Supply chain coordination, contract farming and small farmers in Asia

Workshop on
“Contract farming: Methods and Experiences”
ICAR, New Delhi, May 5-6 2007
Questions

1. What factors are driving changes in supply chain coordination?

2. What are the emerging patterns of supply chain coordination, with particular emphasis on contract farming?

3. What is the impact of contract farming on farmers and how much do small farmers participate?
Definitions

- **Supply chain coordination** (or vertical coordination)
  - Definition: Institutional arrangements that help match supply and demand with respect to product characteristics, time, and place

- Types of coordination:
  - **Spot markets** – Price is only mechanism of coordination
    - e.g. Farmer sells beans to wholesaler with no prior agreement
  - **Contract relationship** – Agreement between seller and buyer that allows exchange of information and resources to match supply and demand
    - e.g. Processor offers farmer inputs on credit and agreement to buy green beans at harvest
  - **Vertical integration** – Ownership of two or more stages in marketing channel
    - e.g. Exporter produces green beans on own land using hired workers
Changes in agriculture in Asia: Shift to high-value agriculture

- **Rising income** → consumers diversify away from grains & starchy root crops toward fruits, vegetables, fish, & animal products ("High-value agriculture")

- **Urbanization** → increased consumption of high-value commodities after controlling for income, probably due to greater availability of high-value foods

- **Trade liberalization** (including market exchange rates) → imported high-value goods more available and more incentive to export, esp to high-income markets

- **Foreign-direct investment** → links farmers to high-income consumers in other countries
Signs of shift: Growing domestic demand

- Per capita grain consumption stagnant or falling
- Per capita consumption of high-value foods growing at 5-10% in China and 1-3% annually in other 7 countries
- Growth in spending on high-value foods even higher

Annual growth in per capita consumption (1990-2000)

-2% 0% 2% 4% 6% 8% 10%

Grain
Vegetables
Fruit
Milk
Meat
Eggs
Fish

Signs of shift: Growing production

- Grain production grew 1.3% annually
- Fruit & vegetable production grew 7.7%,
- Milk & egg output grew 4.6% and 9.2%, respectively
- Meat & fish production grew 6.7% and 8.3%, respectively

Annual growth in production (1990-2000)

Supply chain coordination: Supermarkets

Rapid growth in supermarkets and other modern retail formats

- Causes: income growth, urbanization, info & communication technology, and FDI
- Consequences: decline of wholesalers, need for greater coordination, greater attention to quality & food safety

<table>
<thead>
<tr>
<th>Country</th>
<th>Annual growth in supermarket outlets</th>
<th>Market share of supermarkets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bangladesh</td>
<td>No data</td>
<td>No data</td>
</tr>
<tr>
<td>India</td>
<td>No data</td>
<td>No data</td>
</tr>
<tr>
<td>Pakistan</td>
<td>No data</td>
<td>No data</td>
</tr>
<tr>
<td>Indonesia</td>
<td>No data</td>
<td>No data</td>
</tr>
<tr>
<td>Philippines</td>
<td>No data</td>
<td>80%</td>
</tr>
<tr>
<td>Thailand</td>
<td>No data</td>
<td>60%</td>
</tr>
<tr>
<td>Vietnam</td>
<td>No data</td>
<td>40% (urban)</td>
</tr>
<tr>
<td>China</td>
<td>No data</td>
<td>20%</td>
</tr>
</tbody>
</table>
Supply chain coordination: Processors

Growth in agricultural processing

- **Causes:**
  - Growing domestic demand
  - Liberalization of trade and FDI
  - Shift toward production of perishable foods

- **Consequences:**
  - Greater need for specific crop varieties and production methods
  - Greater need for vertical linkages ie farmer-processor relationship
  - Allows farmers to access high-value markets, esp. fast-growing export markets

Processed food exports growing faster than agricultural exports

![Bar chart showing annual growth of agricultural and processed agricultural exports from 1980-1999 for Bangladesh, India, Pakistan, Indonesia, Philippines, and Thailand. The chart indicates that processed food exports have grown faster than agricultural exports in these countries.](chart.png)
Supply chain coordination: Exporters

Growth in high-value agricultural exports

- Fruit & vegetable exports from developing countries now larger than coffee, tea, cocoa, cotton, and tobacco combined
- Fish exports from developing countries larger than F&V exports
- Exporters need high volume, quality control, and food safety, as well as mechanisms for documenting quality & safety

HVA exports growing at 5-10% p.a.

Annual growth in agricultural exports (1990-2000)

- Non-HVA
- Fruit & veg
- Dairy & eggs
- Meat
- Fish

- China
- All but China
- All 8 nations
Contract farming

Why contract farming?

- **Theory of contract farming**
  - **Info asymmetry**: Buyer has more information about what products and attributes are in demand and likely market prices.
  - **Difference in econ of scale**: Efficient scale for buyer is large, but efficient scale for seller (farmer) is small.
  - **Facilitate exchange of info or resources**: Contract allows provision of inputs and info on credit which reduce overall costs.
Contract farming

Why contract farming?

- Contract farming in practice
  - Buyer characteristics
    - Large scale e.g. processors, exporters, & large retailers
  - Commodity characteristics
    - Price very sensitive to quality, consumers have specific requirements e.g. food safety
    - High investment or input costs
    - New crops and varieties not familiar to farmers
    - Large-scale production not economical or not feasible
  - But it is not without problems
    - Price guarantees generally not enforceable
    - Often contract farming schemes fail
    - Disputes frequently over grading and pricing
Contract farming

Why do firms contract small farmers?

- **Transaction costs for buyer are greater when buying from many small farmers**
  - Cost of providing TA and distributing inputs
  - Cost of monitoring production methods
  - Cost of collecting small quantities from dispersed farmers

- **But production costs may be lower for small farmer**
  - Family farms have lower implicit wage
  - Family farms have better motivation
  - Buying from many small suppliers improves buyer’s bargaining power

- **But depends on policy environment**
  - Policies regarding land markets, labor market, relationships between farmers and companies, etc.

- ... and commodity
Contract farming

What commodities are contracted?

- **Grains**
  - Rare except for differentiated products (basmati rice) and quality-sensitive industrial inputs (barley for beer)

- **Poultry**
  - Contract production and vertically integrated production common in all but poorest countries

- **Pigs**
  - Contracts less common than in poultry but growing

- **Milk**
  - Commercial milk production often produced under contract or by farmers in a cooperative

- **Vegetables & fruit**
  - Becoming more common for F&V needed by processors, exporters, or supermarket chains
Impact of contract farming on small farmers

How to measure impact on small farmers?

- How should “small farmers” be defined?
- What is counter-factual?
  - Average farmer or average farmer growing high-value crop
- How to take into account fact that contract and non-contract production is often for different markets?
- How to distinguish correlation and causation?
  - Need to control for selection bias among participants in contract farming schemes
- What are indirect effects of contract farming?
  - Employment in processing, etc.
Impact of contract farming on small farmers

Case 1: Contract farming of dairy, poultry, and vegetables in India

- 174 dairy farmers in Punjab, 152 of which contract to Nestles
- 50 broiler farmers in Andhra Pradesh, 25 of which contract
- 150 vegetable farmers near Delhi, 100 of which contract

Source: Birthal et al, 2005 “Vertical coordination in high-value food commodities: Implications for smallholders.” IFPRI MTI DP 85
Impact of contract farming on smallholders

Case 2: Profit of contract & independent broiler farms in the Philippines

Source: Costales et al., 2003
Case 3: Potato production in Punjab, India

- 25 farmers contracting with Pepsi for potato chips
- 25 farmers selling on open market
- Size of farms: 32% of potato farms less than 4 ha compared to 62% of farms in Punjab

<table>
<thead>
<tr>
<th>Item</th>
<th>Contract</th>
<th>Non-contract</th>
<th>Percentage difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price (Rs/q)</td>
<td>546</td>
<td>316</td>
<td>73%</td>
</tr>
<tr>
<td>Yield (q/acre)</td>
<td>69</td>
<td>82</td>
<td>-16%</td>
</tr>
<tr>
<td>Gross Returns (Rs/acre)</td>
<td>37,883</td>
<td>25,961</td>
<td>46%</td>
</tr>
<tr>
<td>Total variable cost (Rs/acre)</td>
<td>21,288</td>
<td>15,689</td>
<td>36%</td>
</tr>
<tr>
<td>Gross margin (Rs/acre)</td>
<td>16,595</td>
<td>10,272</td>
<td>62%</td>
</tr>
</tbody>
</table>

- Similar results for peas, but no difference between contract and non-contract growers of tomatoes & chillies
  - May be problem of differentiated products

Source: Preliminary results of IFPRI study “Agricultural diversification in Andhra Pradesh and Punjab”
Impact of contract farming on small farmers

Case 4: Apple production for export in Shandong Province, China

- 44 farmers contracting with exporters - avg size 0.67 ha
- 41 farmers selling on open market – avg size 0.85 ha

<table>
<thead>
<tr>
<th></th>
<th>Contract grower</th>
<th>Non-contract grower</th>
<th>Percentage difference</th>
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</thead>
<tbody>
<tr>
<td>Apple price (yuan/kg)</td>
<td>2.13</td>
<td>2.12</td>
<td>1%</td>
</tr>
<tr>
<td>Net income from apples (yuan)</td>
<td>20,120</td>
<td>18,249</td>
<td>10%</td>
</tr>
<tr>
<td>Net income from other activities (yuan)</td>
<td>9,584</td>
<td>3,460</td>
<td>177%</td>
</tr>
<tr>
<td>Total net income (yuan)</td>
<td>29,704</td>
<td>21,709</td>
<td>37%</td>
</tr>
<tr>
<td>Apple income/apple labor (yuan/day)</td>
<td>87</td>
<td>66</td>
<td>32%</td>
</tr>
<tr>
<td>Apple income/apple land (yuan/mu)</td>
<td>4,972</td>
<td>3,428</td>
<td>45%</td>
</tr>
</tbody>
</table>

Source: Preliminary results of IFPRI study “Impact of contract farming on small farmers in 4 Asian countries”
Impact of contract farming on small farmers

Case 5: Shallot production for export and domestic use in Shandong Province, China

- 60 farmers contracting with companies – avg size 0.46 ha
- 17 farmers selling on open market – avg size 0.30 ha

<table>
<thead>
<tr>
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<th>Contract grower</th>
<th>Non-contract grower</th>
<th>Percentage difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shallot price (yuan/kg)</td>
<td>0.51</td>
<td>0.41</td>
<td>23%</td>
</tr>
<tr>
<td>Net income from Shallots (yuan)</td>
<td>2,572</td>
<td>932</td>
<td>176%</td>
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<tr>
<td>Net income from other activities (yuan)</td>
<td>10,412</td>
<td>8,227</td>
<td>27%</td>
</tr>
<tr>
<td>Total net income (yuan)</td>
<td>12,984</td>
<td>9,159</td>
<td>42%</td>
</tr>
<tr>
<td>Shallot income/Shallot labor (yuan/day)</td>
<td>49</td>
<td>34</td>
<td>46%</td>
</tr>
<tr>
<td>Shallot income/Shallot land (yuan/mu)</td>
<td>1,240</td>
<td>816</td>
<td>52%</td>
</tr>
</tbody>
</table>

Source: Preliminary results of IFPRI study “Impact of contract farming on small farmers in 4 Asian countries”
Summary

- Importance of high-value agriculture is growing rapidly
- In response, various forms of supply-chain coordination are emerging, particularly contract farming
- Contract farming only makes sense in specific situations
  - Perishable quality sensitive goods purchased by processors, exporters, or other large buyers
- Contract farming generally benefits farmers, but participation by small farmers is mixed
  - More likely in dairy and horticulture
  - Contract production in poultry associated with medium and large-scale growers
- Policy should support emergence of contract farming and facilitate participation by poor, but contract farming is not a general solution to rural development.