

# Rapid Transformation of African & Asian Food Systems since 1971

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**In 1971 Hans Ruthenberg published his globally renowned “Farming System in the Tropics”**

**... emphasized endogeneity – and readiness to change – of farming systems**

**... he focused on the main transforming forces of farming systems in 1971:**

**a) increase in rural population density and subsequent farming intensification**

**b) technological change from the emerging Green Revolution**

**... his work occurred just before of an  
immense transformation of agrifood  
supply chains from 1980 to now**

**... with a rapid CONLUENCE of factors that deeply changed the markets farmers face**

**... deep change in policies**

**... rapid urbanization**

**... huge change in urban & rural diets**

**... a “modern revolution” and a “quiet revolution in off-farm parts of food supply chains**

**→ With big opportunities & challenges for farmers**

... “**Rapid**”: transformation not gradual  
but abrupt, sudden

... image of a **TIDAL WAVE**



富嶽三十六景 神奈川沖  
浪裏

享和元年

# 1. Overview of CONFLUENCE of transformations of food systems 1980s-now

## 1.1. “Meta drivers”

- a) **Policy change**: liberalization & infrastructure investment
- b) **Massive private investment** (FDI & domestic)
- c) **Rapid technology change** and transfer (in each segment of supply chains) and cross cutting (e.g. internet)
- d) **Income growth**

## **PULLED by Downstream demand**

**1) urbanization**

**2) diet change in urban and rural areas**

## **“FACILITATED ” by Midstream & Downstream**

**3) Transformation of processing, wholesale, logistics (dual: large & SMEs)**

**... and retail (supermarket revolution! FF!)**

## **FED by upstream**

**4) Farming intensification, commercialization, diversification**

**5) input value chain development**



## **2. Changes in Downstream demand**

### **2.1. Urbanization**

**a) 1971: mainly rural; “urban” was niche subject  
→ 2018: mainly urban**

**b) Rapid increase in population share!**

**... Africa: 24% in 1971, 40% in 2011**

**... Asia: 24% in 1971, 45% in 2011 only 4% of  
farmers far from some town now**

**c) Urban share BIGGER in national food consumption than in population**

**... South Asia and ESE: 30/40/50-60%**

**... SE Asia and West Africa: 40/50/60-70%**

**→ Urban market main market faced by farmers**

## **d) Impacts of urbanization**

### **d.1) A GIANT RIVER of food from farming systems to cities/towns:**

**Rural-urban food supply chain volumes growing fast in the past 3 decades:**

**... 800% in Africa! (is that “stagnant, failed”??)**

**... 1000% in Southeast Asia**

d.2.) **Longer & longer supply chains, reach deeper & deeper into rural areas**

**→ Rural differentiation as function of distance from cities and towns**

**... Delhi IMPACT on Uttar Pradesh:**

... near-urban (deep, mature transformation, “new India”)

... middle (rapid early takeoff of transformation, “emerging new-India”)

... far (hinterland, still traditional, “old India”)

## 2.2. Diet change

**... drawing on work with David Tschirley MSU**

**a) In 1971:**

**... rural households: “farmers grow what they eat, and eat what they grow” – little reliance on food market**

**... rural & urban diets 80% grains; non-cereals were “niche subject”**

**... consumers bought very little processed food**

**b) Rise of Purchased food in total rural food expenditures (purchased + own production)**

**Indonesia and Bangladesh, about 80%**

**Nepal and Vietnam, 65-72%**

**ESA, 45% Nigeria, 70%**

→ Implies rise of rural-rural & urban-rural supply chains

→ including surge of midstream SMEs in these chains

... example of Tanzania, and challenge

## **c) Rise of Processed food (purchase)**

**... share of processed in total rural food expenditure in ESA = 39% (in Nigeria, 65%)**

**... in urban ESA, 53%**

**... in rural Asia, 59%**

**... in urban Asia, 73%**

**... Africa & Asia pictures converging...**

**➔ Massive rise of Small and Medium (SME's) & large processors & "stockists"**



## **d) rapid diversification beyond grains**

**... vegetables/fruit, fish, meat, dairy**

**... Asia: 65% of food consumption in rural areas,  
75% in urban areas**

**... Africa: 50% in rural areas & 65% in urban**

**➔ Huge rise of SME's in perishables!**

**... rural packing plants & staging areas**

**... secondary & primary city wholesale markets**

**... semi-wholesalers between cities & rural**

**... logistics (including cold storage)**

### **3. Focus on supply chain transformation: Quiet & Modern Revolutions**

#### **3.1. Food systems in 1971: “traditional”**

**a) Local – mainly to the village**

**b) Fragmented**

**c) A small “midstream” (little processing, wholesale, logistics)**

**... food distribution was “niche subject”**

**d) Longer supply chains to urban markets were “niche subject”**

## **3.2. Cascade of change in food systems 1980s-2010s**

- a) Traditional**
- b) Transitional**
- c) Modern**

**3.3. I focus on domestic market transformation  
... 90% of food in Africa and Asia from domestic  
supply, 10% from imports**

### **3.4. DUAL transformation of Midstream and downstream of the food system**

**a) From traditional stage to transitional stage:  
THE QUIET REVOLUTION (grassroots SME  
revolution)**

**... rough estimate: 2/3 of developing country  
food system (probably next 2-3 decades)**

**... advanced in Asia, well along in Africa**

**b) From transitional to modern stage: THE MODERN REVOLUTION (large processors, supermarkets)**

**... rough estimate: 1/3 of developing country food system**

**... well along in Asia, emerging in Africa**

## **c) Overlaps of stages per country & over countries**

\_\_\_\_\_ traditional (waning)  
\_\_\_\_\_ transitional (dominant)  
\_\_\_\_\_ modern (emerging)

# 4. Transitional stage to Modern stage: “Modern Revolution”

## 4.1. Overall

**... abrupt/sudden/fast**

**... driven by urbanization, policy liberalization, and FDI and domestic investments**

## **4.2. Structural change in the modern revolution**

### **a) Concentration & partial multinationalization**

#### **a.1) symbiosis of**

**...supermarket revolution**

**... large scale processors, wholesalers, logistics**

#### **a.2) economies of scale and scope**

**outcompeting traditional players**



## **4.3. Conduct change in the modern revolution**

- a.) private standards & quality differentiation**
- b) procurement system modernization (fast tracking supply chain transformation)**
- c) dominos, rolling out: first in processed, then semi-processed, and starting in fresh**

# 5. Quiet Revolution in the “Hidden Middle” of the food system

## 5.1. Overall

... Sudden & fast

... based on domestic markets

... fueled by domestic small-scale investments:  
a grass roots revolution

## **5.2. Structural changes in the Quiet Revolution**

- a) Longer supply chains driven by urbanization**
- b) Product Diversification & value added in supply chains driven by diet change**
- c) Proliferation of 10's of 1000's of SMEs in processing, wholesale, transport, warehousing, cold storage**

## **5.3. Conduct changes in the Quiet Revolution**

### **a) Traditional systems changed! Examples:**

**... tied output-credit arrangements with traders, are disappearing!**

**... shift from traditional rural brokers to town-based wholesalers & logistics**

**... shift from unpackaged bulk sale to packaged, branded milled grains**

# Boom in SME's in food processing: packaging, labeling, branding



## **b) Widespread technology changes, for example**

**... shift from pastures to feed**

**... from capture to enclosure (chickens, fish)**

**... to machines for farming, transport, milling, packaging, cooling**

**→ I believe 85% of technology change in developing countries is of this basic transitional type**

**... other 15% is modern, emerging (e.g., robotic sorters in fruit packing plants in Mexico)**

## **6. Illustrations of rapid change MIDSTREAM in food systems in Africa & Asia in the Quiet Revolution**



## **6.1. Bangladesh fish farming (IFPRI/MSU)**

**a) 1999: belief that fish prices would rise & choke food security**

**... but 1999-2018 fish prices dropped!**

**b) aquaculture grew 15 fold in 25 years → from 30 to 70% of fish supply**

**c) feed sector grew 600% in 10 years...**

**d) SMEs in the supply chain 300% in 10 years**

**e) shift from traditional variety (carps) to fast-growers (tilapia, catfish)**

# Fish consumption & farm boom

## Bangladesh



# Rapid spread of rural feed mills (but competition large peri-urban mills)



# Rural extruders for floating



# Large mill near Dhaka





= 282 =

ভাসমান বাসিন্দা  
কিস ফিড



**NOURISH**  
FLOATING NURSERY FEED

নারিশ ফিডস লিমিটেড  
আমিরদিয়া, মাস্টার বাড়ী, ডাঙ্গকা, ময়মনসিংহ  
ফোনঃ ৮১১৭৯৭৭, ৮১১৫০৩৩, ৯১৪৫৭৭৬  
ফ্যাক্সঃ ৯১৪৫৭৭৭, ফ্যাক্টরীঃ ০৬৮২৫-৫১২২২

UKAS  
HACCP & ISO 9001:2008 CERTIFIED

খাদ্য উপাদানের পরিমাণ বিশ্লেষণঃ-

খিট	নামের ধরন	মোট পরিমাণ	নরিশ আর্বিভস	নরিশ প্রোভি	নরিশ অর্বিভস
খিট	নামেরী	১৯	১০০	৩	৮
	ক্যান্ডি	১৯	১৭	৩	৮
নামের	ক্যান্ডি	১৯	১০	৩	৮
	ক্যান্ডি	১৯	১৮	৩	৮
ক্যান্ডি	ক্যান্ডি	১৯	১০	৩	৮
	ক্যান্ডি	১৯	১৮	৩	৮

সেখানে অন্তর্ভুক্ত ঐ উপাদান ক্যান্ডি ২৫০ গ্রাম ৩০ দিন।  
এছাড়াও ভিটামিন, মিনারেল ও প্রয়োজনীয় এন্টিজেন মিশ্রিত করা হবে।

ভাসমান নার্সারী ফিড



**NOURISH**  
FLOATING NURSERY FEED

# Simple cheap motors & HAND MADE small trucks EVERYWHERE





Hand-made by local smiths (also get lot of jobs!)



## **6.2. Teff in Ethiopia (Bart Minten IFPRI), in 10 years!**

**a) From mules to motor vehicles as transport in teff value chain (100 years in US)**

**b) huge jump in urban wholesale, milling, prepared sales of enjera and milled teff**

**c) farm response: teff variety change and intensification with manure and fertilizer**

### **6.3. Boom in Nigeria maize/feed/chickens-eggs complex (MSU, Saweda Liverpool-Tasie)**

- a) huge growth in chicken farming at SME scale**
- b) intense involvement of women**
- c) marketing to growing towns**
- d) 600% feed sector growth in 10 years**
- e) growth of the long north south supply chain for maize and feed**

## 6.4. Boom in Potato cold storages in Agra/India

a) Testing Conventional wisdom:

... We were told 2009 by government and research gurus “sadly there are NO cold storages in India”

... **We found:** 1999, 1% modern, 99% traditional storage, 10% of potatoes stored

... 2009: 99% modern, 1% traditional!  
65% of potatoes stored





Fig.1. Heaps in an open area under the shade of trees.

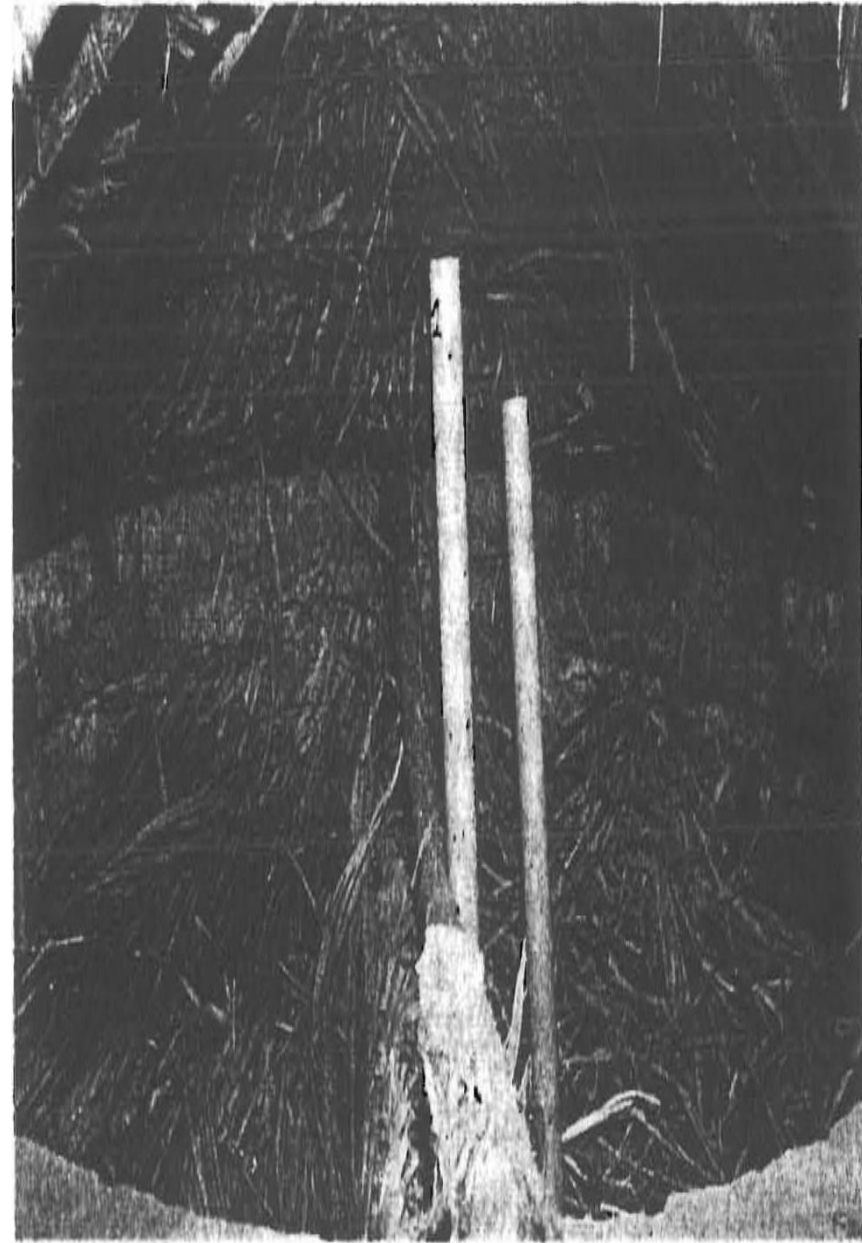


Fig.2. Pit method of potato storage.



Fig.3. Pits covered with hut made up of locally available materials.

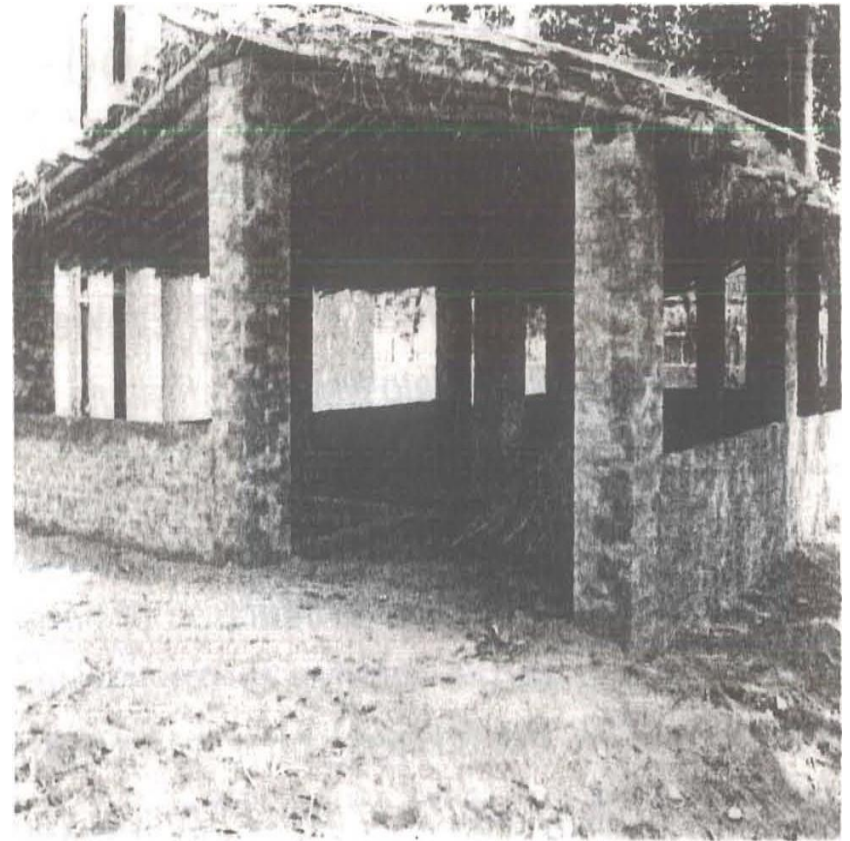


Fig.4. Thatched roof at storage site for providing additional protection against hot sun and rains.

Here, potatoes are heaped under the shade of trees just outside the village. The heaps are covered with a layer of available straw material (about 30 cm thick). Generally, 6-30 tonnes of potatoes are stored in each heap by the farmers. Losses in heaps can reach even up to 40%, if they are not properly made and cut, cracked, bruised, diseased and rotted potatoes were not removed by sorting before storage. The work carried out at Lhe campus showed that it is possible









a) 1<sup>st</sup> wave of public investment & shift to potato farming late 1980s-1990s

- **Farmers shift from wheat to potato**
- **Public investment: NARS research & extension of new potato variety** (higher yield, longer storage life, more resistant to transport)
- **Public investment: water pump subsidies**
- **Encouraged by initial growth in Delhi economy**

## b) Rapid Urbanization as “demand pull”

- **Rapid growth in Delhi’s** population and incomes in the 1990s/2000s: IMAGINE!
- **“diffusion” of urbanization effect** in rural space: large public investment in **rural roads**
- **Diet diversification** into horticultural products in urban areas

## c) Rise of the Rural nonfarm sector

- **Rural nonfarm sector development** especially fast and intense in the “market-shed” of Delhi
- **Drives up farm and nonfarm wages**
- **Fuels private investment** in all segments of the supply chain

## d) 2<sup>nd</sup> wave of public investments in rural areas

- Public investment in **energy grid**
- Public investment in **limited subsidies for modern cold storages: drives only 5% of storage investment**

## e) Modern Cold Storage Boom in 2000s!

- **Massive private investment in cold storages starting in mid/late 1990s**  
... crescendo over the 2000s
- **Shifting potato from seasonal consumption in Delhi to nearly-year round (2/3 from cold store)**

## f) capital-led intensification in second half 2000s

- **capital-led intensification**
- **Land concentration** (rental and purchase)



# 7. Upstream transformation

**7.1. Farming intensification** – advanced in Asia, emerging in Africa (increase in use of external inputs)

**7.2. Farm diversification** – rapid increase in fruit, vegetables, meat, dairy, oilseeds

**7.3. Rapid commercialization** of small & medium farming

**7.4. Organizational change:** clusters & cooperatives

# 7.5. Input value chain development: responding to farmers' needs

**a) Development of mobile asset-specific farm support services geared to market efficiency & quality demands**

**b) examples:**

**... sprayer-trader mobile services for mango farmers Indonesia (Qanti)**

**... e.g., mobile combine services for rice farmers in China (Zhang) Myanmar (Belton, Slover)**

# Spraying High



# Pruning high



# Trading high: Sprayer-Trader services Indonesia (Qanti)



# Massive new wave of combine teams, “Fast & early”: Myanmar (Slover, Belton)



# Mobile team China (Zhang)



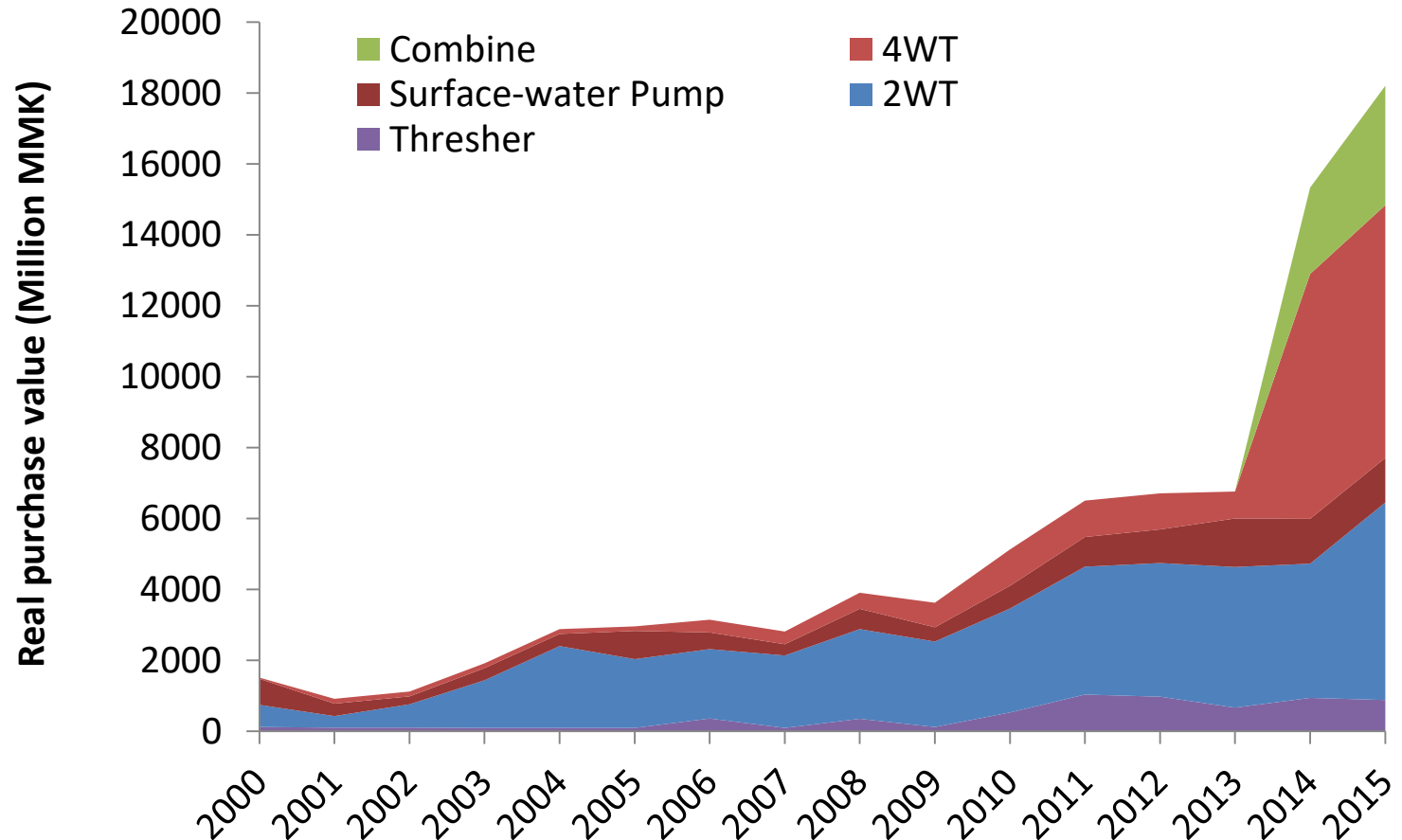
May, 2009, Sichuan Province

# Combine (harvester-thresher) of mobile team, Myanmar (Belton)





# Increasing value of machines owned Myanmar (Belton)



Real annual value of agricultural machinery purchases, by year and machine type (2000-2015) – MAAS 2016

# 8. Conclusions

**a) Rapid transformation** of food systems in Africa & Asia: not sleepy & traditional but dynamic

... Hans Ruthenberg found farming systems changeable & transforming in 1960s-1970s due to population density & technology change

... we find food systems & farming systems changeable & transforming fast 1980s-2010s due to urbanization, diet change, and supply chain transformation

**b) “pulled” downstream** by urbanization & diet change

**c) “facilitated” midstream** by modern revolution and Quiet Revolution in HIDDEN MIDDLE and downstream

**d) “fed” upstream** by intensification, diversification, commercialization of farming, and inputs/services value chains

**e) Huge opportunities for farmers: urban demand, high value markets**

**f) But challenges too:**

**...rise of quality & consumer safety standards,**

**... demands for technology investments**

**... demand for farmers cooperative organization**