# Using ICTs to create efficient agricultural markets

## a future vision for Sri Lanka

Workshop on Potential of ICTs in Agricultural Value Chains. 21-23 February, Kandalama, Sri Lanka

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LIRNE*asia*

Learning Initiatives on Reforms for Network Economies

# Plan

- Theory → empirical evidence
- What is being done
- ICT interventions along the VC
- Future…

# Creating efficient markets

- Require good governance
  - Infrastructure
  - Institutions
  - Accurate and timely market information
  - Grading and standards [weights and measures]
  - Risk management
  - Contract enforceability
- And, public policy
  - for equitable outcomes for smaller farmers

# Some basic theory

- Information is critical for efficient functioning of markets
  - Pareto efficient
    - No individual can be made better off without another being made worse off; competitive equilibria
  - Law of one price [LOP]
    - Price difference of a good between two markets must be equal to transport costs
- In reality information is costly and markets are not always efficient → High transaction costs
  - Chicago Board of Trade vs. Dambulla Dedicated Economic Centre [DDEC]

# Empirical evidence

- How can ICTs be used to reduce information [transaction] costs → increase efficiencies in agricultural markets → increase welfare
  - Much work on Internet-centric evidence
    - IIM Professor Bhatnagar, today; many examples in India
  - Not much mobile-centric work
    - LIRNE*asia*, today; opportunity cost of not using ICT
  - Recent mobile-centric comprehensive academic work
    - Harvard Professor Jensen, QJE, 2007; microeconomic study on fish prices along the Kerala coast, 2007
    - UC Berkeley, Jenny Aker, unpublished, 2008; panel study on Niger grain markets

# Jensen

## 14 September 1997

THE
QUARTERLY JOURNAL
OF ECONOMICS

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THE DIGITAL PROVIDE: INFORMATION (TECHNOLOGY), MARKET PERFORMANCE, AND WELFARE IN THE SOUTH INDIAN FISHERIES SECTOR*

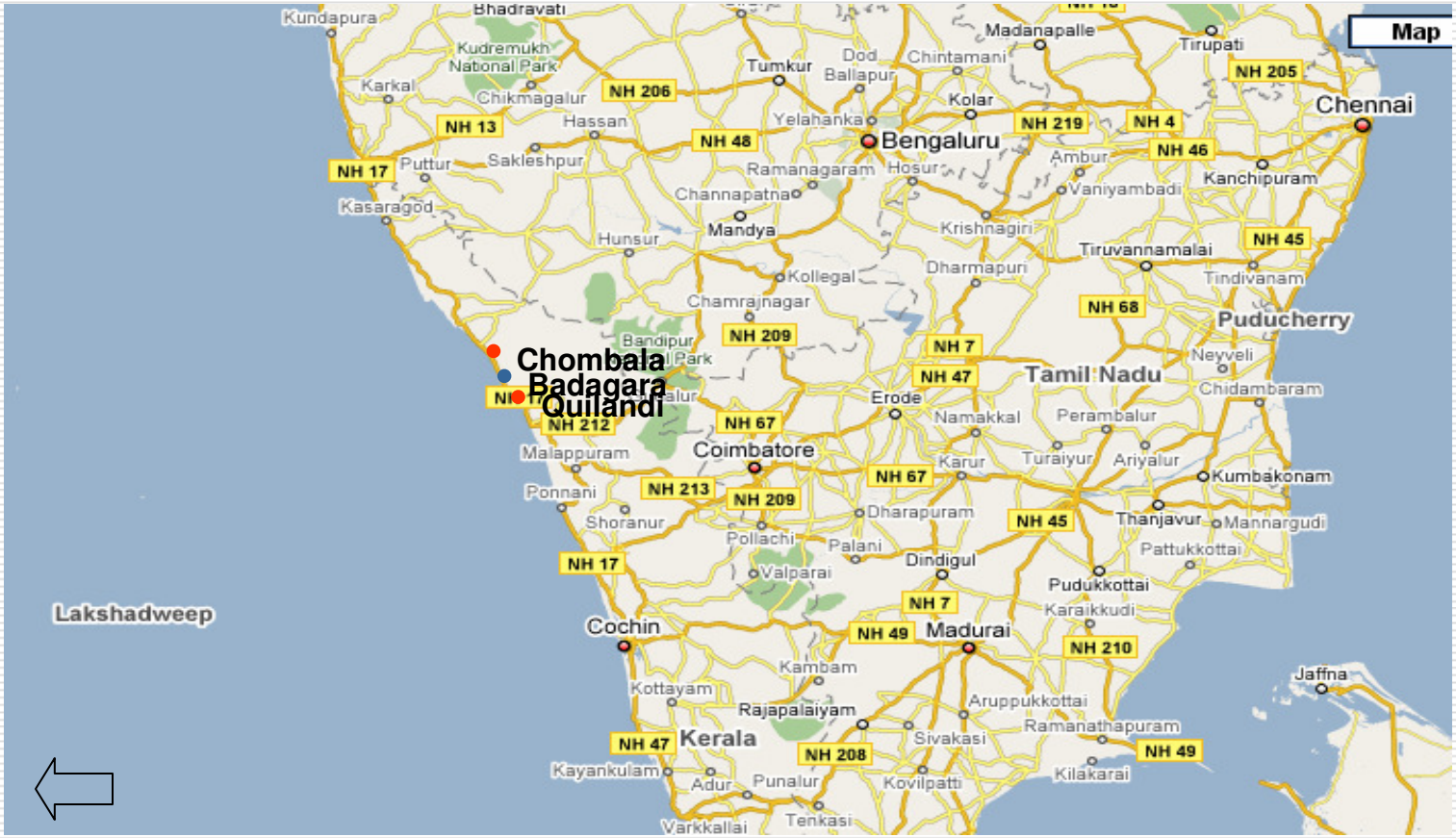
ROBERT JENSEN

TABLE I
PRICES AND EXCESS SUPPLY AND DEMAND IN FIFTEEN SARDINE BEACH MARKETS

| | Price (Rs/kg) | Excess buyers | Excess sellers |
|---|---|---|---|
| Kasaragod District | | | |
| Hosabethe | 6.2 | 0 | 0 |
| Aarikkadi | 4.0 | 0 | 0 |
| Kasaba | 0.0 | 0 | 4 |
| Kanhangad | 7.2 | 0 | 0 |
| New Mahe | 6.2 | 0 | 0 |
| Kozhikode District | | | |
| Chombala | 9.9 | 15 | 0 |
| Badagara | 0.0 | 0 | 11 |
| Quilandi | 9.8 | 12 | 0 |
| Puthiyangadi | 0.0 | 0 | 6 |
| Chaliyam | 6.4 | 0 | 0 |

With coverage increasing; outside home market sales 0% → 35%

In 2000 end study; no waste; LOP; fisherman profits up 8%; fish price down by 4%



# Aker

Does Digital Divide or Provide?
The Impact of Cell Phones on Grain Markets in Niger*

Jenny C. Aker
University of California, Berkeley

JOB MARKET PAPER
January 15, 2008

- Niger; large very poor African country
- Mobile phone penetration during 2001 and 2006
  - Following Jensen search theory; cheaper alternative for traders to find out grain prices [net of transport costs]
    - With greater penetration; ability to check on more number of markets
    - Reduction in cost of information
      - USD 2 for travel; USD 1 for mobile call
  - Grain price dispersion fell by 6.4%
    - Greater impact on market pairs that are further away; poor road quality
    - Improve [reduction of dispersion] with wider coverage
  - Improved consumer [prices lower by 3.5%] and trader welfare [increased reservation price]

WSIS THEMATIC MEETING
MULTI-STAKEHOLDER PARTNERSHIPS FOR BRIDGING THE DIGITAL DIVIDE
23-24 June 2005, Seoul, Republic of Korea

Document: BDB-WSIS/01
6 June 2005
Page 1/2
Original: English

# GGS, 2005

- Govi Gnana Seva, Dambulla
  - Independent price collection and dissemination service

## GGS pilot objectives

If produce already brought to DDEC market

→ Help farmer get best possible price

If produce harvested, but not brought to DDEC

→ Help farmer decide whether to bring to DDEC or not

If produce just about to be harvested

→Help farmer decide whether to harvest today or tomorrow or day after

If not planted, or many days to harvest

→ Help farmer enter into FSC

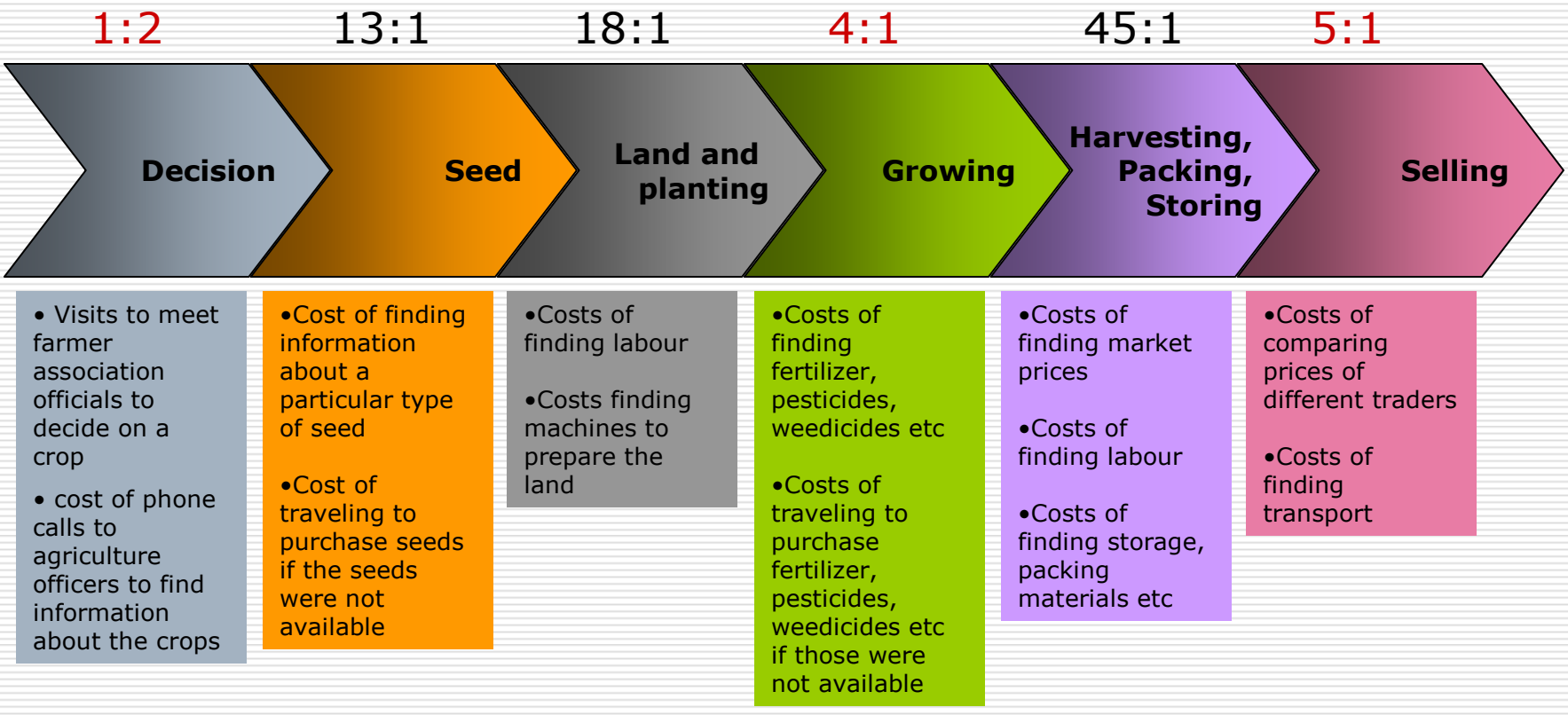
# GGS 2

- Operational since 2003 at different service levels
  - Price displays; IVR; radio broadcast; newspapers
- Mid-2005 evaluation, 385 farmers
  - 25% farmers who frequent market used GGS as a primary means of obtaining price information; mostly price screens
    - 77% felt it helped get accurate price information
    - But 75% no direct access to telephone
  - Only Dambulla Market
    - No price dispersion studies done
      - Meegoda

# Limitations

- Most studies have focused on information related to the selling stage of the value chain
  - Search cost of market prices [particularly for perishables]
    - "Output markets play a central role in determining farmer incomes; living standards are determined largely by how much they get for their output [in poor agricultural communities; including in Sri Lanka]"
- Have not disaggregated the VC and considered the efficiency of each economic exchange [input markets]
  - Relative importance of search costs vary along VC
- Ratnadiwakara presentation identified the need for research in to, and for developing, ICT applications for economic exchanges along the VC to reduce what seem to be large information costs

# Information cost during decision and growing higher than in selling

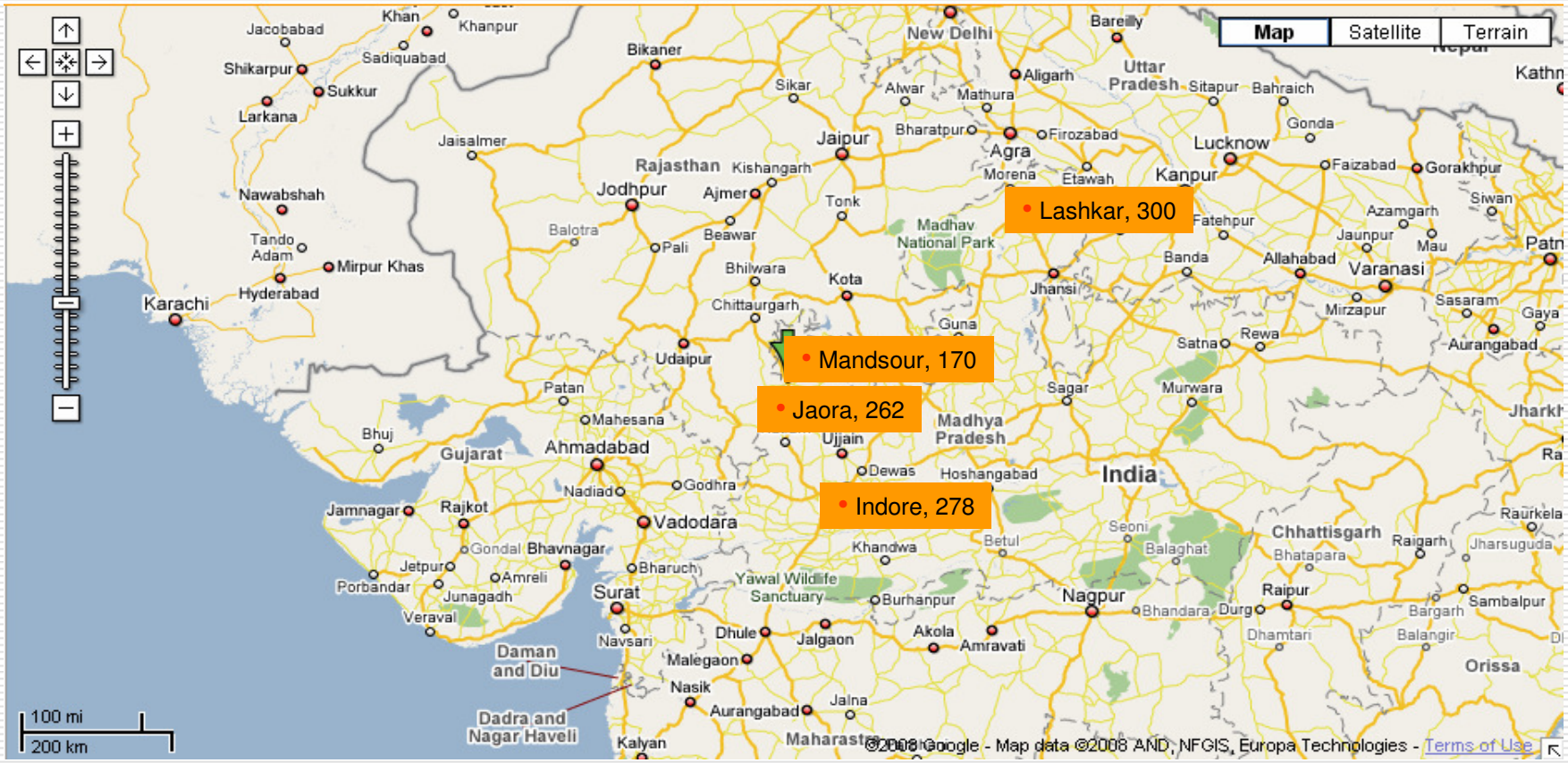


# ICT solutions exists

- Public sector extension services have been e-enabled
  - WDR 2008; public MIS 'often disappointing'
    - Disseminated too slowly; in the wrong form; too infrequently to be of use for mkt. participants
- Public private or purely private services
  - New ICT based models
    - Mainly Internet-based: Mandi-Board; AgMark Net
    - "These new systems have the potential to significantly reduce transaction costs; search and transport costs…" WDR 2008
    - Manobi and others [mobile phone]

# How well are they working?

- Real time information across VC
  - Prices; weather; soil data; farm and risk management; supply chain contacts etc.
  - Can people access information; are they using the information
- Price data example
  - Mandi Board
    - Onion; 15 February 2008; Modal price, Rs per Quintal
      - Indore; 278
      - Jaora; 262
      - Lashkar; 300
      - Mandsour; 170



# Manobi

- Senegal; mobile phone based system
  - Collect and disseminate prices from several markets
  - 2003; multi-stakeholder operation
    - Fish; expanded in to other agricultural produce
    - Participating farmer income estimated increase by 15% to 50% or even more
  - Externalities; free SMS

# Issues; agree

## Prof Bhatnagar presentation

- Poor telecom infrastructure
  - At BOP in rural India; Internet use is almost nothing
  - Same in Sri Lanka and others in region and outside
    - Telecentre model
- Many economically unviable projects
- Need for better training and management capacity
  - Sustainable business plans
- Lack of micro-level impact → reluctant donors
  - Difficult to obtain the evidence at a 'generalized' level; if not, there would be enough evidence
- Need to understand agricultural VC to pitch ICT interventions

# How to overcome

- Resolve issues of telecentre-based intervention; Prof Bhatnagar
  - Private incentive; private or cooperative establishments to improve business process
  - Public services [in Agriculture] pushed via private telecentres for fee
  - Intermediaries and rural entrepreneurs create large kiosk network
- Use different tool to intervene
  - Mobile phone; Mobile 2.0
  - How much of identified information issues [based on agriculture VC] can be addressed?

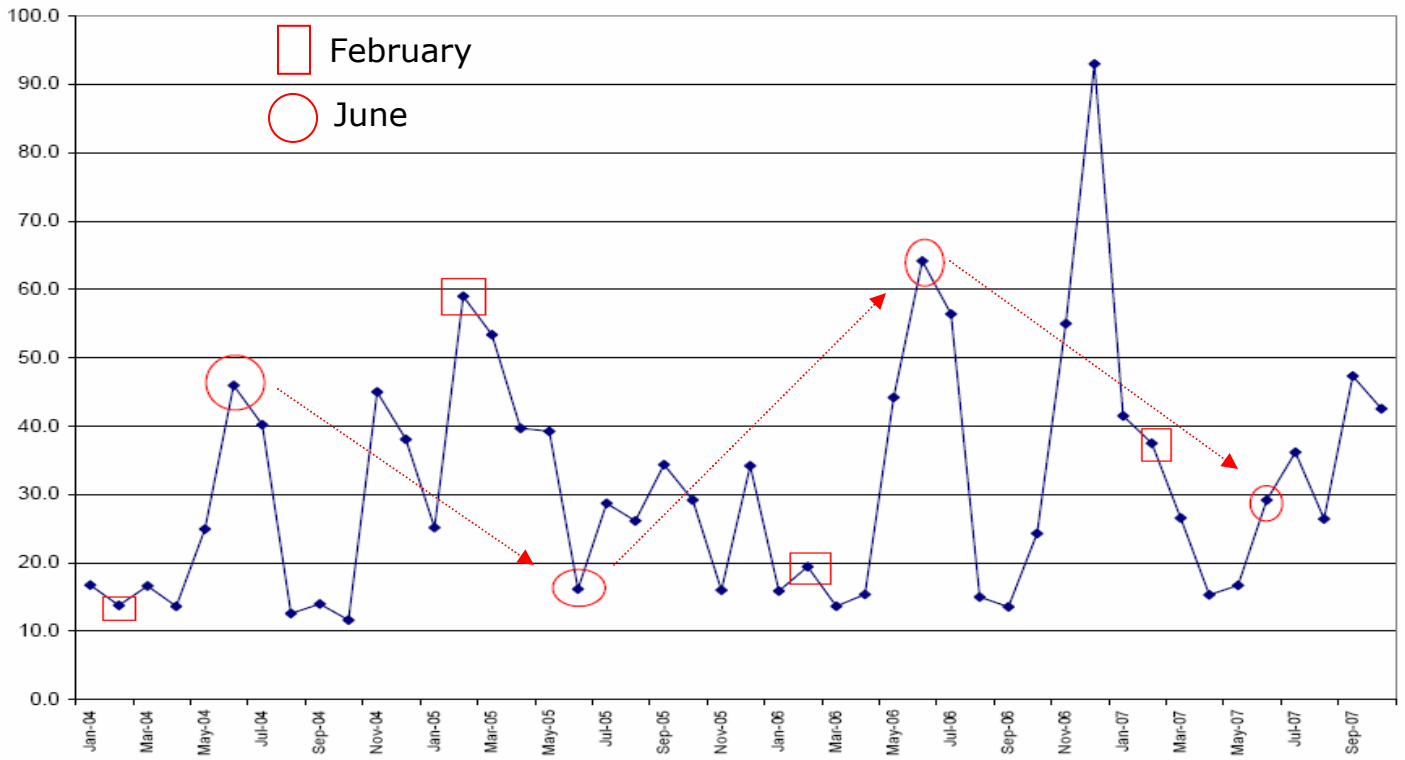
# So, the question is…

- If price dispersion falls and farmers, on average, get a higher price for produce, does it mean their profits, and welfare have increased?
- Yes, but?
  - Can welfare be increased further; maybe by much more?
  - Doing things right vs. doing the right thing

# Tomato prices at DDEC

## Jan 2004 – Dec 2007

- Doing the right thing?

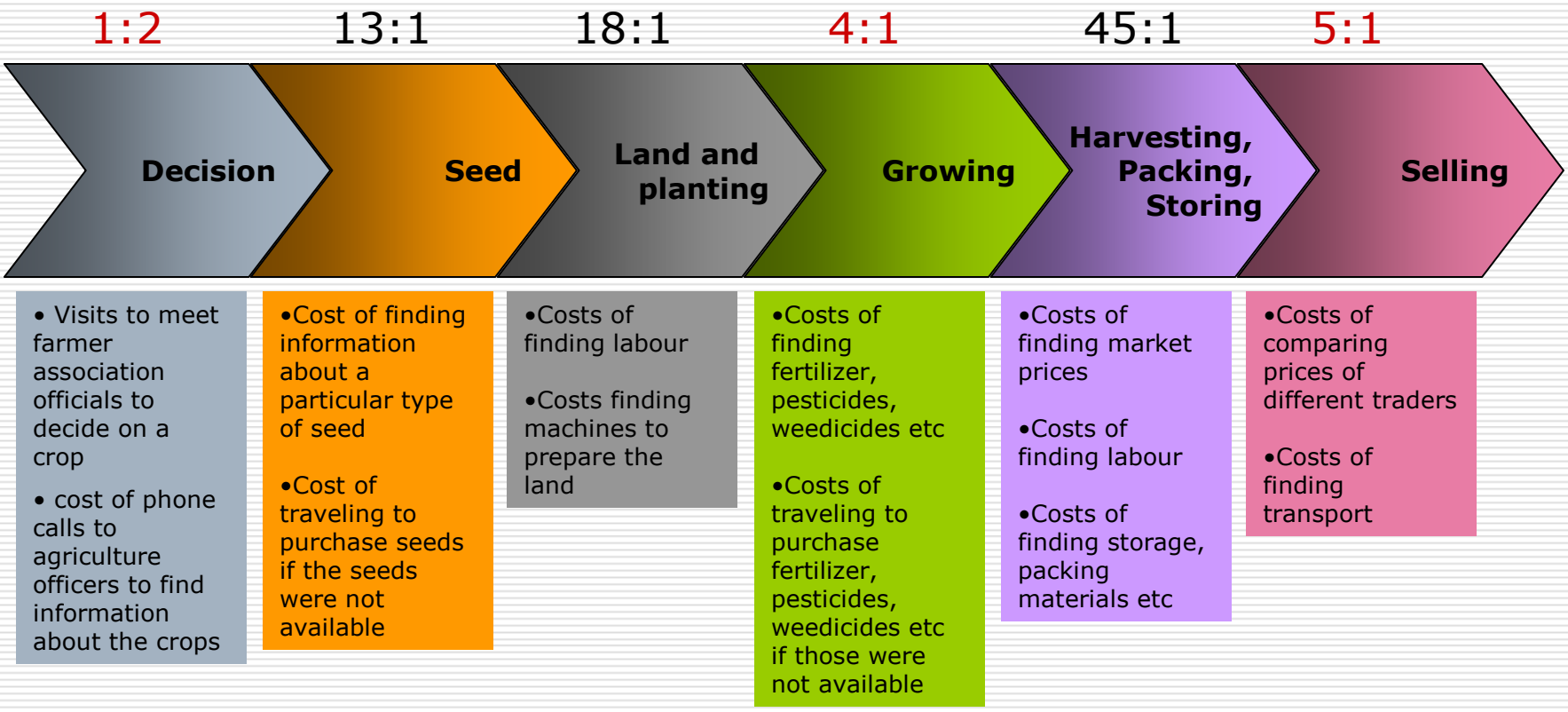


# So, the real question

- If price dispersion falls and farmers, on average, get a higher price for produce, does it mean their profits, and welfare have increased?
- Yes, but?
  - Can welfare be increased further; maybe by much more?
    - Doing things right vs. doing the right thing
- Starting point is understanding the demand for information by disaggregating the activity in to a series of activities → VC

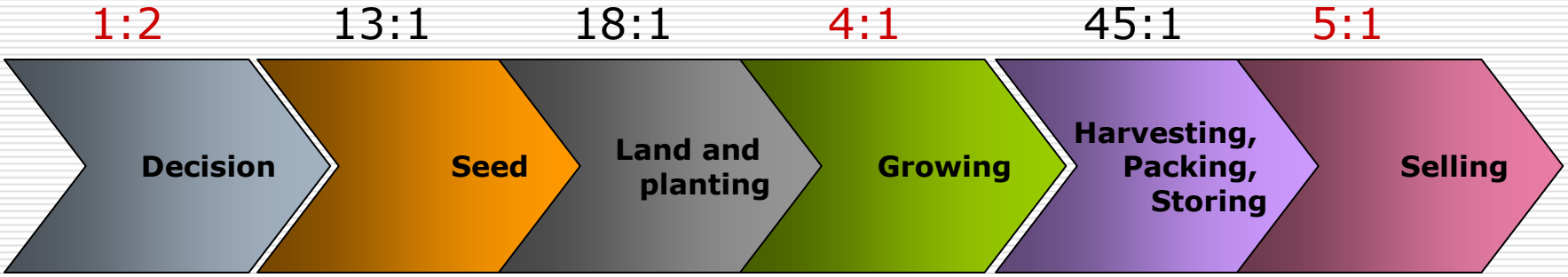
# Demand for information

## market driven; not centrally planned



# Decision

## Only 5% cost of production but 75% of information cost




| Decision | Seed | Land and planting | Growing | Harvesting, Packing, Storing | Selling |
|---|---|---|---|---|---|
| • Visits to meet farmer association officials to decide on a crop<br>• cost of phone calls to agriculture officers to find information about the crops | •Cost of finding information about a particular type of seed<br>•Cost of traveling to purchase seeds if the seeds were not available | •Costs of finding labour<br>•Costs finding machines to prepare the land | •Costs of finding fertilizer, pesticides, weedicides etc<br>•Costs of traveling to purchase fertilizer, pesticides, weedicides etc if those were not available | •Costs of finding market prices<br>•Costs of finding labour<br>•Costs of finding storage, packing materials etc | •Costs of comparing prices of different traders<br>•Costs of finding transport |

# Decision 2

## GGS pilot objectives

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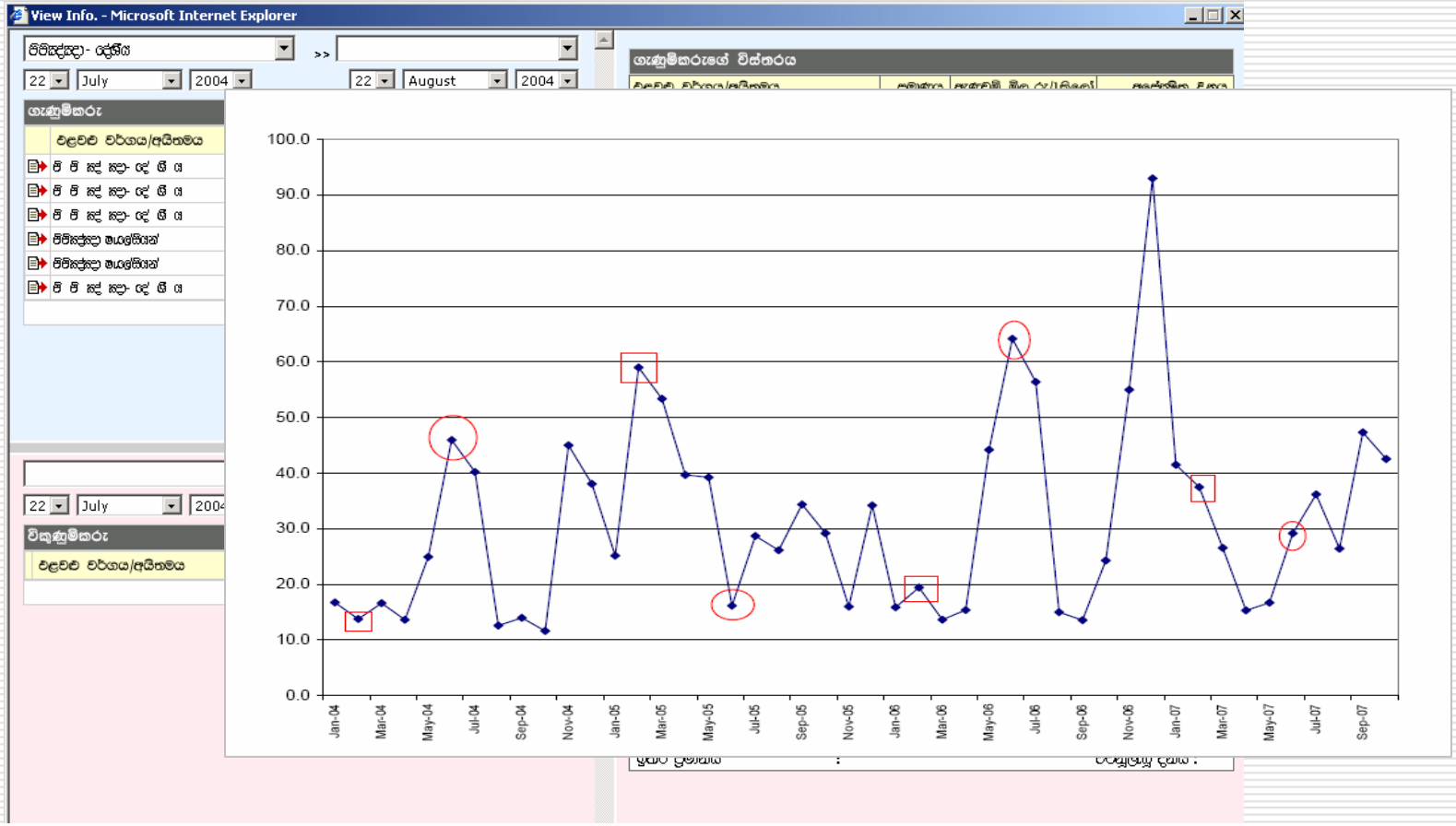
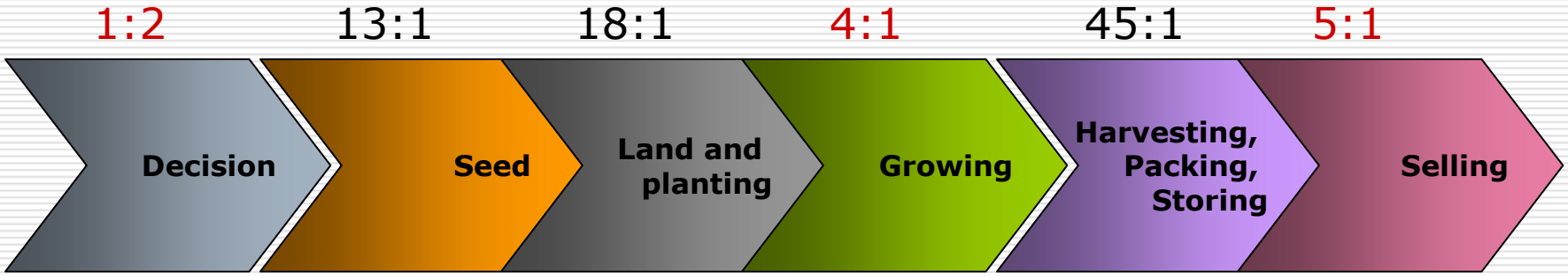
Source: Central Bank of Sri Lanka Forward Sales Contract Brochure

# Decision 3



# Growing

## 45% cost of production and 20% of information cost




- Visits to meet farmer association officials to decide on a crop
- cost of phone calls to agriculture officers to find information about the crops

- Cost of finding information about a particular type of seed
- Cost of traveling to purchase seeds if the seeds were not available

- Costs of finding labour
- Costs finding machines to prepare the land

- Costs of finding fertilizer, pesticides, weedicides etc
- Costs of traveling to purchase fertilizer, pesticides, weedicides etc if those were not available

- Costs of finding market prices
- Costs of finding labour
- Costs of finding storage, packing materials etc

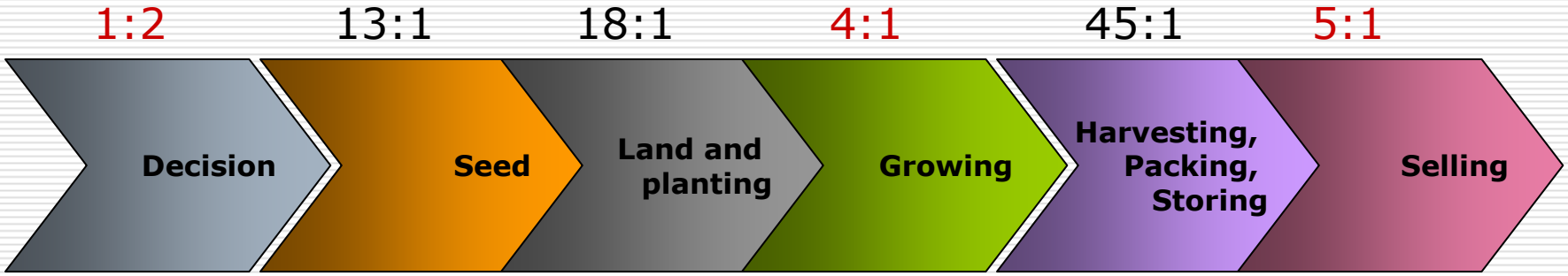
- Costs of comparing prices of different traders
- Costs of finding transport

# Growing 2

- Current and country-specific issue; information search on fertilizer subsidy

# Selling

## 8% cost of production but 17% of information cost




- Visits to meet farmer association officials to decide on a crop
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- Costs of finding market prices
- Costs of finding labour
- Costs of finding storage, packing materials etc

- Costs of comparing prices of different traders
- Costs of finding transport

# Selling 2

- Number of examples
  - Successes and failures
  - Environment-specific
    - Market spread; quality of roads and transport; availability of grading and standards; sophistication of institutions; legal and regulatory structure etc.

# The future of ICT in agriculture markets

- Integrated systems that address individual needs from Decision → Selling
- System core will be Decision + Selling; commodity exchanges
  - Start with forward markets
  - Information related to every point in VC
  - Move in to futures, options, swaps etc.
    - Dichotomize delivery [farmer] from financial contracts
    - India, China, South Africa, Thailand [large domestic markets; fairly well established financial sectors] all have physical exchanges

# KACE

- Kenya Agricultural Commodity Exchange and Safaricom → SMS; IVR; Call
  - Positive evaluations; but real 'exchange' not materialized

# India and other Asia

## Physical exchanges

- National Commodities and Derivatives Exchange [NCDEX]
- Multi Commodity Exchange [MCX]
- National Multi Commodity Exchange [NMCX]
- 21 regional futures exchanges
  - Cereal, sugar, cotton, potatoes, oil seeds, spices
- Dalian Commodity Exchange, China
  - World's largest agricultural commodity exchange
- Tokyo Grain Exchange
- Bursa Malaysia Derivatives Exchange

# Sri Lanka

- Moving towards a primarily mobile phone driven virtual exchange
  - Lessons from Jensen, Aker, eChoupal, eMundi, Manobi etc.; but going beyond
  - Address information needs at each point in the VC
    - Planting decisions based on forward contracts
    - Seed information on a pull-basis; subscription during period of need
    - Fertilizer availability also on a pull-basis
    - Sale based on existing contracts

# Sri Lanka 2

- Host of farmer services will get linked up
  - Finance institutions and Micro-Finance Institutions
    - To validate forward contracts and offer crop loans based on discounted contract
    - Crop insurance schemes
      - Even small denomination or short duration plans
      - Possibly weather-indexed insurance; rainfall; water release?
  - Other non-durable and even durable goods providers
- Leverage on sophisticated technology now widely available; ability to pay via mobile phone

# Sri Lanka 3

- GGS is now working towards implementation with
  - LIRNE*asia*
  - Leading mobile phone company
  - [Banks, MFIs, insurance companies]
  - Government
  - Donors
- Current
  - www.mobile.ggs.lirneasia.org
  - http://www.ggs.lirneasia.org or http://www.lirneasia.org/asianict/ggs/viewprices.php

ICTs can improve efficiencies in agricultural markets which will then help millions of poor benefit from the dividends of the technology. All we need to make that happen is to recognize that the poor is nothing but the most value-conscious consumer segment.

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