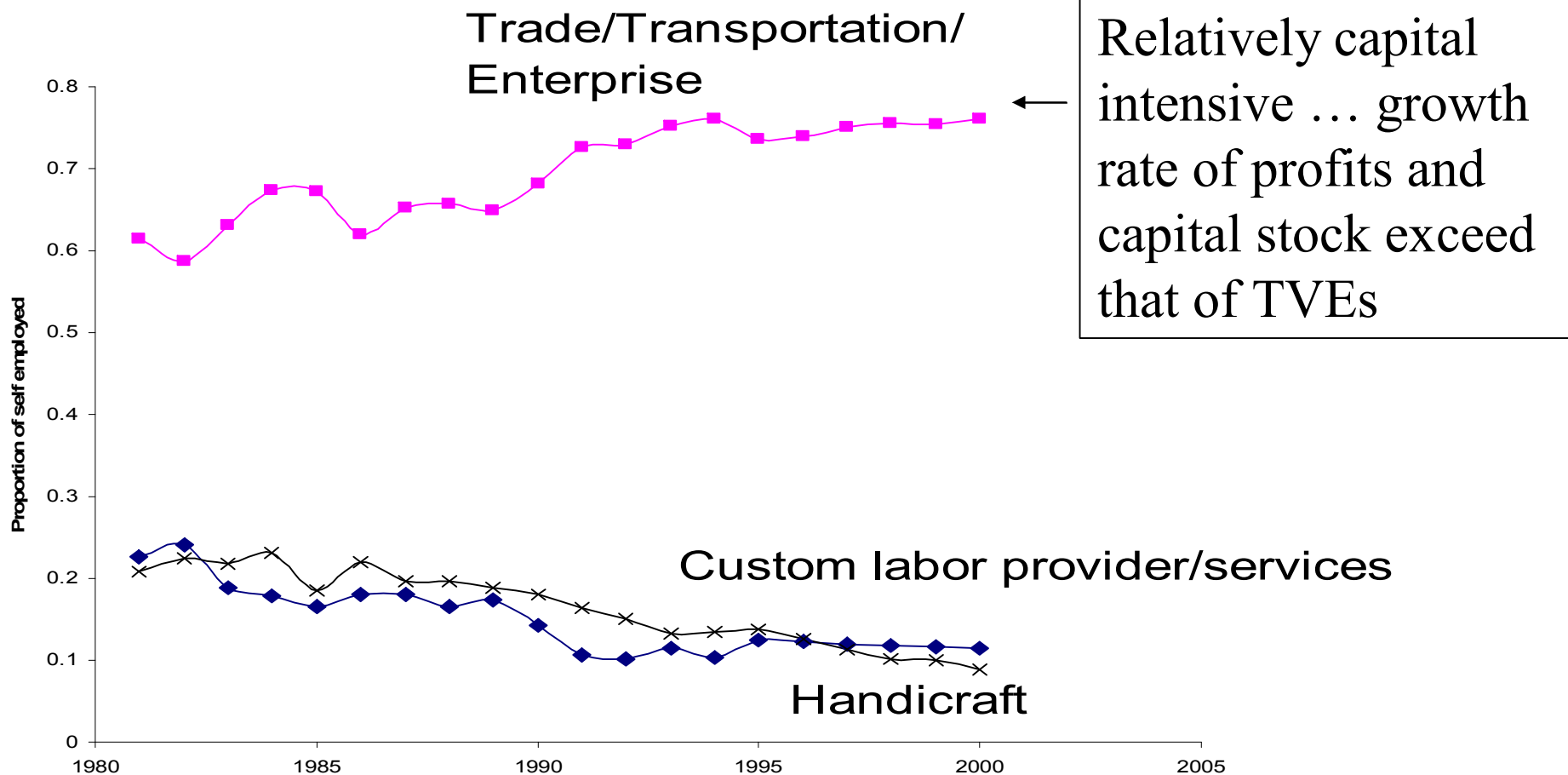


Self employed also growing fast ... sign of healthy growth or break down of formal wage sector?



In 2000: > 80 million people work in these micro-enterprises (or should we call them *nano-firms*—1.4 persons/firm)

While in some countries the rise of a self-employed sector is seen as symptomatic of the failure of the formal wage sector, in China there is evidence, the self employed sector is healthy, growing and increasingly sophisticated ...



From petty traders and marginalized street vendors ...



... to manufacturers and ...

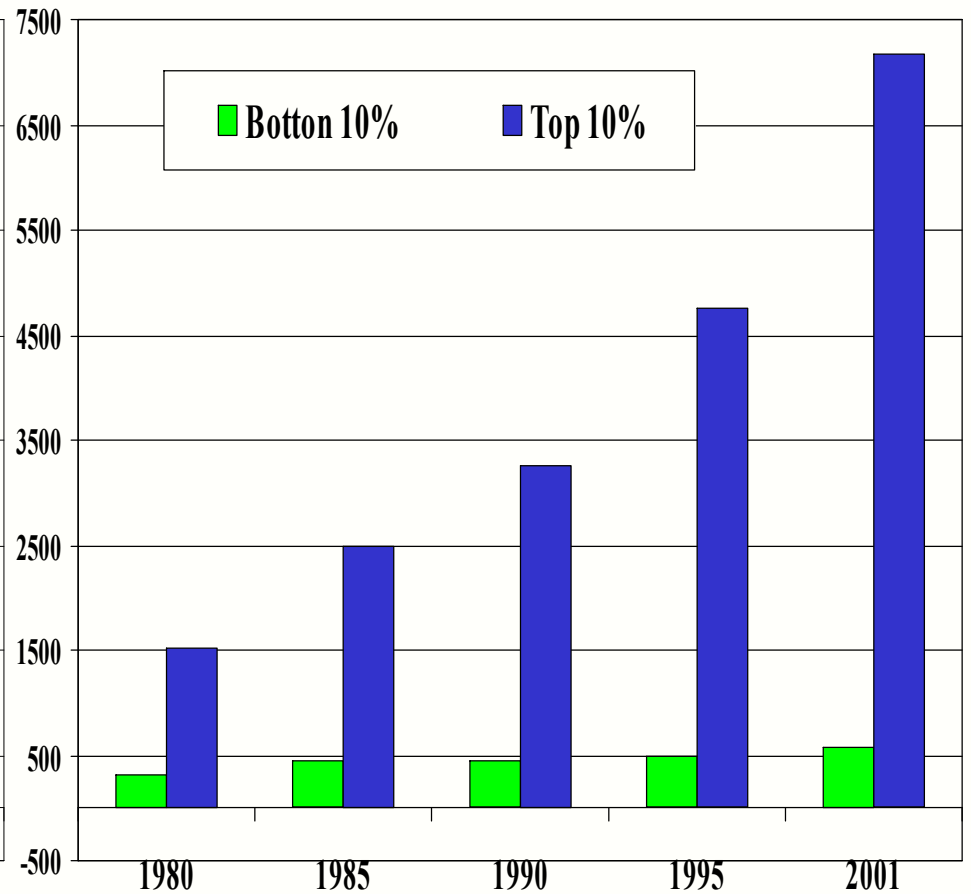
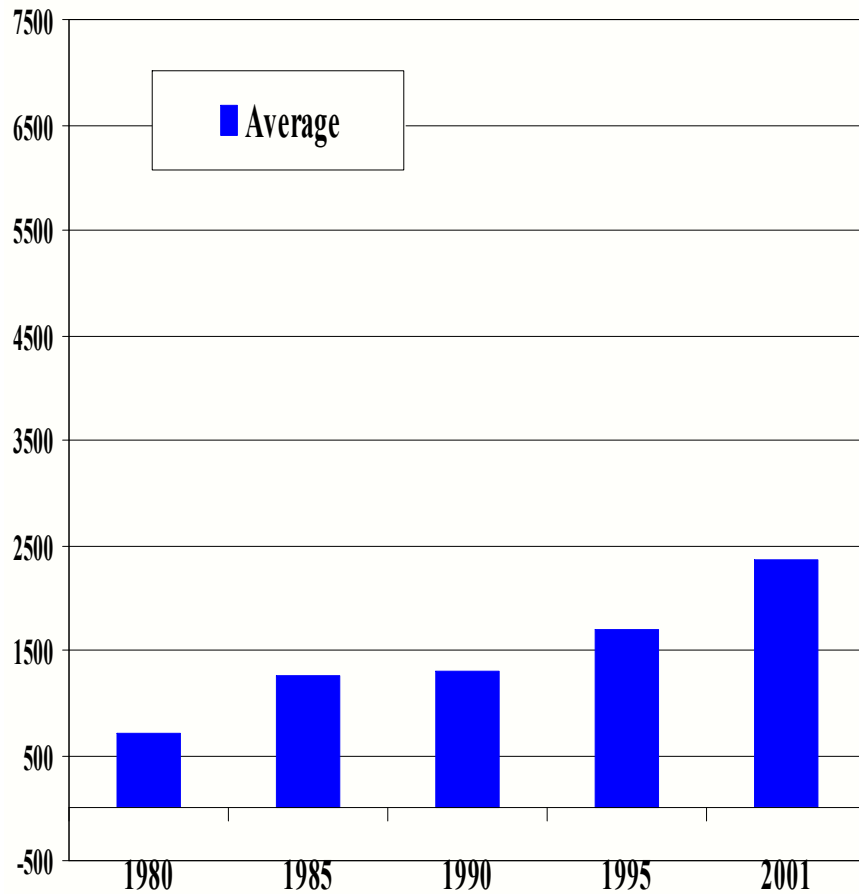


... to high-end tradesman!



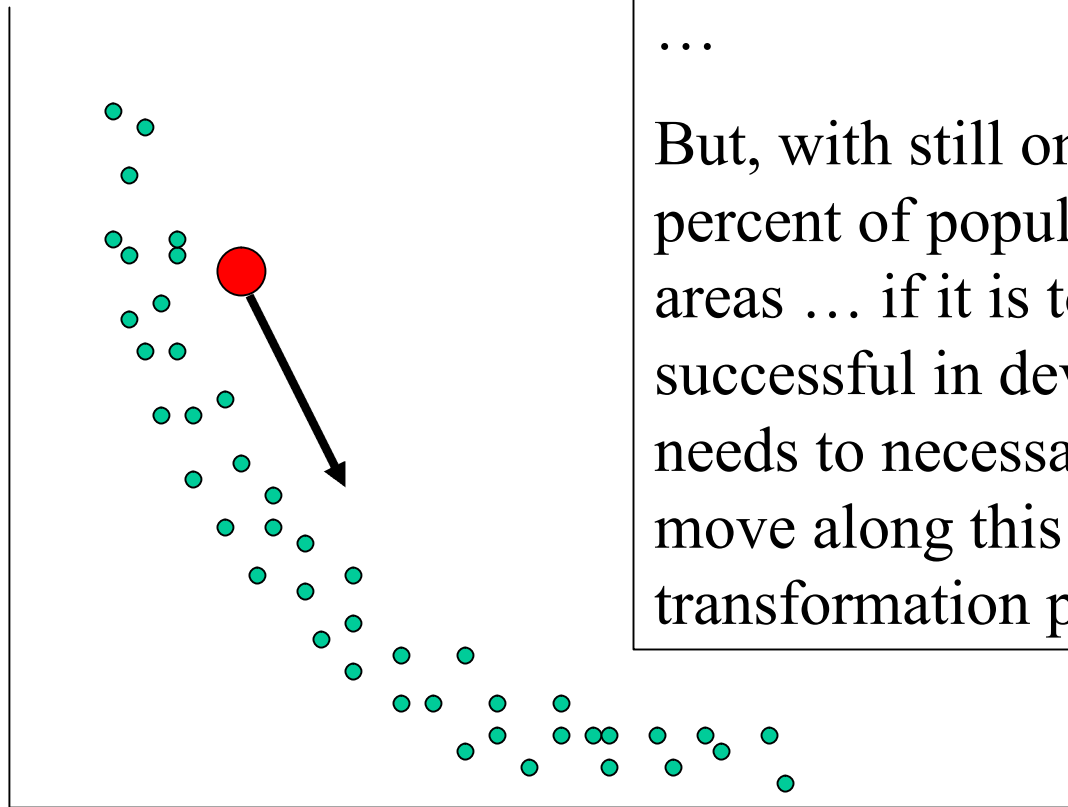
Per capita income in rural

Average:330%; Bottom 10%:180%; Top 10%:407%



Transformation Path

Percent
of Pop'n
in Ag.
Sector



Since 1980 ... China has clearly begun the path of transformation ...

But, with still only about 40 percent of population in urban areas ... if it is to continue to be successful in developing ... it needs to necessarily continue to move along this rural-urban transformation path ...

Income per Capita

Necessary but not Sufficient

- Shifting labor to off farm sector / shifting population from rural to urban is necessary ... key is job creation in cities in industrial/service sectors
- But not sufficient ...
 - Need to make sure those who are left behind are taken care of ...
 - Need to make sure those who do not get jobs off the farm are being invested in ...
 - So: **process can continue ...**
 - And, so: **there is stability ...**
- Here is where the Role of Agriculture comes in ... the poorest are still in agriculture ... Agriculture is going to provide a large part of the resources for the remaining rural households to make the transformation ..

Goal of Rest of Presentation

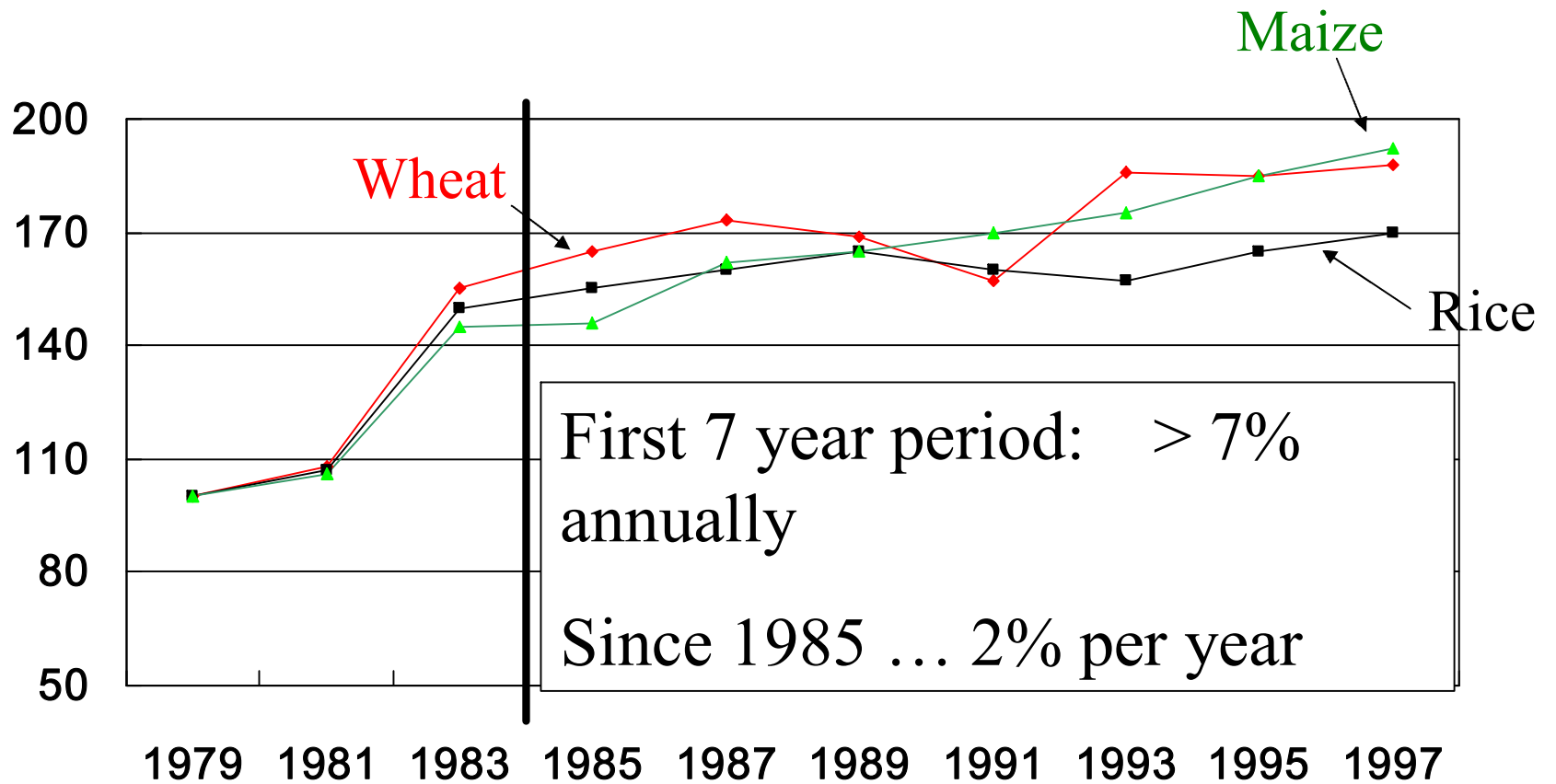
- Can China's Ag/Rural Economy Continue to Grow and Overcome the Problems Inherent in any Long-run Development Process?
 - Environment for Continued Growth
 - Potential Constraints to Growth of Rural Economy
 - Responses

Environment for Continued Growth

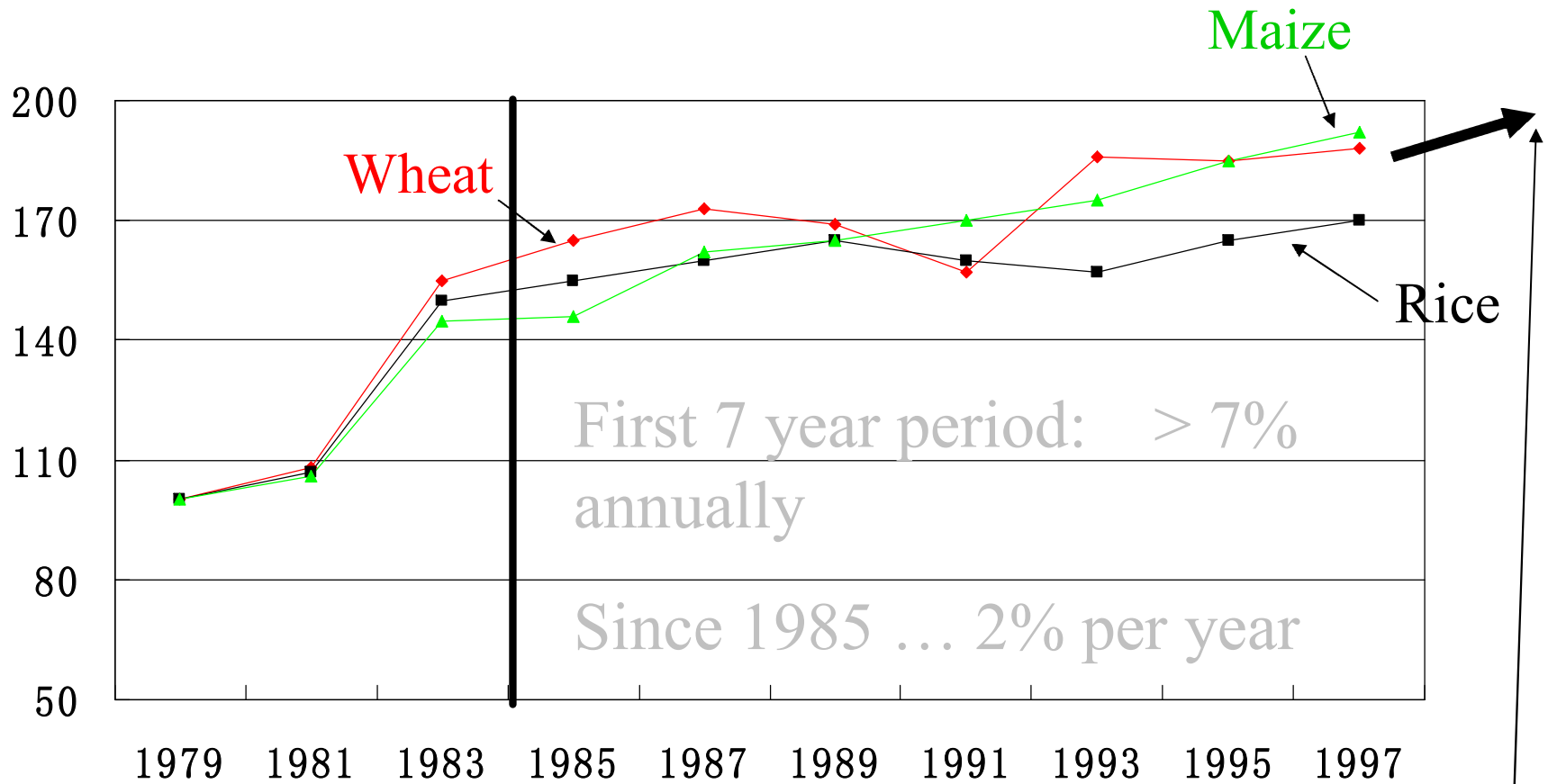
- Technology
- Domestic Markets
- International Trade

Does China have the “technology tools”?

Agricultural Productivity and the
Technology that is Driving it



Growth of Wheat, Rice and Maize TFP in China, 1979 to 1997

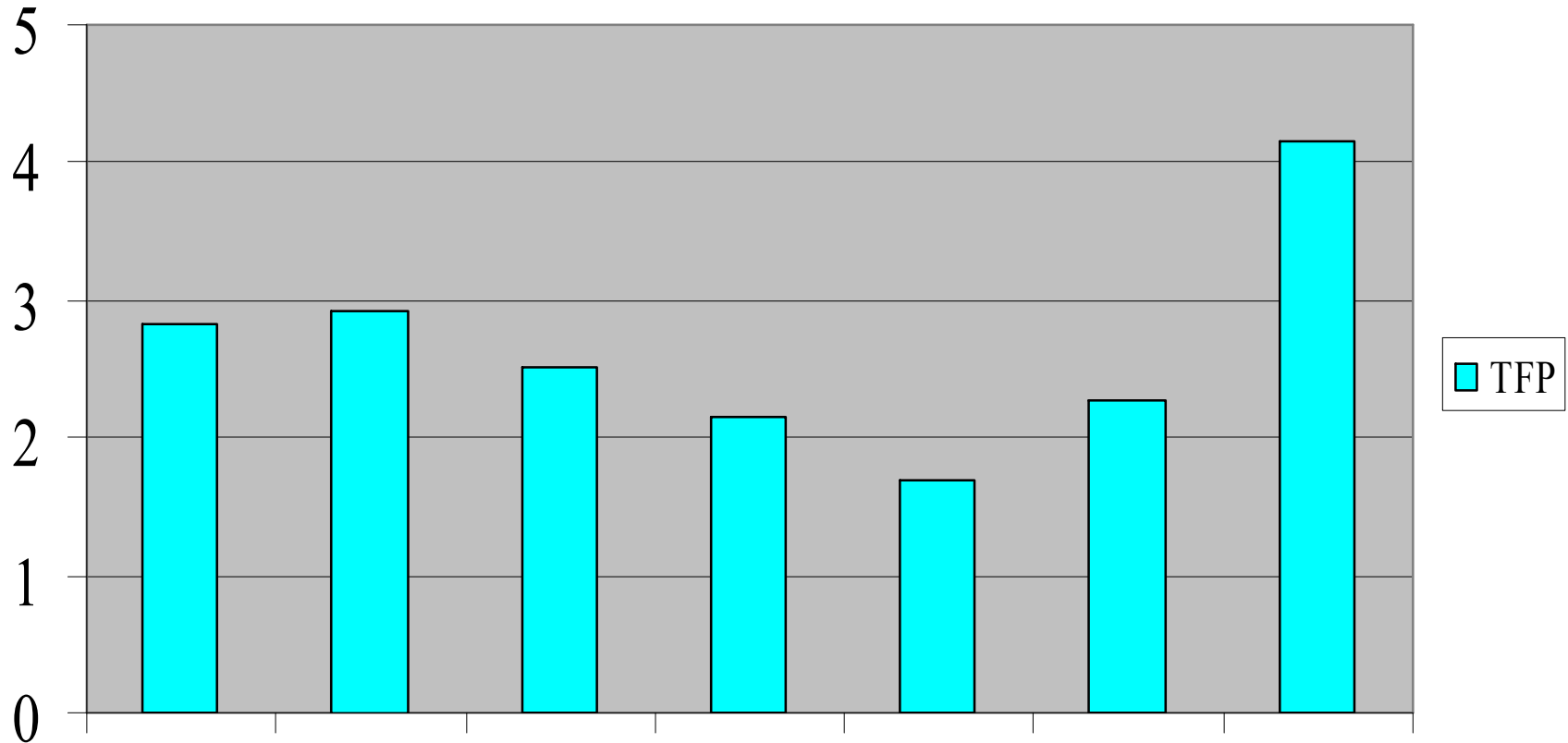


What about after mid 1990s?

... and beyond ...

TFP Growth Rates of Grains and Cotton (1995-2004)

Percent per year



Early Indica Late Indica Japonica Wheat Maize Soybean Cotton

Jin, Huang and Rozelle, 2007

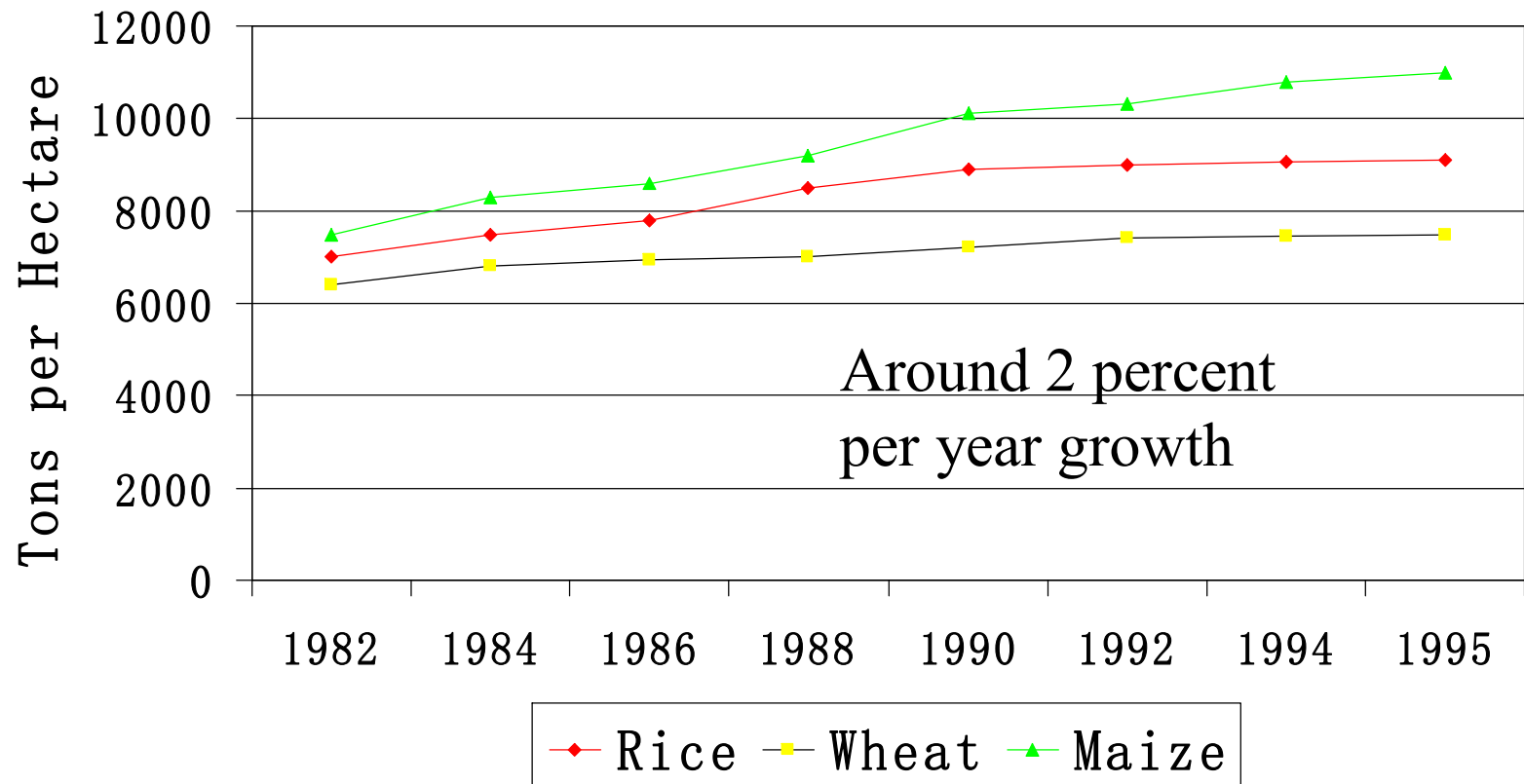
Contributions to Productivity

- **Before 1984:**
 - MOST: property rights reform (decollectivization)
 - SOME: technology
 - a bit to extension and education
- **After 1984**
 - ZERO: property rights reform (decollectivization)
 - a bit to market emergence and education
 - none to extension
 - MOST to technology

Contributions to Productivity

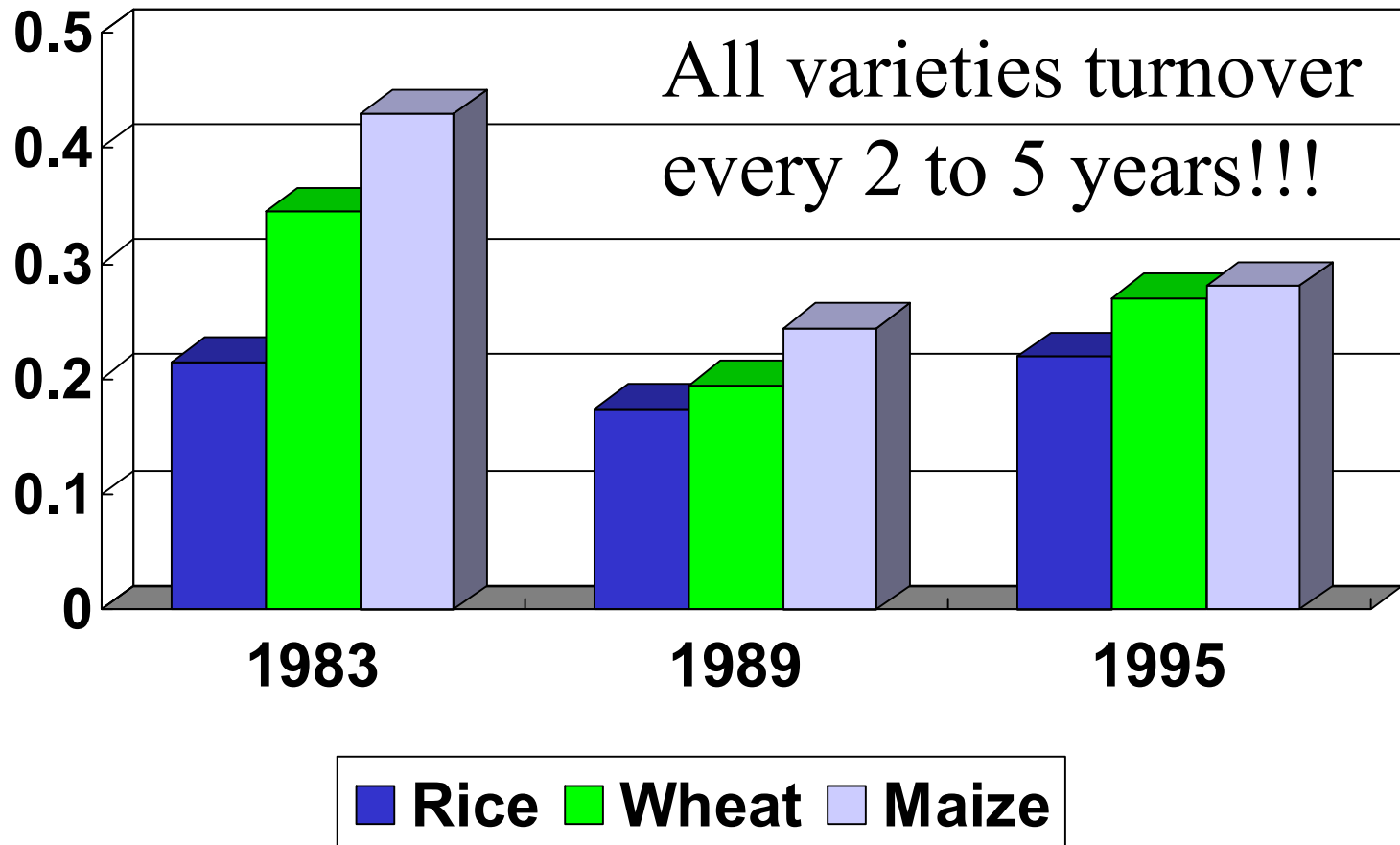
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 - a bit to market emergence and education
 - none to extension
 - MOST to technology

Rise of “Yield Frontier” in China’s Experiment Stations for Rice, Wheat, and Maize

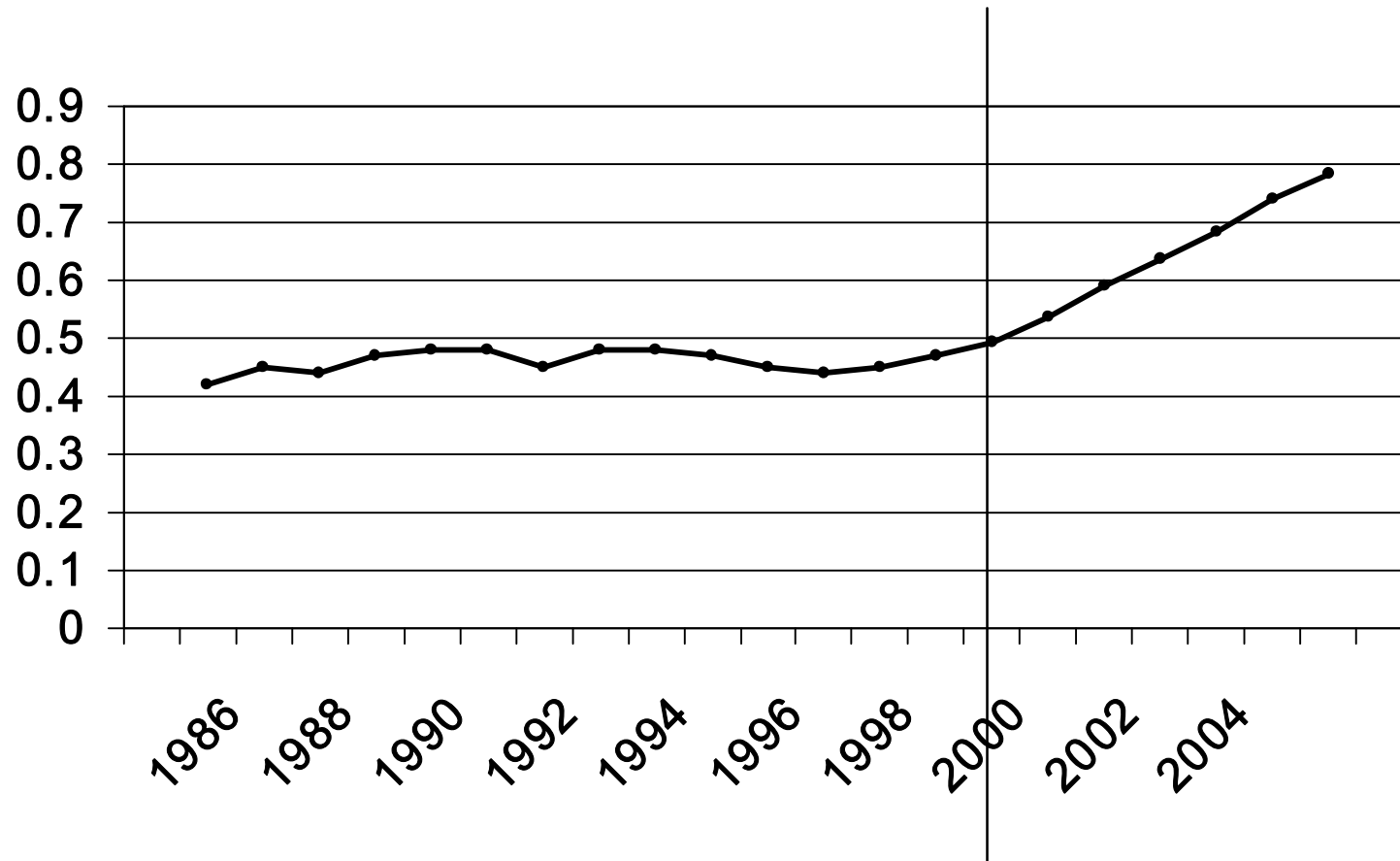


Sown area weighted of sample provinces

Varietal Turnover in China's Agriculture, 1983 to 1995 (proportion of area planted to new varieties)



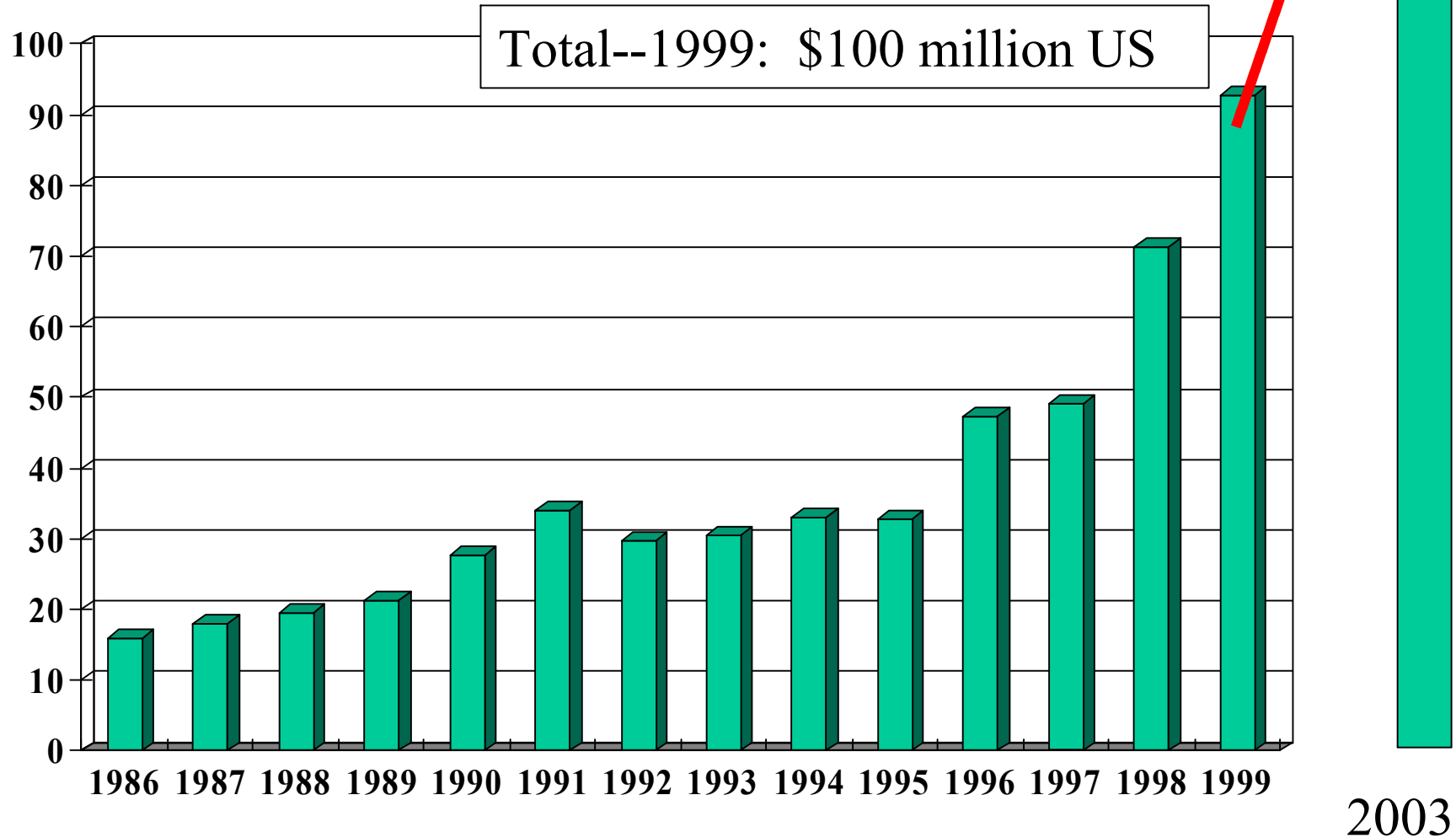
Agricultural research investment intensity (%) in China



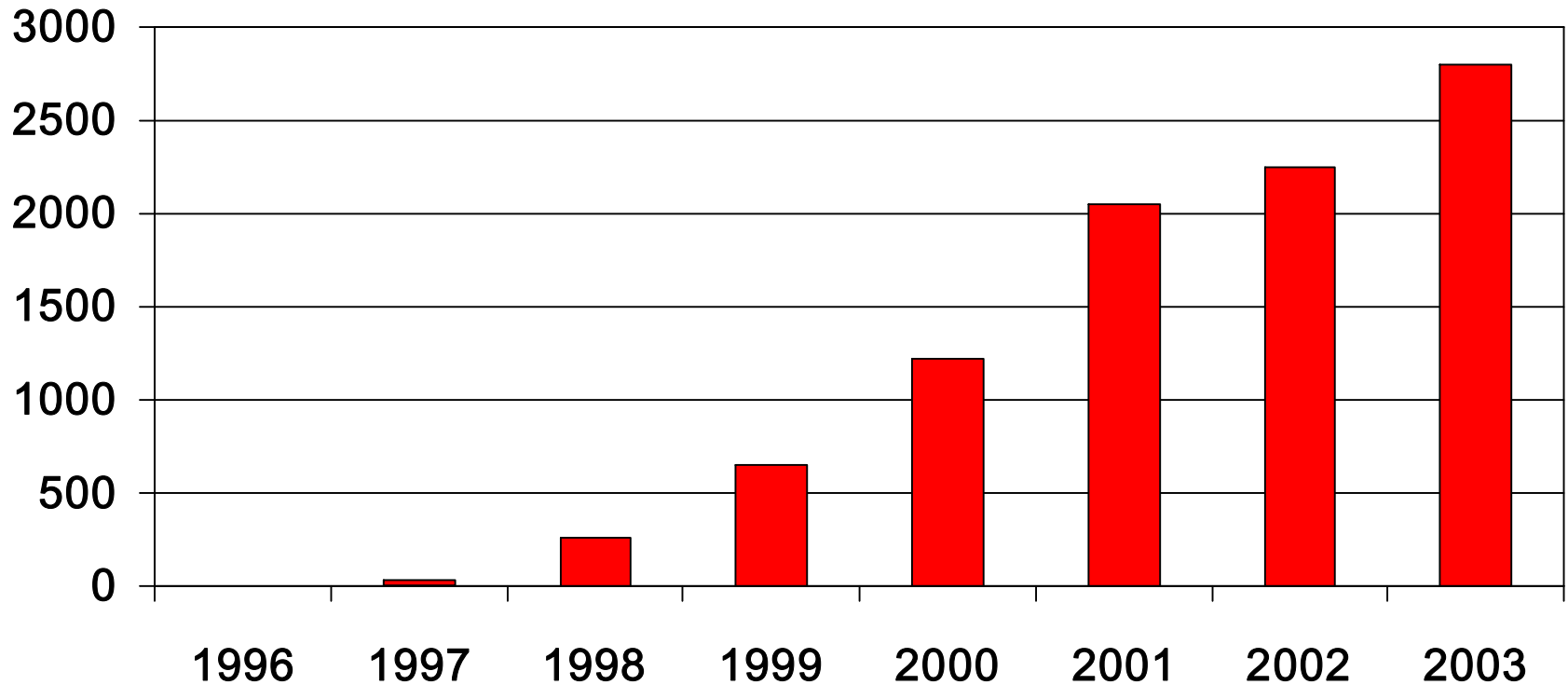
Total—2003: \$300+ million

Plant biotech research expenditure

(million yuan in 1999 price, 22 institutes)



Bt cotton areas in China, 1996-2003 (thousand hectares)



More than 5 million farmers adopted Bt cotton in 2003

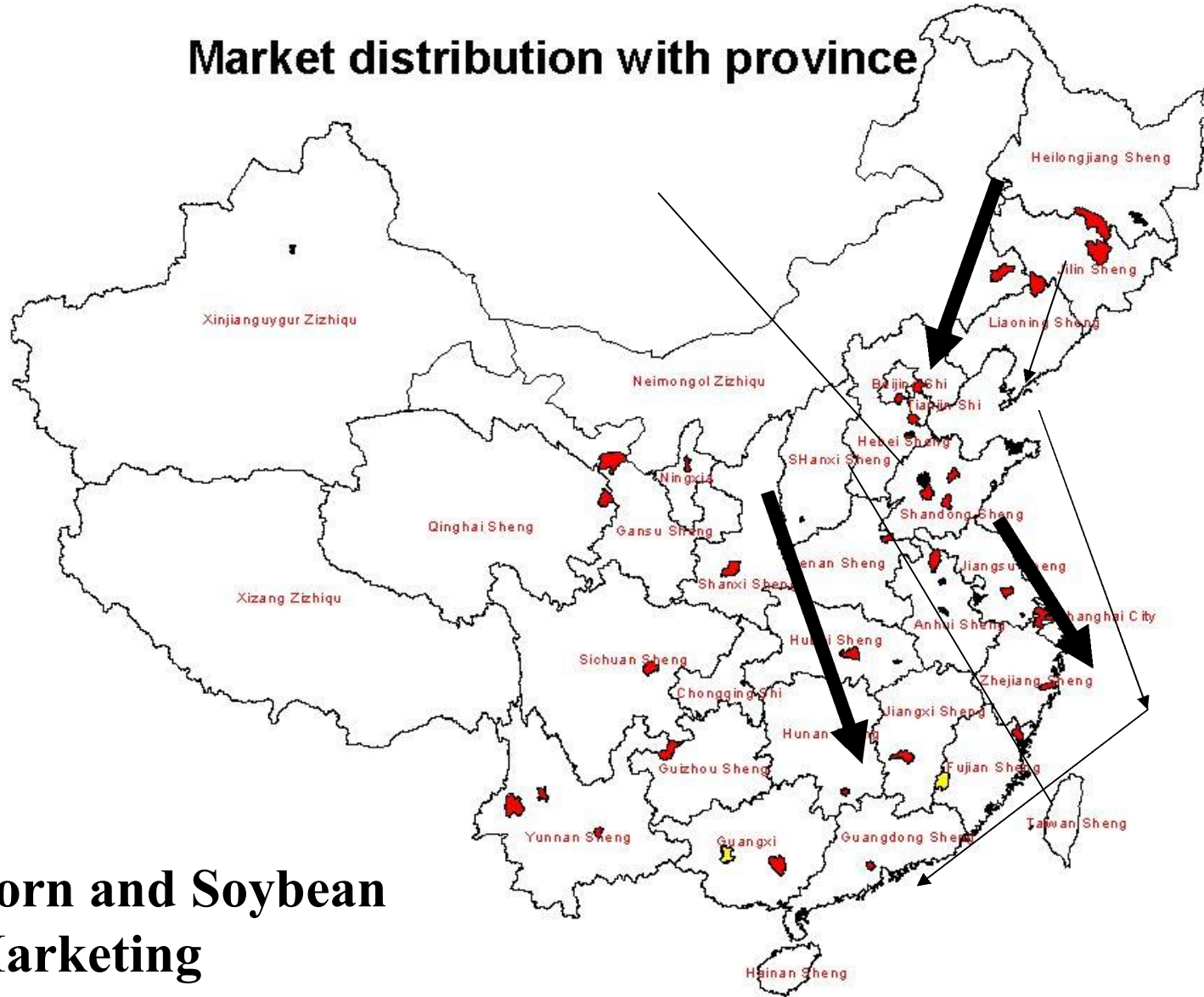
Major findings on Bt cotton impacts in 1999-2001 (per hectare)

- **Reduce pesticide use:** 34 kg 923 yuan
- **Increase yield:** 9.6% 930 yuan
- **Increase seed cost:** 570 yuan
- **Reduce labor input:** 41 days 574 yuan
- **Increase net income:** 1283-1857 yuan
(US\$ 155-225)

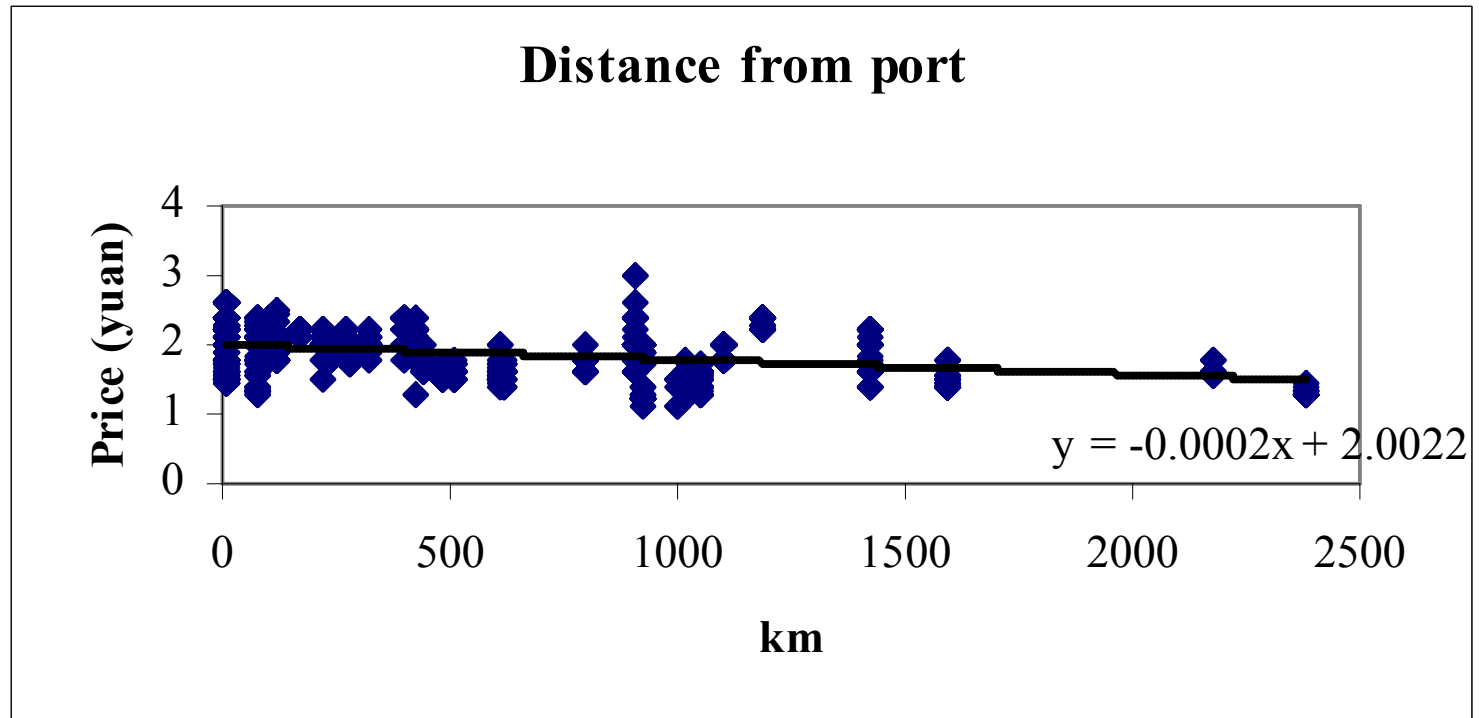
A net increase of about 20-30% ... this is a HUGE increase in productivity!

How good are China's Domestic Markets?

Market distribution with province

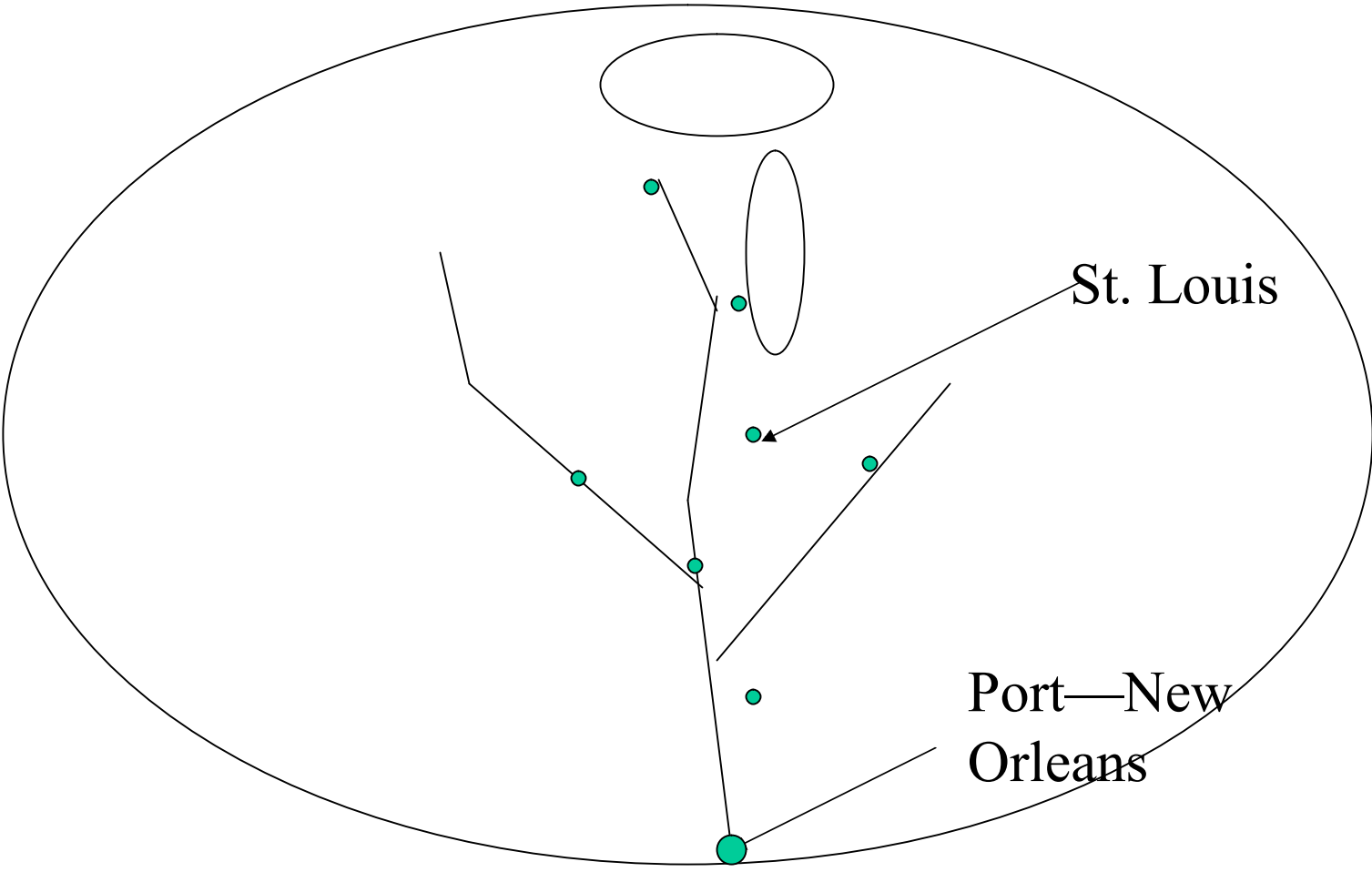


Corn and Soybean Marketing Regions and Flows

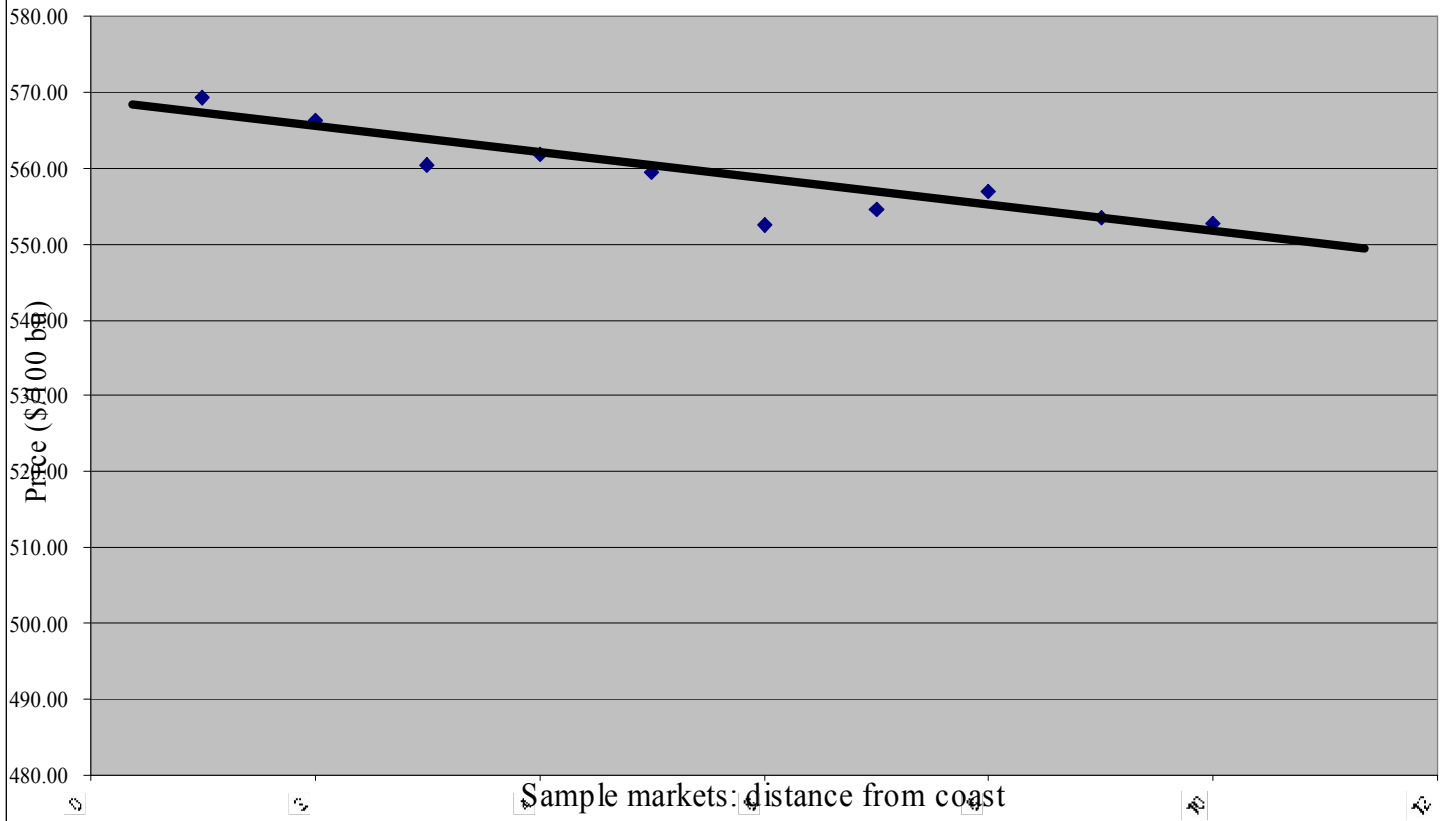


Changes in corn price across China as markets increase its distance from port, 2000

Location of Major Corn Markets in Greater Mississippi Valley



US Corn Prices

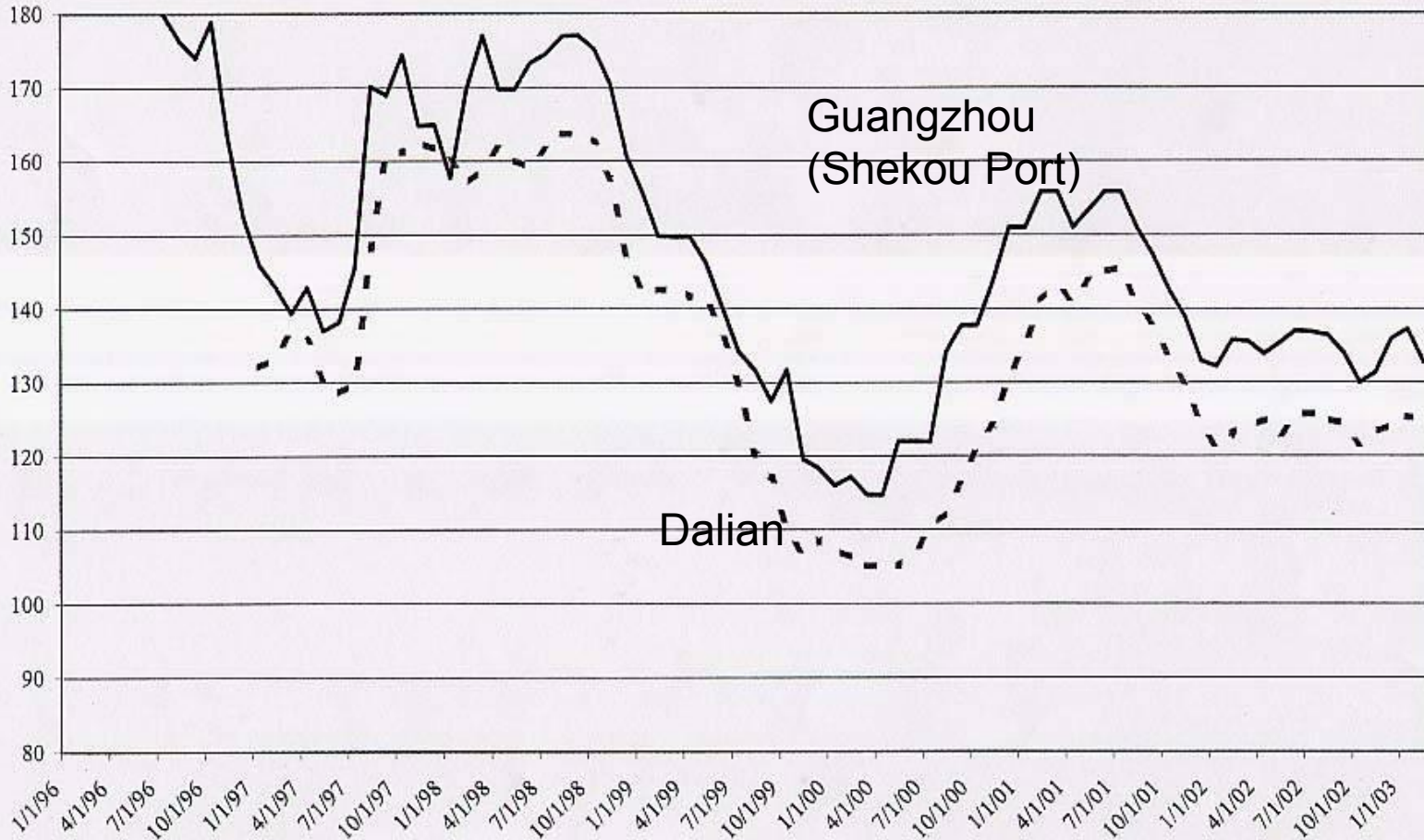


Percentage change in price for every 1000 kilometers of distance from port

	Corn	Soybean	Rice
China 1998	-4%	-10%	-10%
1999	-4%	-9%	-9%
2000	-3%	-4%	-7%
US – 1998	-5%	-3.5%	8%

Guangdon V.S. Dalian

- - - Dalian- at
storage(\$/mt)
— Guangdong(\$)



Soybean Market Integration between Regions

Year	AH=> SD	AH=> SaX	AH=> NX	JL=> TJ	HLJ=> DL	GD=> SaX	GD=> GS
1996	-5.36*	-5.87*	-4.84*	-3.93*	-4.01*	-4.33*	-4.83*
1997	-3.88*	-4.33*	-5.21*	-4.15*	-3.21*	-3.82*	-3.84*
1998	-4.13*	-5.56*	-4.84*	-4.72*	-4.67*	-4.85*	-4.05*
1999	-3.57*	-3.73*	-4.02*	-	-	-	-

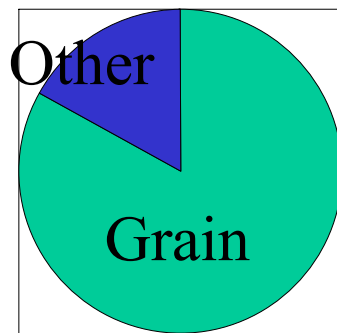
Dicky-Fuller Test critical value rejecting null of no integration @ 5% (10%) level is -3.3 (-3.0)

Integration in China's Markets (percent of market pairs that have integrated price series)

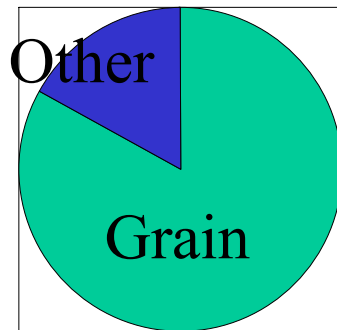
	1991-92	1997-00	2001-2003
Corn	46	93	100
Soybean	56	95	98

More than $(45*44)/2 = 800$ pairs of markets

Percent Grain in Sown Area in China: 1950s, 1970s and 2003

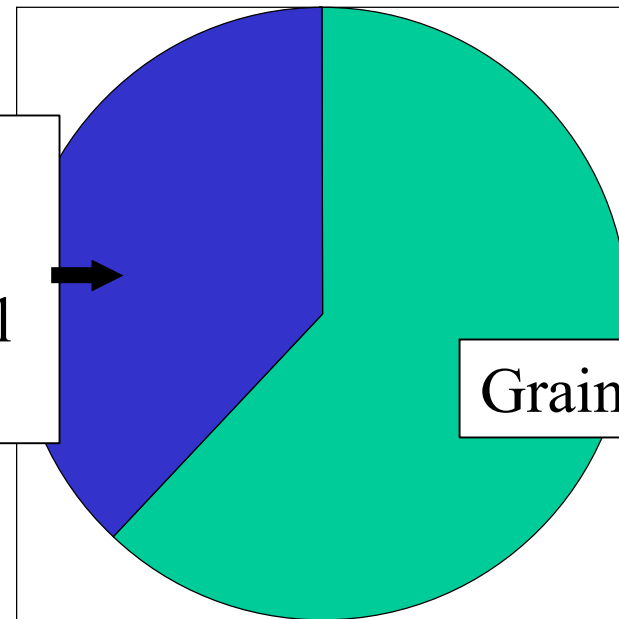


1950s



1970s

Other ...
including
horticultural
producers

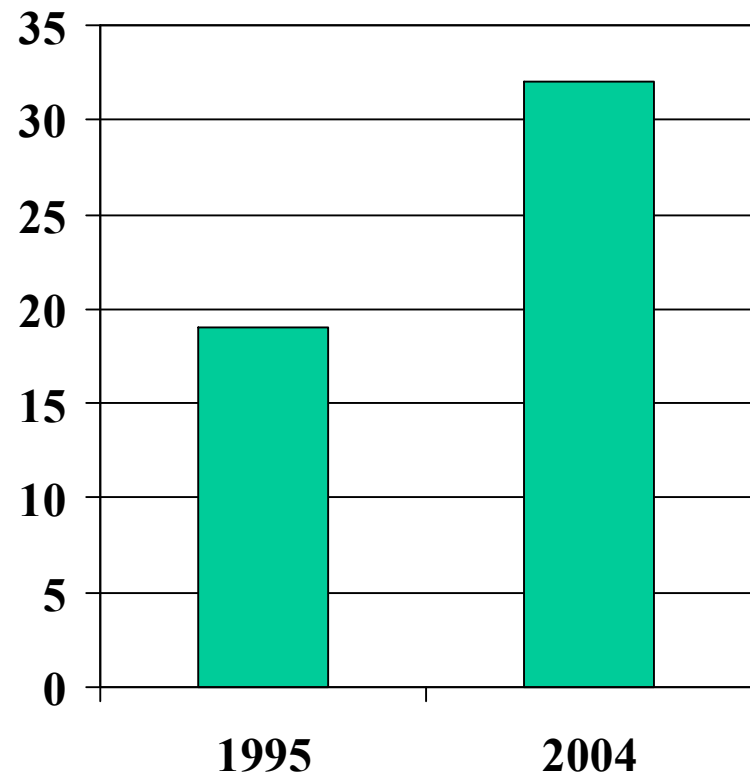


2003

Steady rise in cash
crops / fruits /
livestock /
aquaculture

Rise of specialization (entire nation)

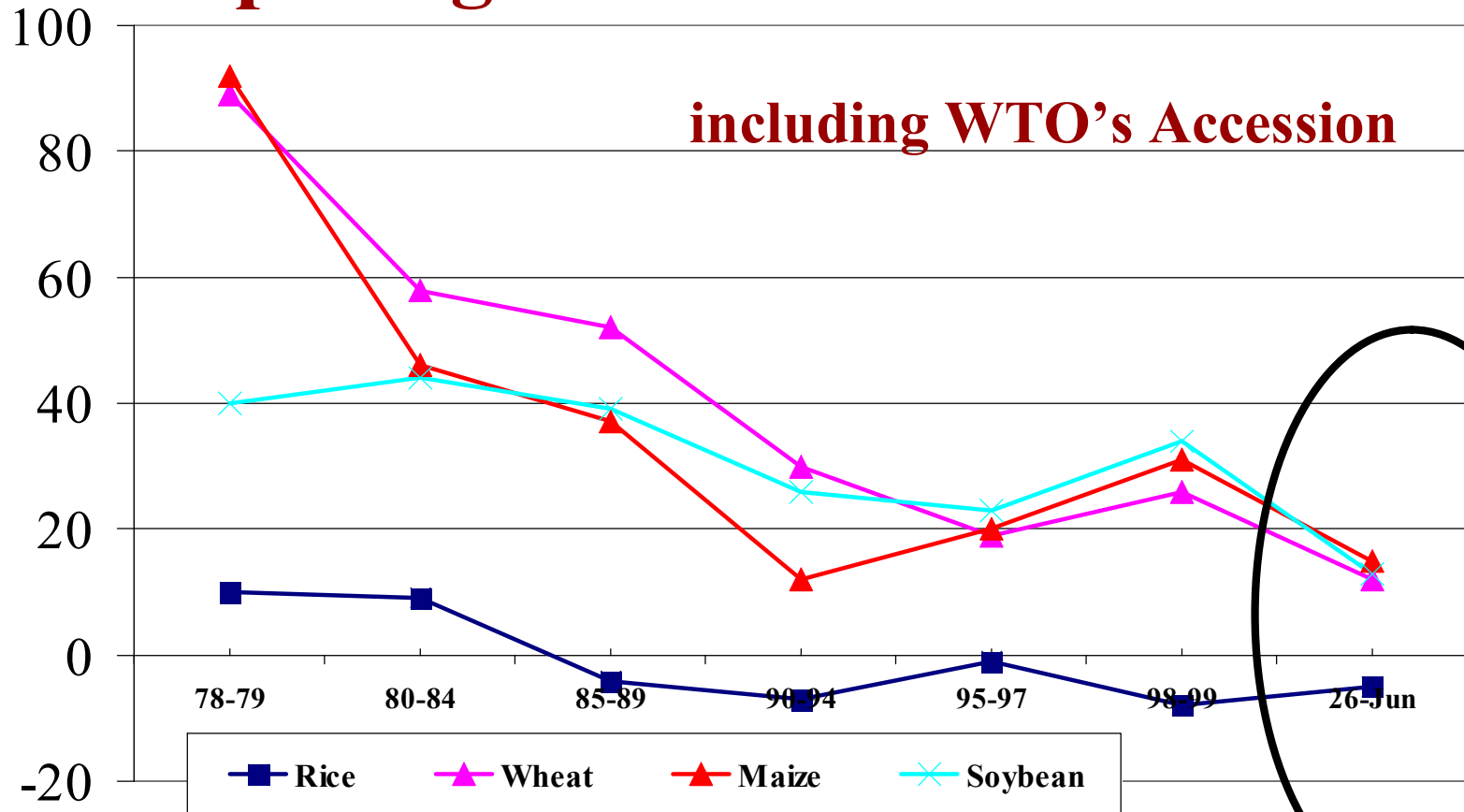
- In a recent survey of 650 communities in China, we asked the leaders:
 - Do farmers in your village specialize in the production of a field crop, tree crop or livestock commodity?



Data source: China National Rural Economy Survey (CCAP)

International Trade

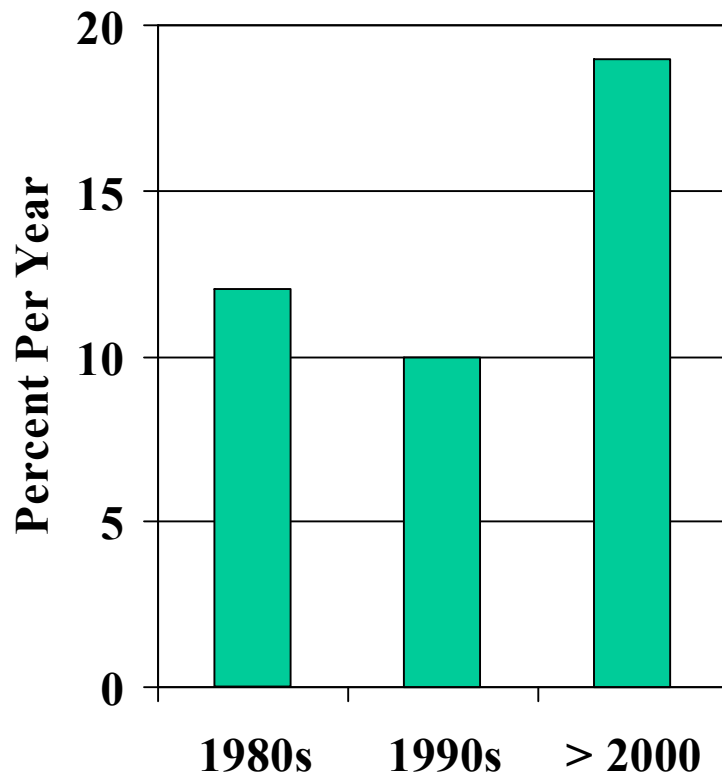
... and: Falling Barriers and Opening to the Outside World



Huang, 2001

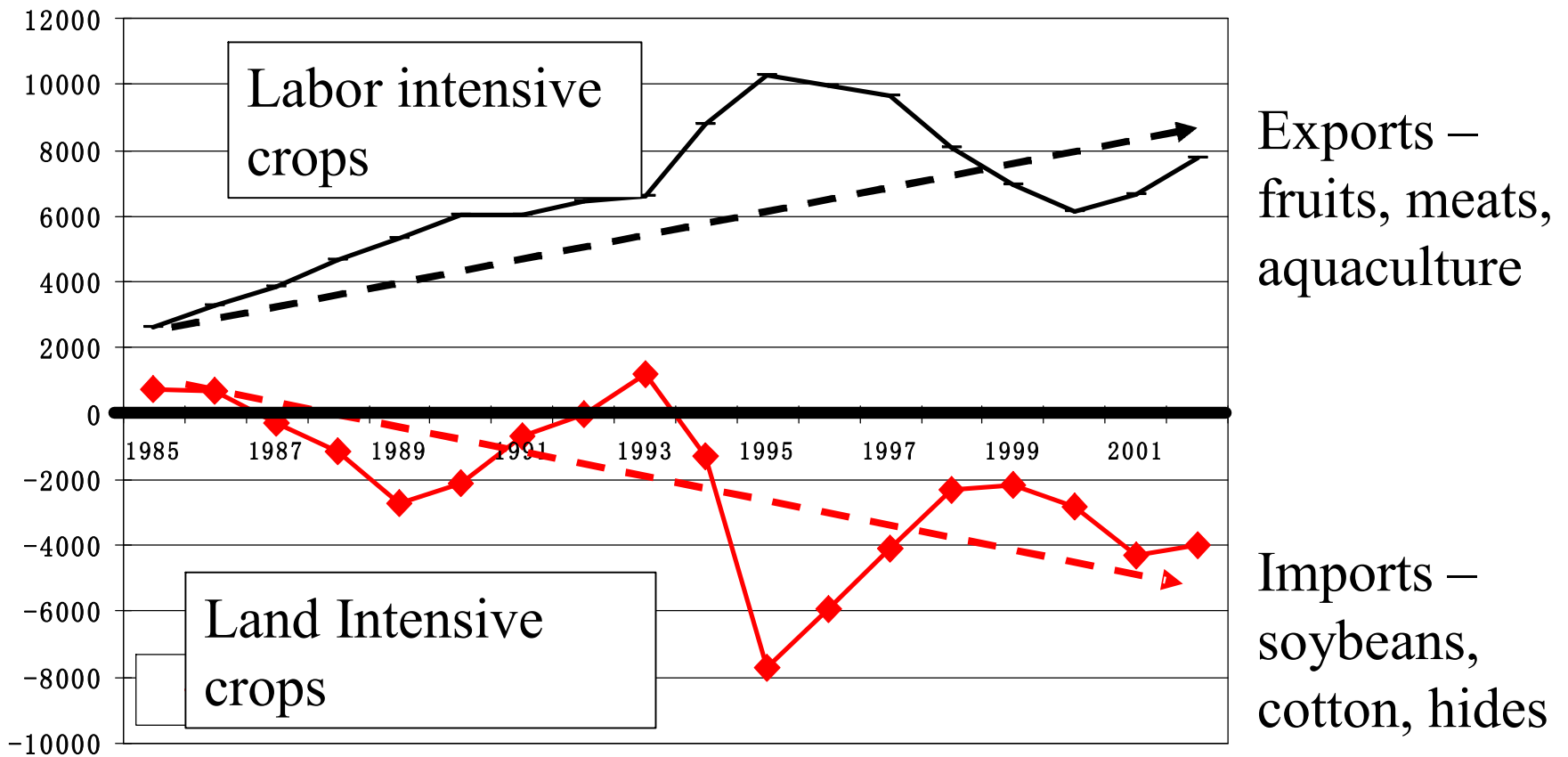
China has one of most liberalized tariff schedules in the world

Growth in International Ag Trade



- Exports > Imports
 - Between 1982 and 2006, only 2 years in which Im > Ex (2005/2006)
 - 2007: Ex > Im
- China is now the 4th largest ag trading nation in the world

Net exports



Agricultural Trade Balance by Factor Intensity, 1984 to 2002 (mil US\$)

Summary

- Some of the basic foundations of a supportive environment exist for continued rural growth:
 - Technology for raising technical efficiency / expanding productivity
 - Markets for raising allocative efficiency / gains from specialization
 - Gains in Domestic / International Market Liberalization

But, there are problems ...

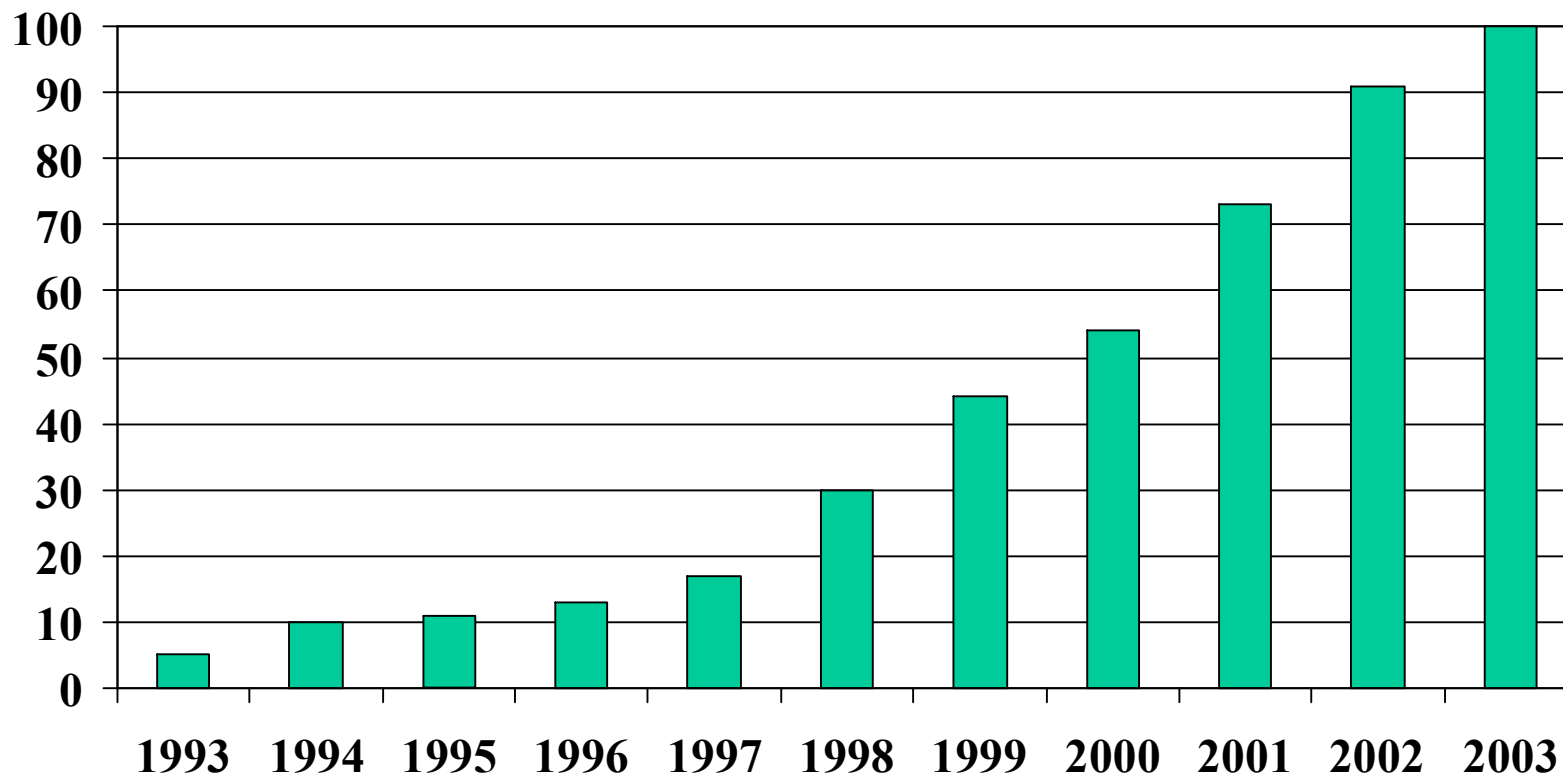
- Small Farmers
- Scarce Land (and falling??)
- Scarce Water

Small Farmers and Lack of Organization

- Since 1950, China's average size of farm has fallen ...
- between 2005 and 2006, first year average farm size rose

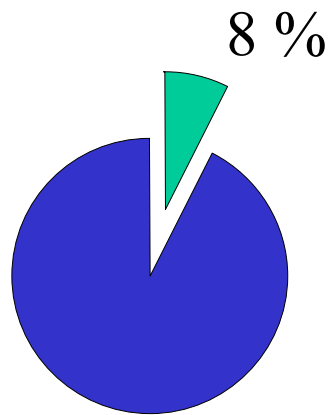
Growth of Cooperatives and Farmer Associations – Targeted mostly at provision of technology and inputs and marketing

Index (2003=100)

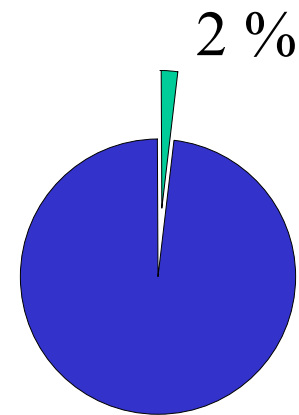


And, these small farmers are mostly
“on their own”

Cooperative movement still small



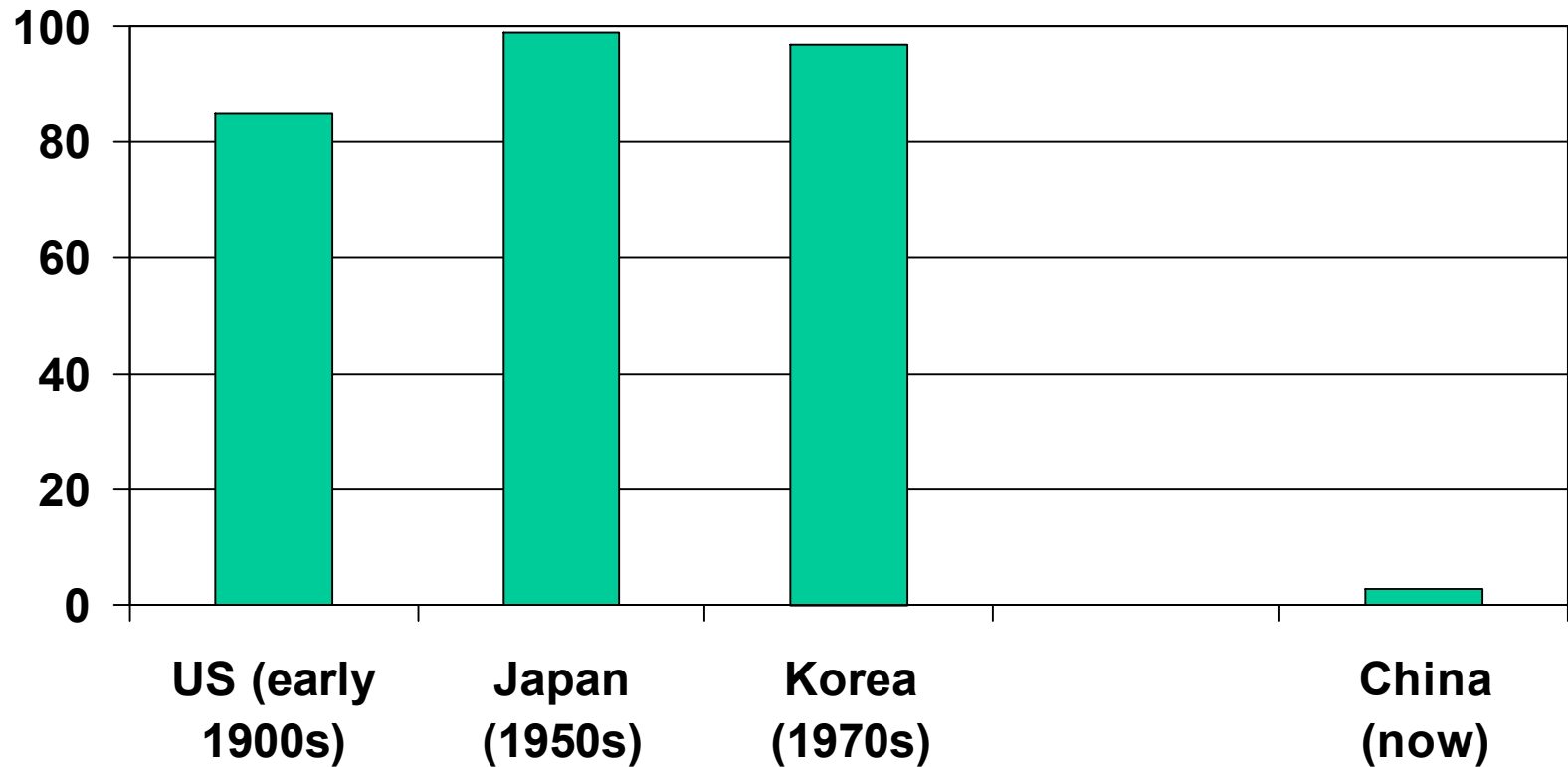
Percent of villages with
Cooperatives / FAs



Percent of households that
belong to Cooperatives / FAs

In Greater Beijing: only 4% of villages had cooperative /
only 8% of farmers (China Horticulture Survey)

Comparing with other nations: Percentage of Households Participating in Coops/FAs



Loss of Cultivated Land?

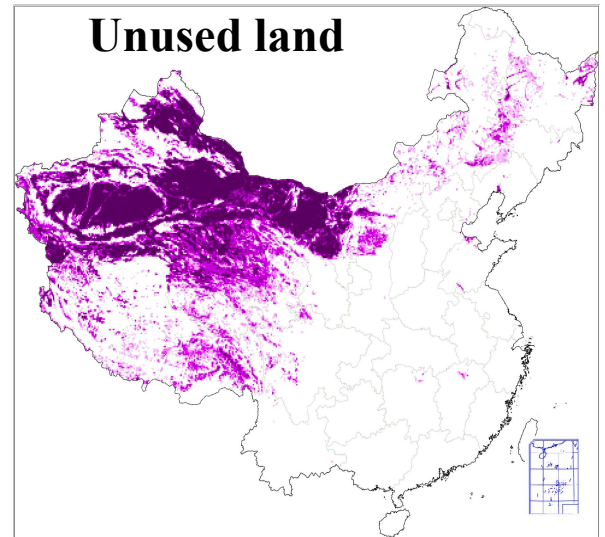
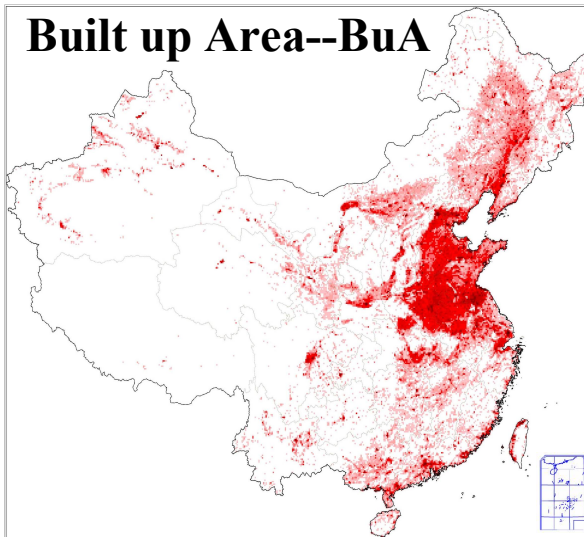
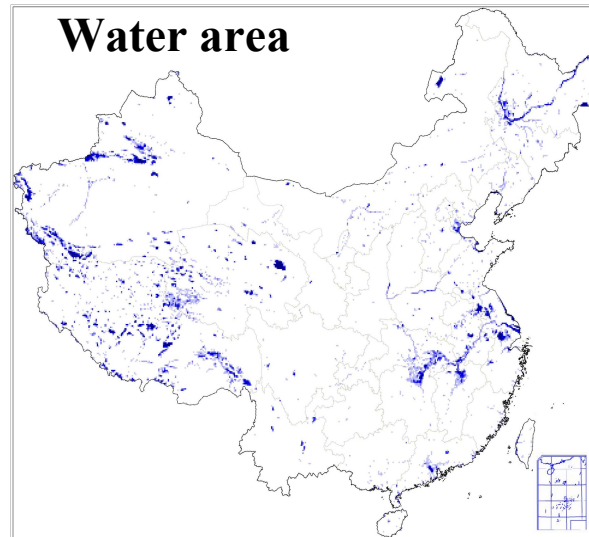
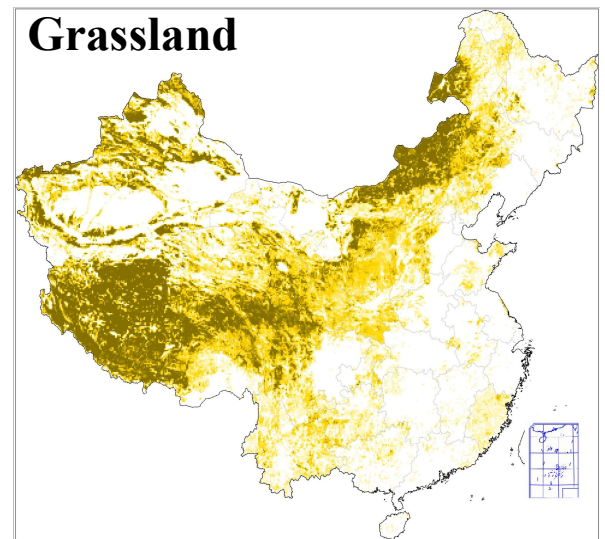
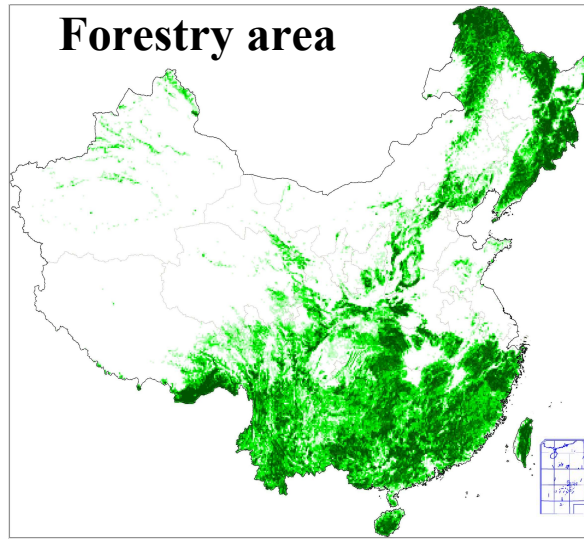
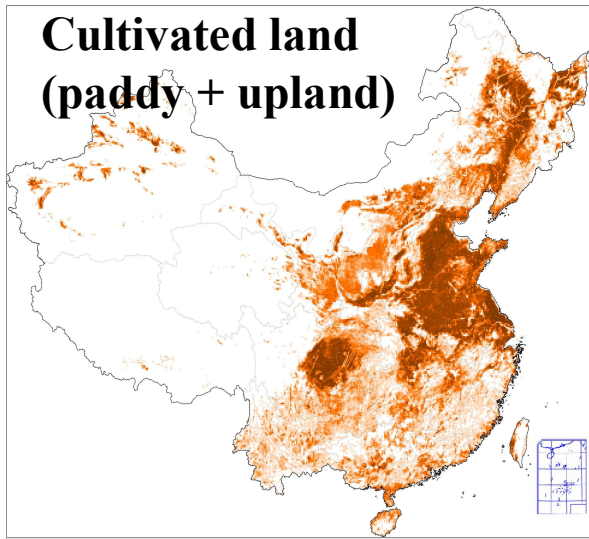
Production
+ import
trends



PLUS
pictures
such as
these ...

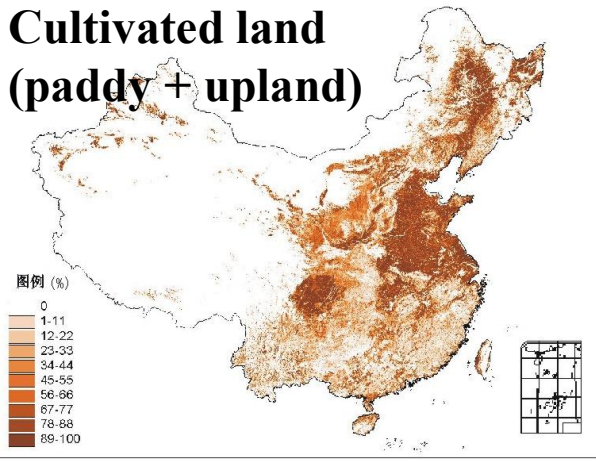


[Shenzhen in 1980 and 2000]

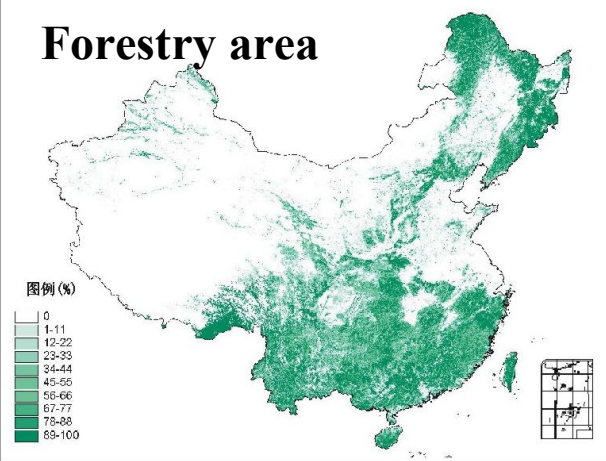


Land use maps by six categories in 1985

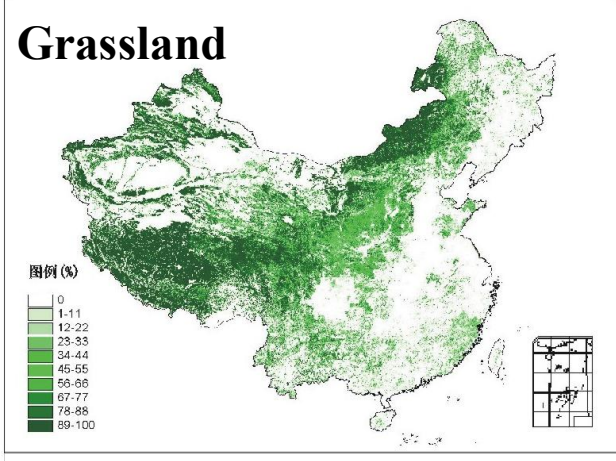
Cultivated land (paddy + upland)



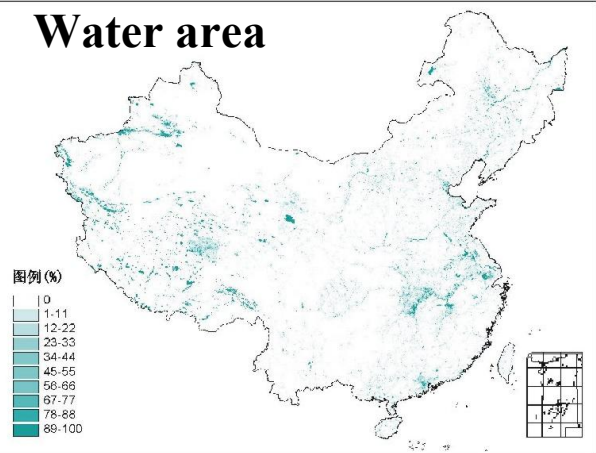
Forestry area



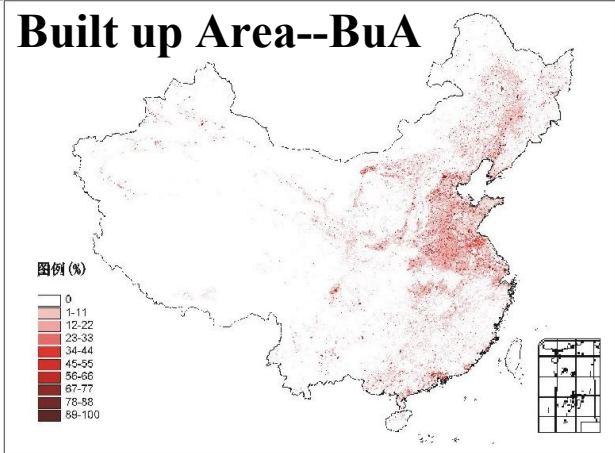
Grassland



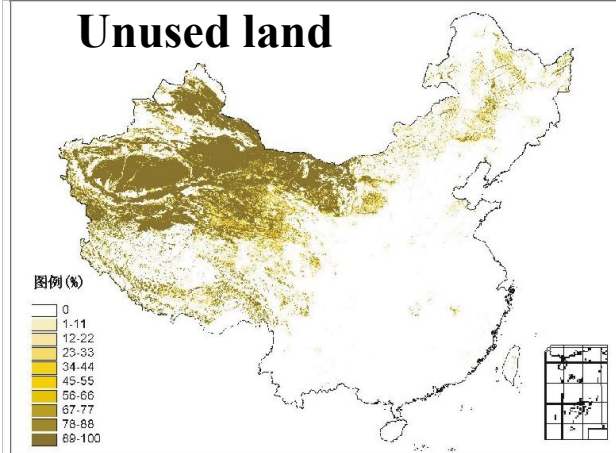
Water area



Built up Area--BuA

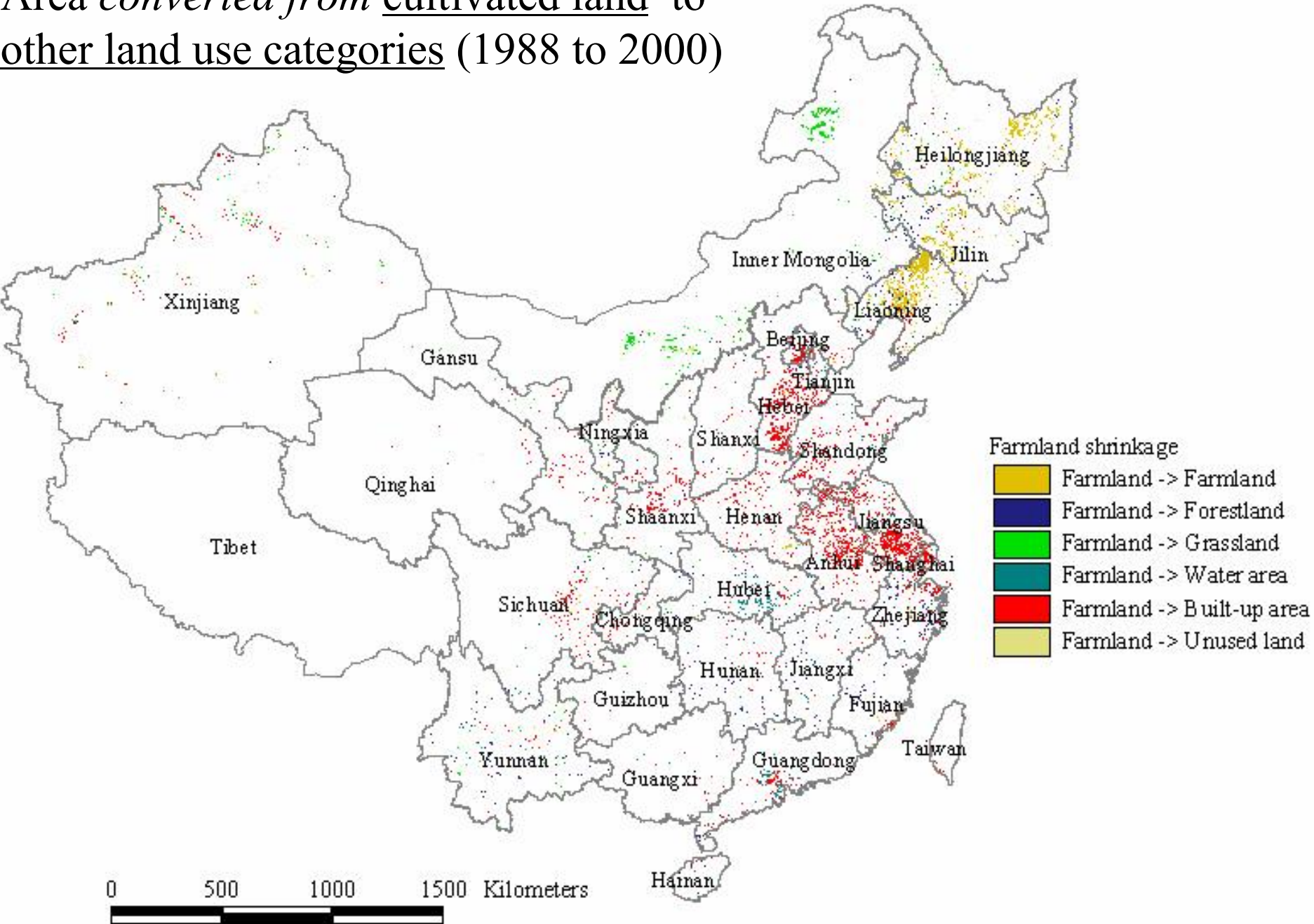


Unused land



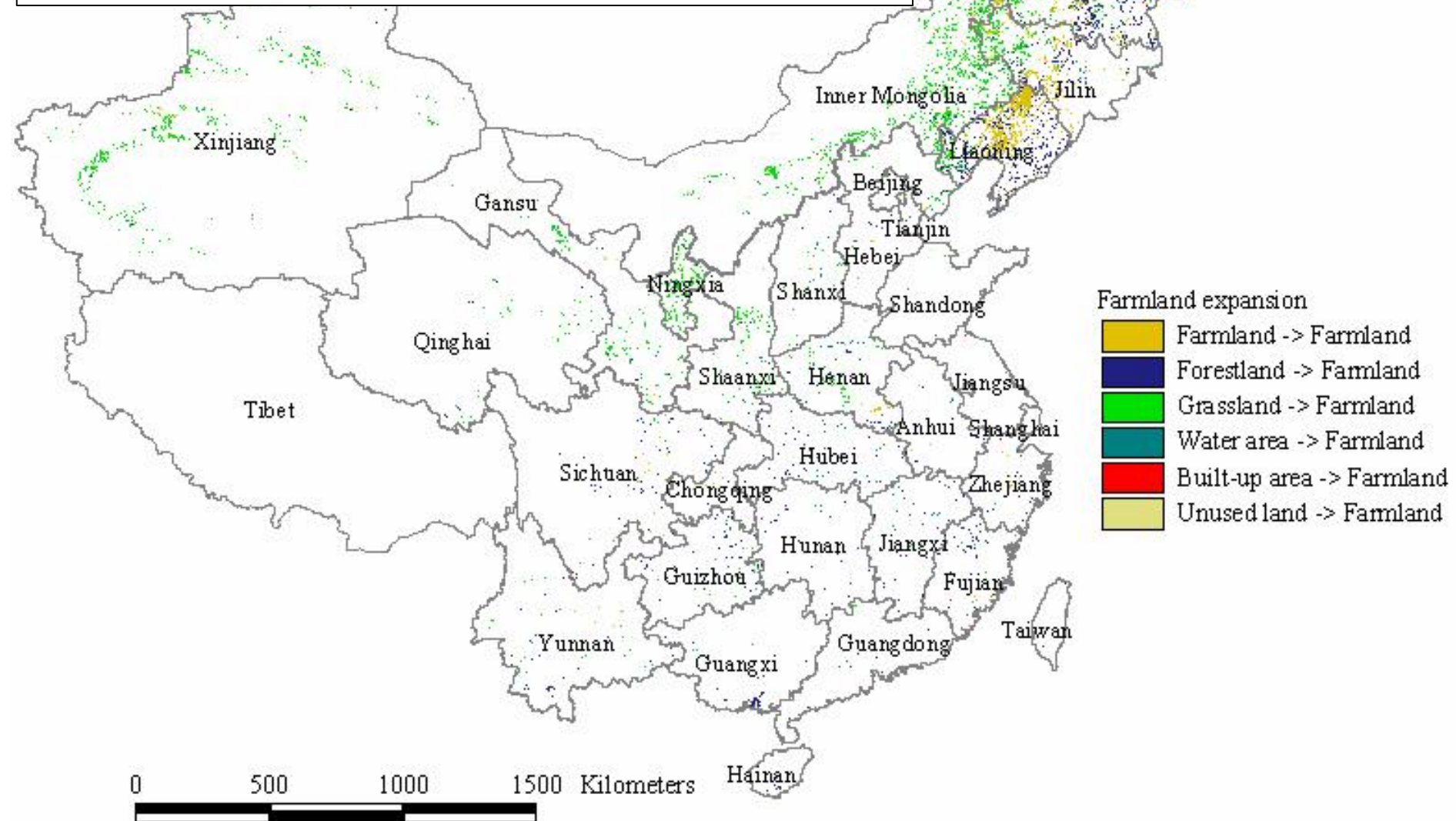
Land use maps by 6 categories in 2000

Area converted from cultivated land to other land use categories (1988 to 2000)



But, conversion is a “two-way street”

Area converted to cultivated land from other land use categories (1987 to 2000)

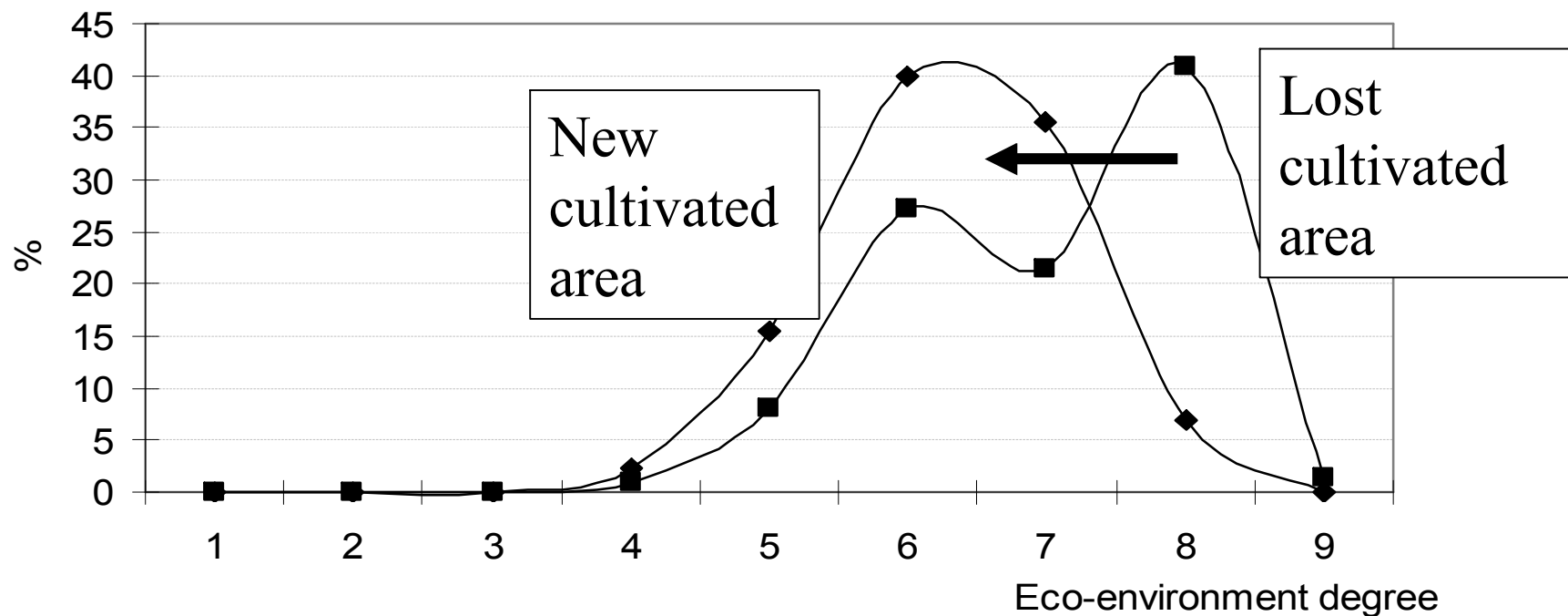


Accounting for changes in cultivated land in China, 1988 to 2000

From other uses to farm land	→	+ 5.7 million ha
From farm land to other uses	→	- 3.0 million ha
		<hr/>
		2.7 million ha (NET GAIN)
		[+ 1.9%]

Between 1988 and 2000, China actually experienced a net increase in cultivated area ... different than Ministry of Land Resources

Using Eco-Environment Measure



Comparing the change of “quality” of cultivated land that was converted to other uses with the “quality” of newly expanded cultivated area in China, 1985-2000.

Final Result: **Decrease in “quality”**: around **0.5%** ...↑

China's Water Problems

- They are severe ... in some places ... and loom as a serious constraint ...
- Groundwater table falling steeply ... but, only in 8% of northern China (about 4% of China's arable land area)
- But water quality is improving ...

Recent Responses:

The “tidal wave” washes into Rural China

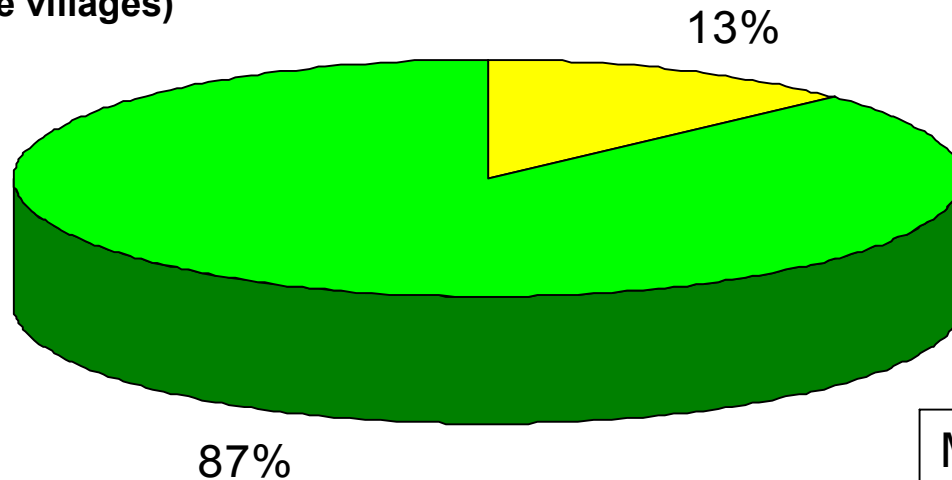
- Public Infrastructure Investment
- Subsidies
- Other Programs

Composition of investment projects public vs. development

Total number of projects in
sample

9,138 projects
(in 2459 sample villages)

Development Projects

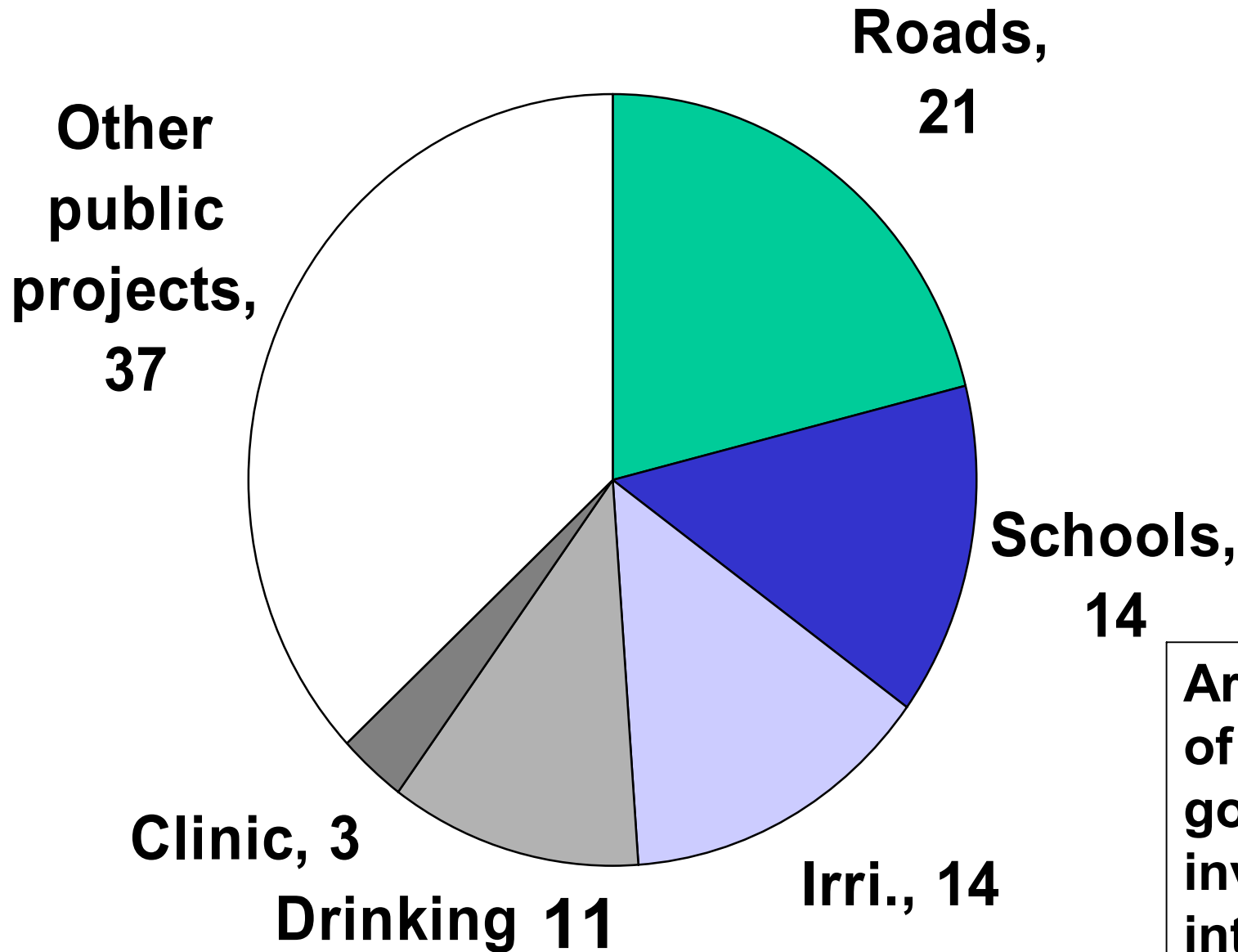


Public goods investments

Nearly 4 per village during the study period ...
or almost 1 per year

Most of projects in
rural China now focus
on the provision of
public goods ...
different than the
1980s

Type of PUBLIC GOODS projects

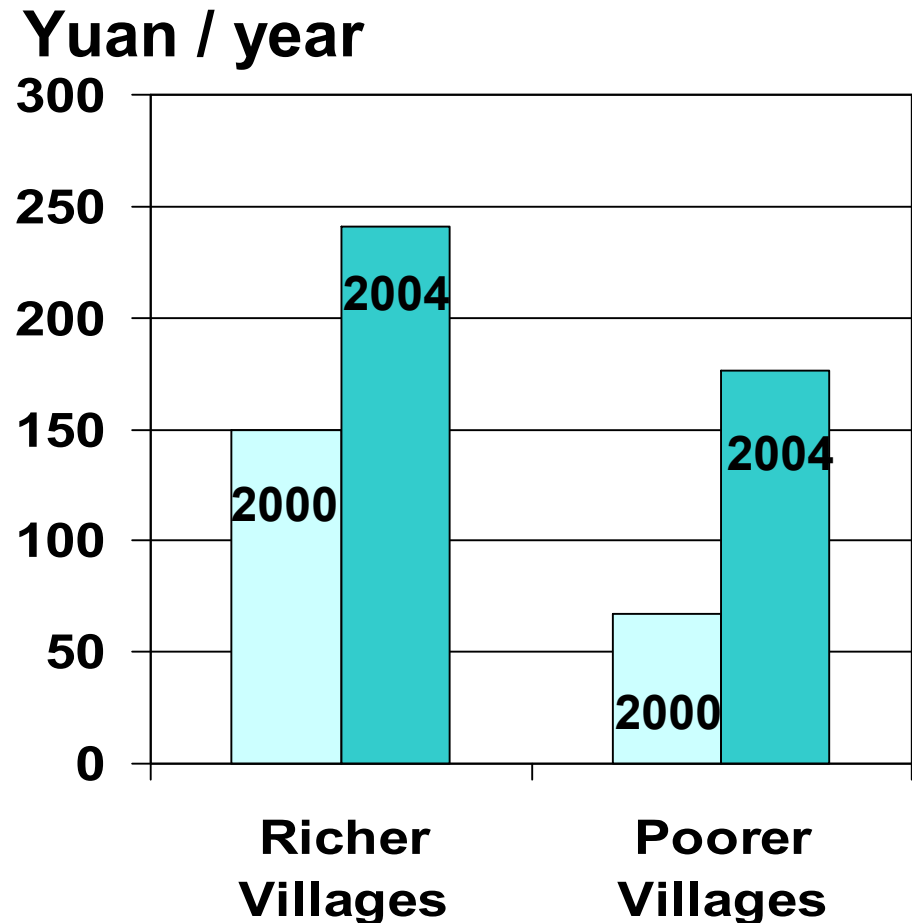


Around 2/3rds of public goods investments into 5 types of projects

Rising Investment Over Time

(100 village study)

- Nearly all villages experienced rising investment into public goods
- Poor received greater increase, absolutely and in percentage terms
- In 2004, per capita investment almost US\$100/capita 2004



Determinants of Public Investment

Targeting factors		
Net per capita income, 1997 (yuan)	4.10e-08 0	-0.00014 -1.22
Net per capita income square, 1997 (yuan)	1.66e-08 0.7	0 (1.88)*
Percent of minority population	0.002374 0.79	-0.00291 (1.86)*
Percent of hilly land over 25 degree	0.007085 (3.64)***	0.002949 (1.91)*
Distance from village committee to township seat (km)	0.011216 0.97	-0.01641 (2.06)**
Distance from the village seat to the nearest road (km)	-0.01607 (3.81)***	-0.00658 (1.96)*
Total population, 1997 (person)	0.00021 (3.57)***	0.000271 (6.34)***
Distance between two most distant small groups within this village (km)	0.002905 0.2	0.039351 (2.93)***
Demand side factors		
Number of collective enterprise	0.107772 (2.75)***	0.074373 (2.67)***
Percent of self-employed households	0.026779 (3.28)***	0.019392 (3.65)***
Percent of migrant labors	-0.00576 -1.48	-0.00572 (1.96)*
Per capita land (mu)	-0.04014 -1.39	-0.02637 -1.33
Percent of effectively irrigated land	-0.00685 (3.95)***	-0.00866 (6.66)***
Other factors		
Number of fellow villagers with township-above governments, person	0.030891 (4.12)***	0.020646 (3.94)***
Village head turnover, 1998-2003, 1=yes, 0=no	0.22298 (1.71)*	0.102749 0.97
Village head occupation prior to office: 1=fulltime farmer, 0=not 1	-0.21257 (1.88)*	-0.16451 (1.75)*
Schooling of village head, year	0.003529 0.14	-0.01813 -1.07
Party secretary occupation prior to office: 1=fulltime farmer, 0=not 1	-0.10934 -0.93	-0.06384 -0.66

Summary on Investment Spending: Where? To Whom?

Determinants, investment in public goods from above:

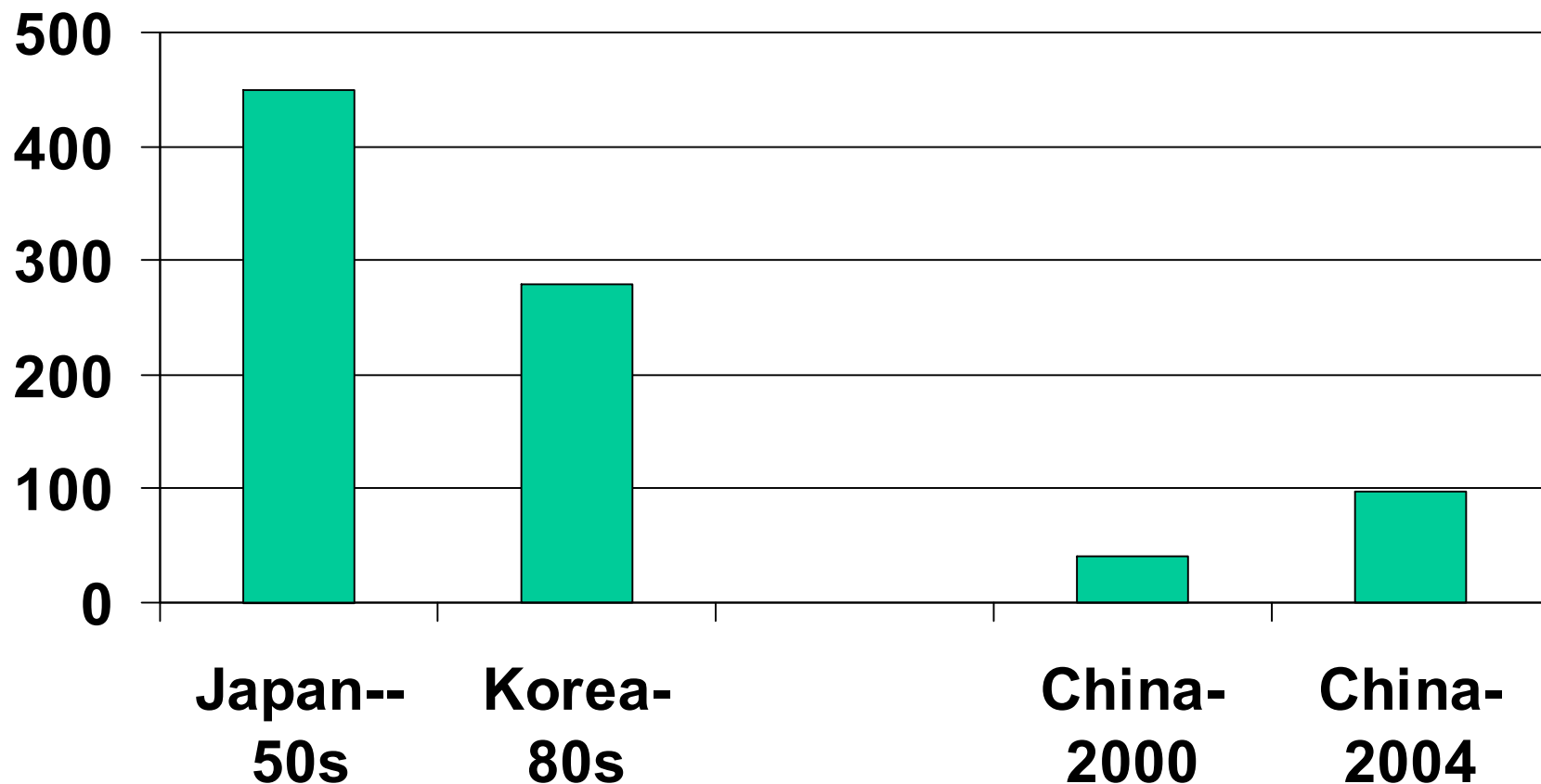
- Poor
- Minority
- Smaller
- Remote
- Mountainous villages

it is almost as if leaders were following a blueprint drawn by development economists ... progressive and well-targeted

Rising ... But Still Not Enough!

Total Spending: China versus Japan/Korea

Total Inv./Capita (US dollars, PPP terms)



New Subsidy Programs

New Subsidy Policies in 2004

(source: ERS China team)

Policies

Estimated Cost

*Direct Subsidies
to Farmers*

\$5 billion (PPP terms)

Agricultural Tax Reduction

\$5-10 billion

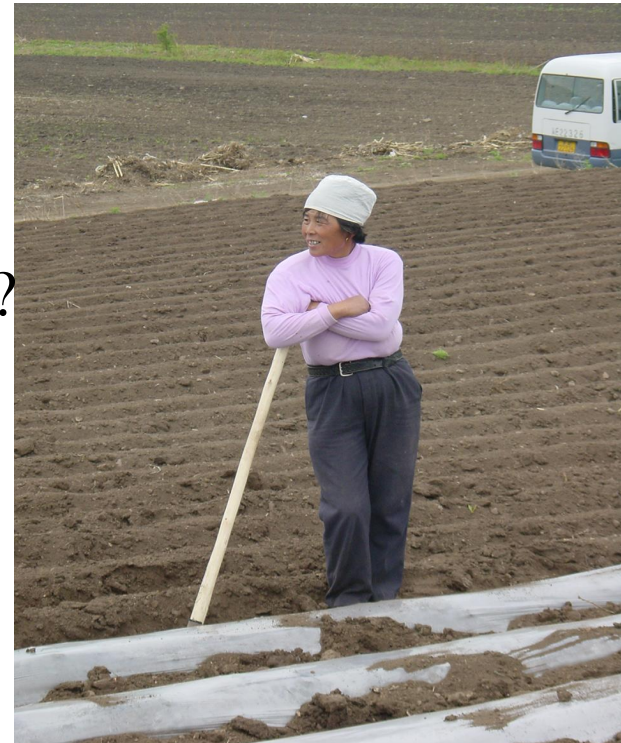
Input Subsidies

\$200 mil.

China also eliminated more than 2 to 3 billion US in exports subsidies (for cotton and maize??) ...

But, Doubled Size of Program in 2005/06

- **\$15 per acre (at nominal exchange rates)**
[**\$60 per acre in PPP terms**]
 —————> Higher in 2007/2008?
- **Can they continue?**
- **Below 4 percent gross value of production**
[**China is allowed 8.5% percent by WTO rules**]

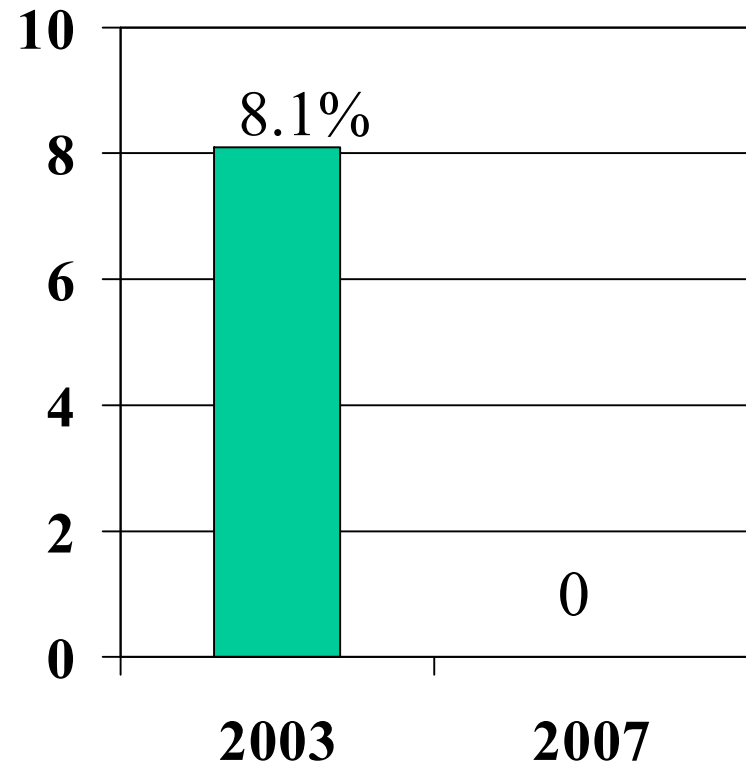


Source: our own survey

Tax Reduction Program Completed

- Completely eliminated taxes
- Farmers now pay no taxes or fees
- No grain quota

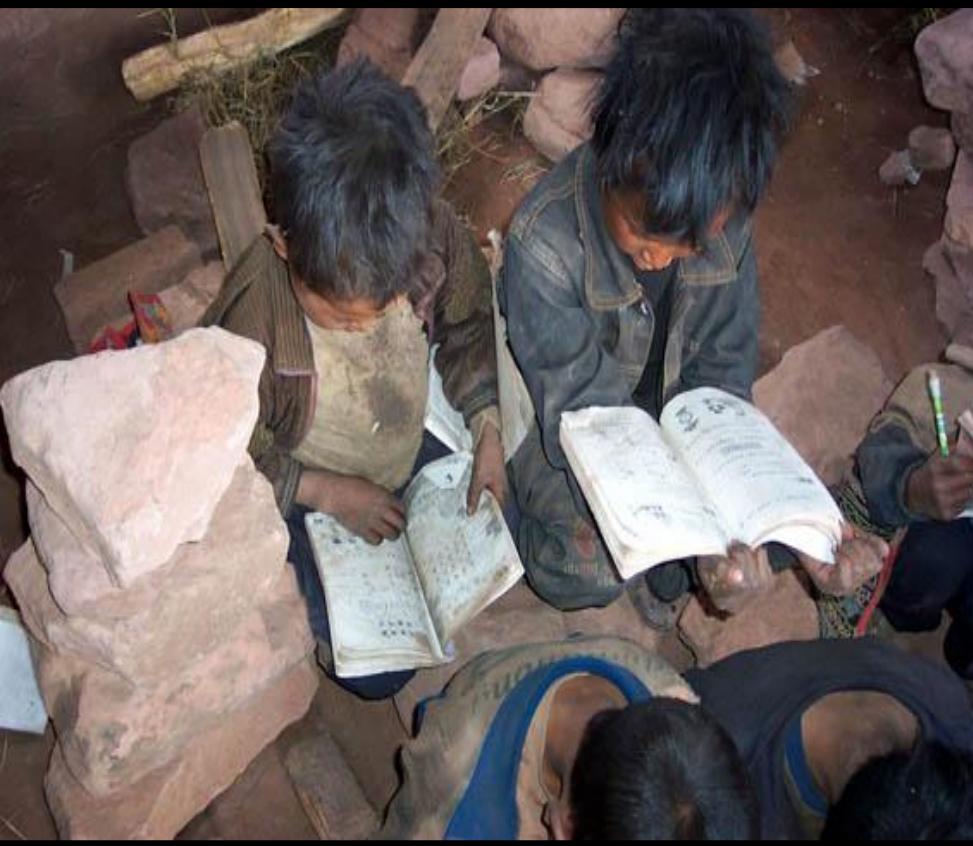
Percent of Value of Output



Other New Programs

New programs to upgrade rural education ...

All compulsory education (grades 1-9) is now tuition free ...



- Nascent Rural Health Insurance Program
- Even More Nascent Rural Social Security Program

Gradual improvement in rural governance ...

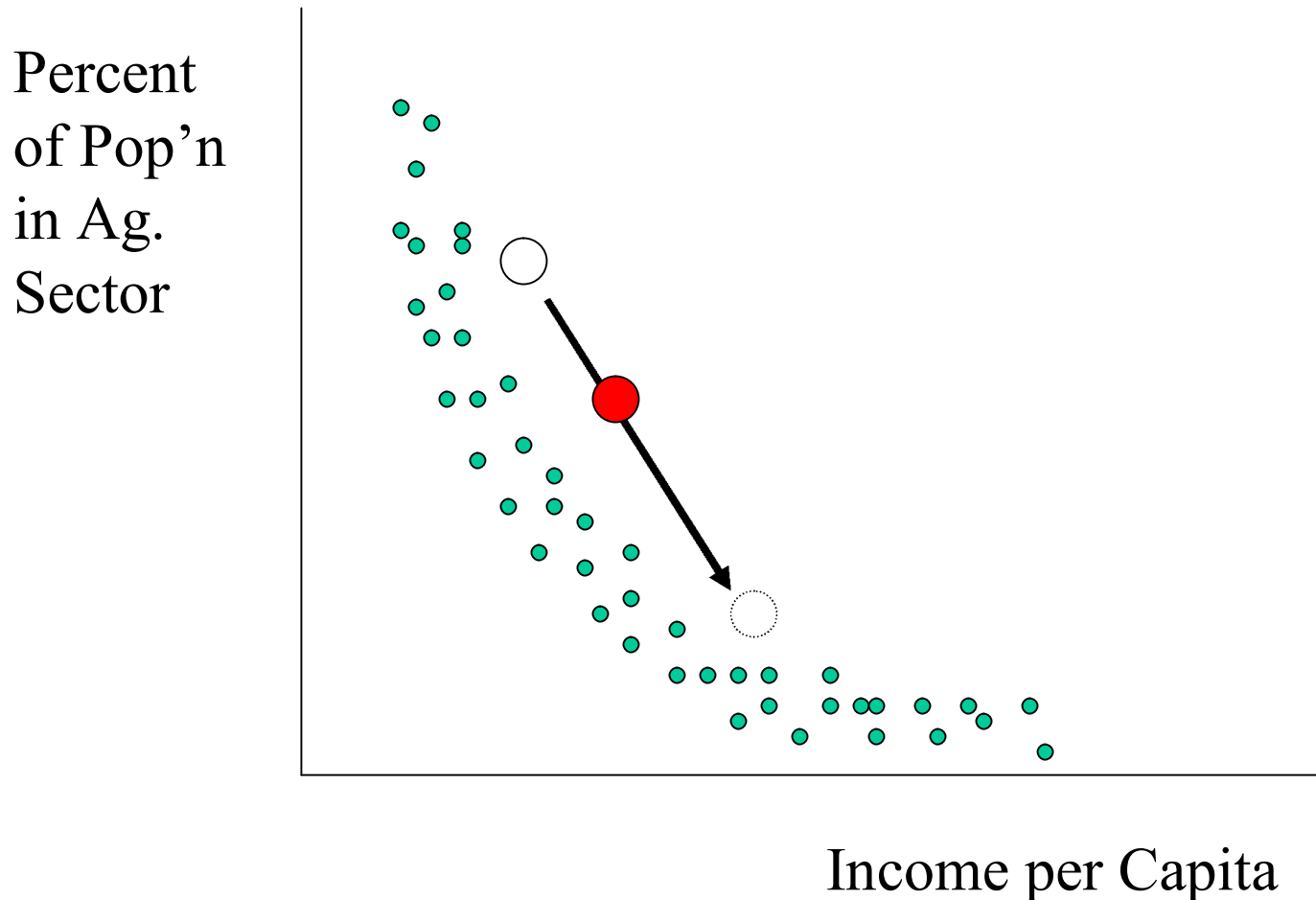
Every three years there are nearly 1 million village elections in China ...

... increasingly formal and more and more competitive



Final Summary

So where is China? What does it need to do to keep moving?



Stage 1 – Development Strategy

- Get *Property Rights* Right (1978)
- Get Technology Right (1980s/1990s)
- Get Prices Right (> mid-1990s)
 - Inside the domestic economy
 - Across international borders

Summary of this presentation:

China is doing this well ... mostly ... so far

What do they need to do in next stage?

Transformation of Agriculture – Stage 2

In the longer run, the challenge may be more complicated!

Continue!

Added Challenge

New Technology/Investment
Increase output / unit of land
Raise technical efficiency

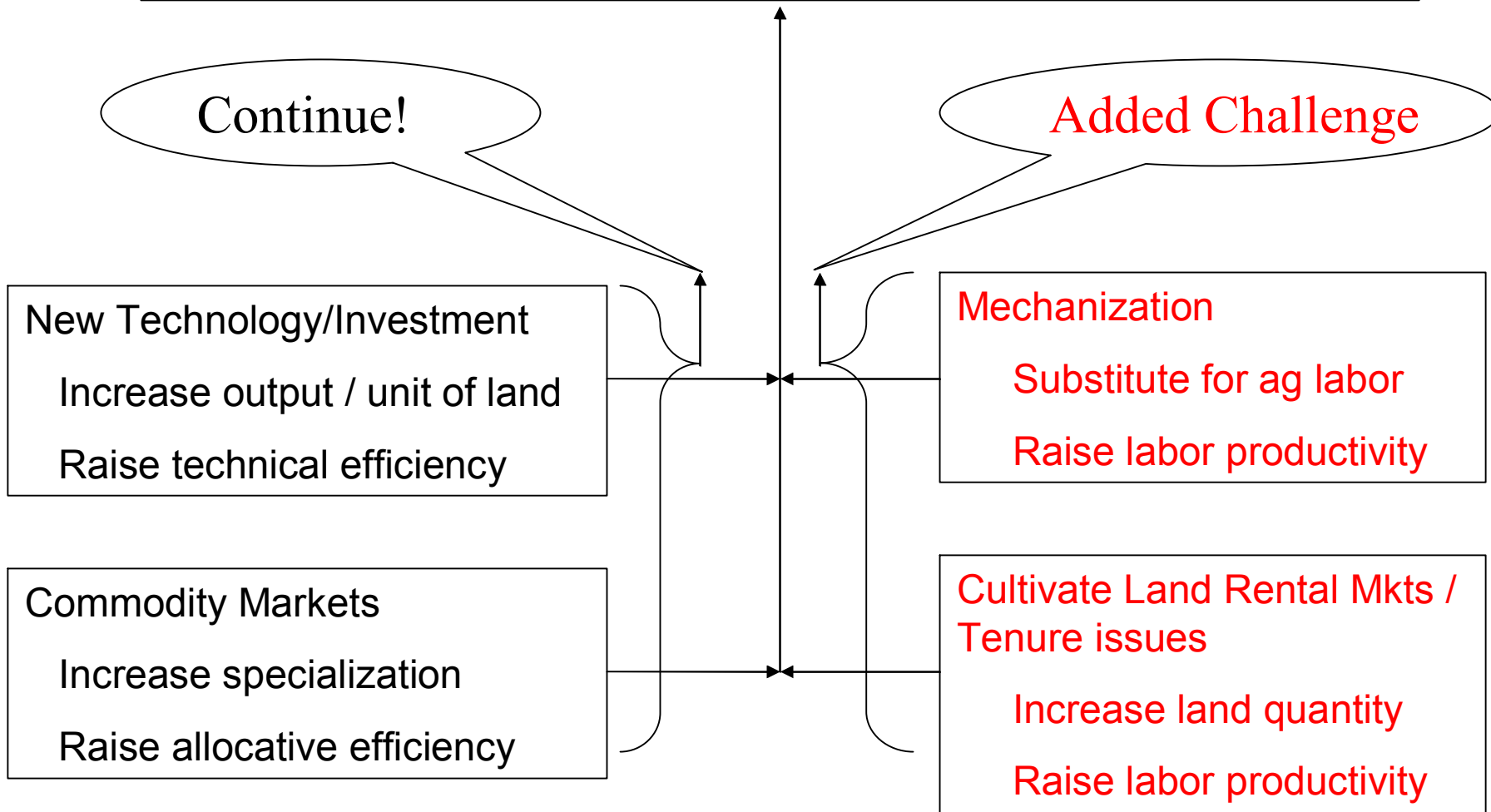
Mechanization
Substitute for ag labor
Raise labor productivity

Commodity Markets
Increase specialization
Raise allocative efficiency

Cultivate Land Rental Mkts /
Tenure issues
Increase land quantity
Raise labor productivity

Stage 2
(continued)

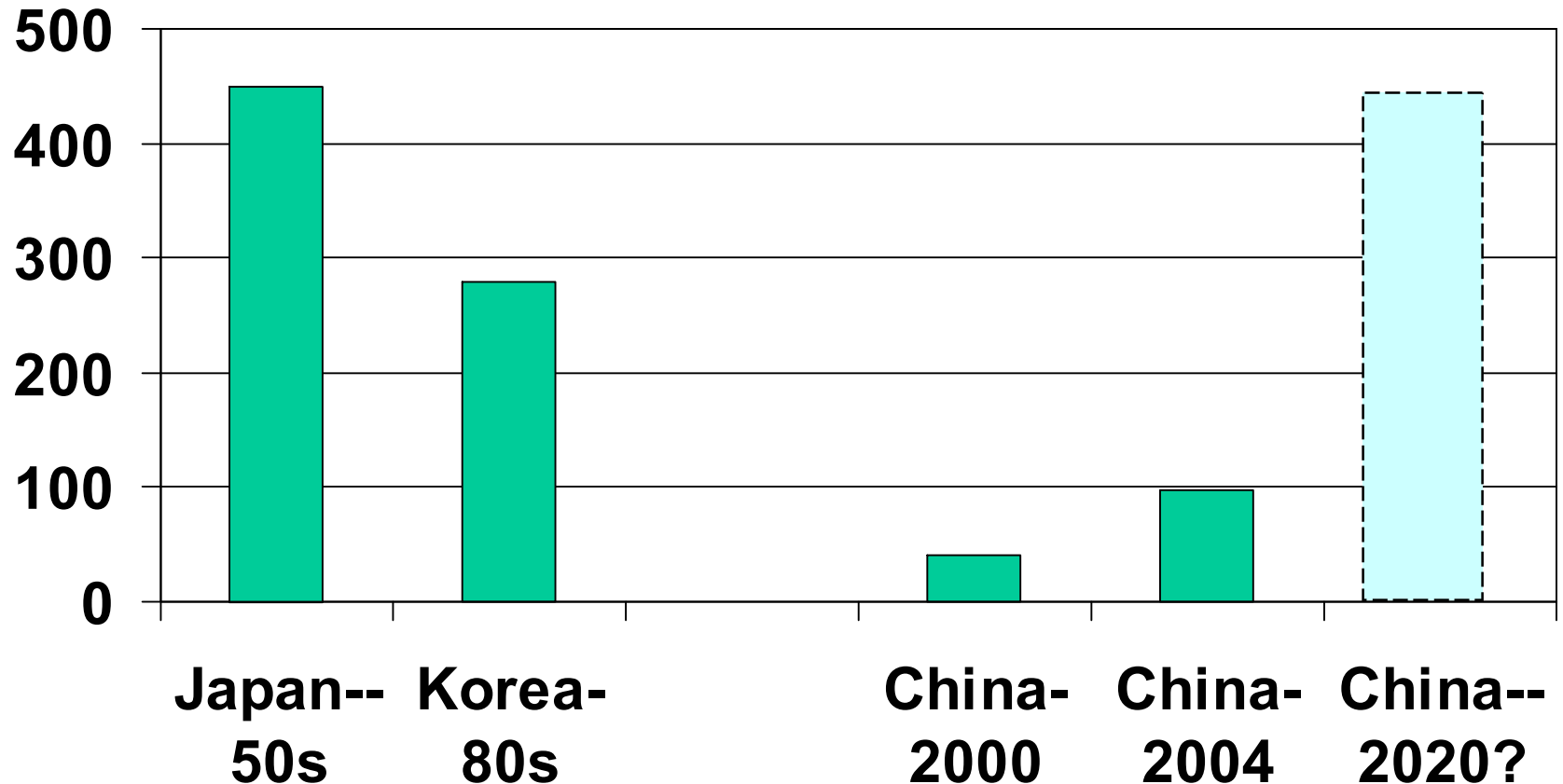
Stage 2



Needs a lot more investment

4 times this years ... and do for 25 years in a row!

Total Inv./Capita (US dollars, PPP terms)



The REAL CHANGE in AG

- Corn → Fuel ...
- Things will be very good for all of those that have land in the future ...
- Farmers are now in the Energy Business!
- Probably more important than anything the gov't will do!

Thank you