# Overview of Japanese agricultural development and contribution factor

December, 2018
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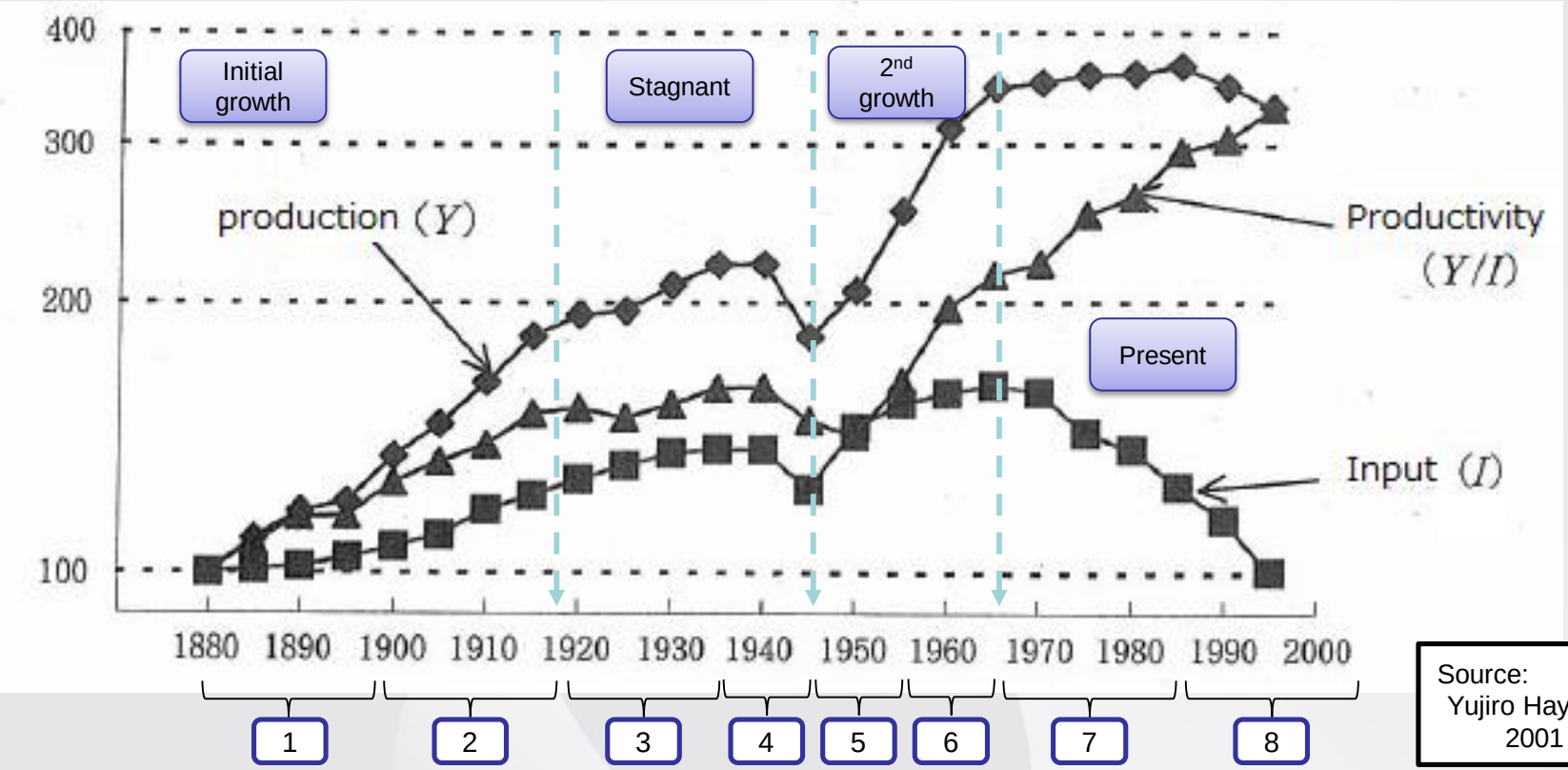
# PRODUCTIVITY INCREASE AND MAJOR INPUT TO AGRICULTURE

# Development stage of Japanese agriculture




Source: Yujiro Hayami, 2001

| | | | |
|---|---|---|---|
| 1 | Formulation of foundation (-'00) | 5 | Rehabilitation from WWII('45-'55) |
| 2 | Initial growth ('00-'20) | 6 | Rapid economic growth ('55-'65) |
| 3 | Stagnant during War ('20-'35) | 7 | Saturation of the market ('65-'85) |
| 4 | Destruction by WWII ('35-'45) | 8 | Globalized Economy ('85-) |

# Major factor for growth shifted from “land productivity” to “landholding”

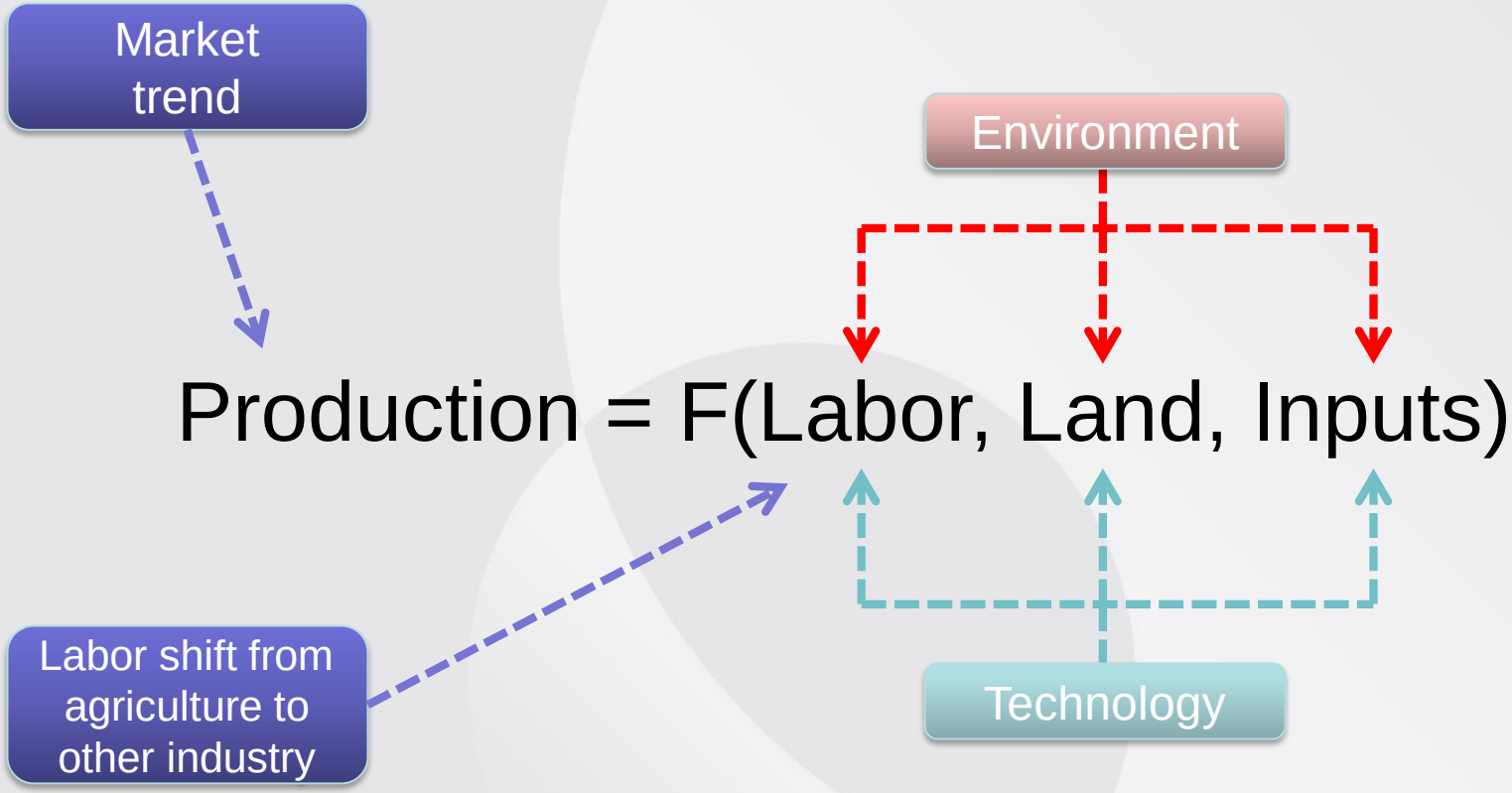
| Stage | Growth rate (Log%) | | | Contribution of each factor to labor productivity (%) | |
|---|---|---|---|---|---|
| | Labor productivity (1) | Landholding (2) | Land productivity (3) | Landholding (2) / (1) | Land productivity (3) / (1) |
| 1: 1880-1900 | 1.6 | 0.5 | 1.1 | 31% | 69% |
| 2: 1900-1920 | 1.9 | 0.7 | 1.3 | 35% | 65% |
| 3: 1920-1935 | 1.0 | 0.4 | 0.7 | 38% | 62% |
| 4: 1935-1945 | -1.8 | -0.3 | -1.5 | 17% | 83% |
| 5: 1945-1955 | 3.4 | 0.4 | 3.0 | 12% | 88% |
| 6: 1956-1965 | 6.6 | 3.5 | 3.0 | 54% | 46% |
| 7: 1965-1980 | 4.6 | 3.7 | 0.9 | 80% | 20% |
| 8: 1980-1995 | 3.2 | 3.1 | 0.0 | 99% | 1% |

Continuous grow

- Labor productivity = total production / # of farmer
- Landholding = total farm area / # of farmer
- Land productivity = total production / total farm area

Source: Yujiro Hayami, 2001

# General concept for agricultural production



# Comparison of major production factors between “initial growth” and “2nd growth”

| Year | Growth% of labor | Growth% of land | Growth% of inputs | |
|---|---|---|---|---|
| | | | Agricultural machinery | Fertilizer |
| Initial growth 1880-1935 | -0.1 | 0.4 | 1.5 | 4.3 |
| 2nd growth 1945-1995 | -3.7 | -0.4 | 5.4 | 1.3 |

Fertilizer application improve land productivity, while mechanization enable farmer to cultivate larger area without extra labor

Source:
Yujiro Hayami, 2001

How environmental limitation in technology dissemination was overcome during “initial growth”?

# TECHNOLOGY DISSEMINATION AND ENVIRONMENT

# Overcome environmental limitation through technology innovation

Mere increase of inputs can not bring such a dramatic spur of growth

To optimize inputs, technical innovation is required in three way,

(1) Develop optimal farming technology
(2) Adaptation to the environment
(3) Modification of the environment

Unique characteristics of agriculture

# Develop optimal farming technology

*One example: develop “fertilizer responsive” variety

Source: Yujiro Hayami, 2001

| Variety | Low fertilizer (N:106kg/ha) | | High fertilizer (N:168kg/ha) | |
|---|---|---|---|---|
| | Grain (t/ha) | Straw (t/ha) | Grain (t/ha) | Straw (t/ha) |
| Japanese | | | | |
| Kameno o | 6.1 | 6.2 | 6.8 | 8.5 |
| Fuku bouzu | 6.1 | 8.6 | 7.8 | 11.0 |
| Rikuu-232 | 6.5 | 7.7 | 8.3 | 9.6 |
| Norin-1 | 7.1 | 8.1 | 8.6 | 9.2 |
| Norin-2 | 5.7 | 7.1 | 7.3 | 8.8 |
| Bangladesh | | | | |
| Batak | 6.1 | 10.6 | 6.6 | 13.2 |
| Habiganj7 | 5.4 | 8.9 | 4.9 | 11.7 |

Old

New

# Adaptation to the environment

1. Development of cold tolerant variety
   - ✓ Western high yielding variety “Shin-riki” was not tolerant to cold weather in the east. Thus, could tolerant high yielding variety “Kameno o” was developed
2. Cultivation method to improve cold tolerance
   - ✓protected semi-irrigated rice nursery

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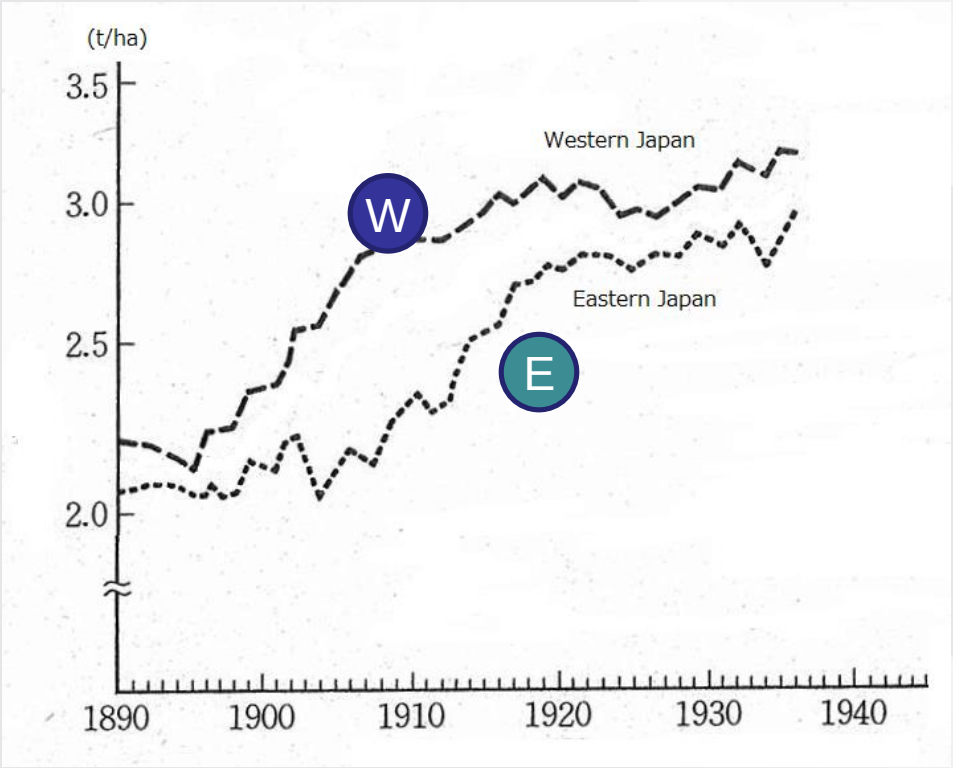
# Modification of the environment

1. Reform of ill-drained paddy field
   - ✓ Drainage development combined with horse plowing
   - ✓ Improved soil nutrient availability

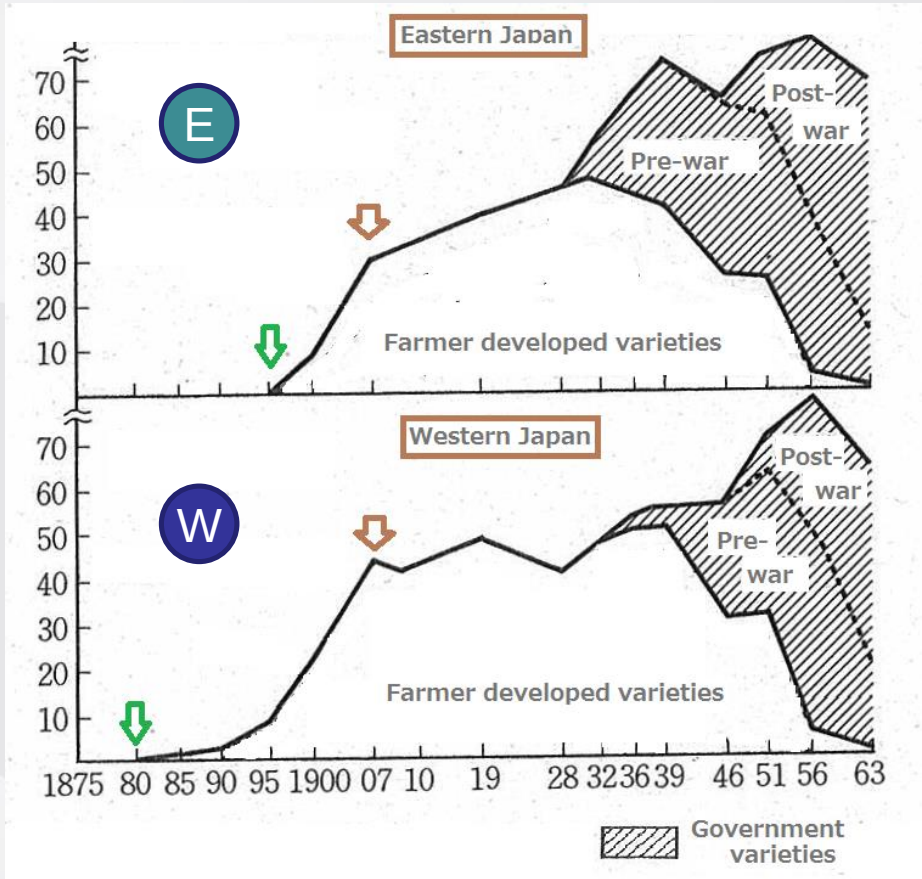
2. Support to farmland development
   - ✓ Land consolidation law (1899)
   - ✓ Japan hypothec bank (low interest loan using farmland as hypothecated asset)(1897)
   - ✓ Government subsidized land consolidation project (1906-)

1. During the initial growth stage, farming technology was developed and adopted in western part of Japan, which had preferable environmental condition
2. Technology was transferred to eastern part after adaptive research and irrigation / drainage development

Source:
Yujiro Hayami, 2001




Rice yield in western and eastern Japan




Adoption of modern variety in western and eastern Japan

Where are the technology source, how it is disseminated?

# TECHNOLOGY DISSEMINATION PATTERN

# Process of technology dissemination

| Year / stage | What happened? |
|---|---|
| Feudal system -1868 | Closed society : technologies were developed and accumulated within local government level, or even village level |
| Early modern 1868- | The Meiji restoration |
| 1870-1880 | Introduction of western farming technology : failed |
| Initial growth 1880-1920 | Introduction of farmer-farmer technology transfer<br>• Verification of farmer developed technology<br>• Technology dissemination through, “village level round table”, “seed exchange meeting” |
| Stagnant 1920-1945 | • Accumulated technical resources were used up<br>• Depletion of labor force and agricultural inputs during war |
| 1920- | Government start to develop national research network to substitute farmer developed technology |
| 2nd growth 1945-1965 | • Maturation of national research network (norin-10,etc.)<br>• Increased usage of agricultural input<br>• Mechanization enhance labor shift from agriculture to other industry |

Productivity increase, labor shift, changing consumer’s preference

# AGRICULTURAL DEVELOPMENT AFTER WWII

# Productivity increase and labor shift

| | Year | primary industry (1000) | secondary industry (1000) | tertiary industry (1000) | rice yield (t/ha) | number of tractor | Industry |
|---|---|---|---|---|---|---|---|
| Initial growth | 1880-1920 | Around 14,000 | No data | No data | 1.8 - 2.9 | - | Light manufacturing industry (textile) |
| Stagnant | 1920 | 14,672 | 5,598 | 6,464 | 2.91 | 9 | Heavy industry (steel, shipbuilding) |
| | 1930 | 14,711 | 6,002 | 8,836 | 2.89 | 89 | |
| | 1940 | 14,392 | 8,443 | 9,429 | 3.09 | 3,900 | |
| 2nd growth | 1950 | 17,478 | 7,838 | 10,671 | 3.27 | 35,000 | Petrochemical industry, vehicle, electric products |
| | 1955 | 16,291 | 9,247 | 14,051 | 3.39 | 80,000 | |
| | 1960 | 14,389 | 12,804 | 16,841 | 3.93 | - | |
| | 1965 | 11,857 | 15,115 | 20,969 | 4.08 | 3,000,000 | |
| Stagnant | 1970 | 10,146 | 17,897 | 24,511 | 4.39 | 3,200,000 | |
| | 1975 | 7,347 | 18,106 | 27,521 | 4.62 | | |
| | 1980 | 6,102 | 18,737 | 30,911 | 4.61 | | |
| | 1985 | 5,412 | 19,334 | 33,444 | 4.97 | | |
| | 1990 | 4,391 | 20,548 | 36,421 | 4.91 | | |
| | 1995 | 3,820 | 20,247 | 39,642 | 4.92 | | |

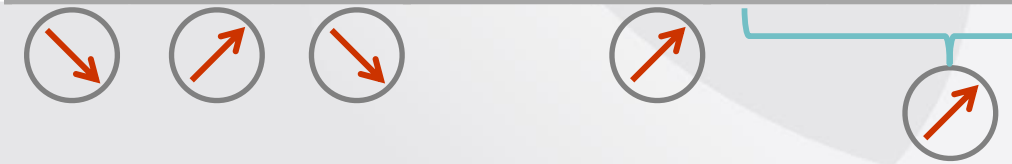
Rural population

- ✓ Yield increase
- ✓ Mechanization
- ✓ Industry growth

Urban population

# Income increase and diversified diet

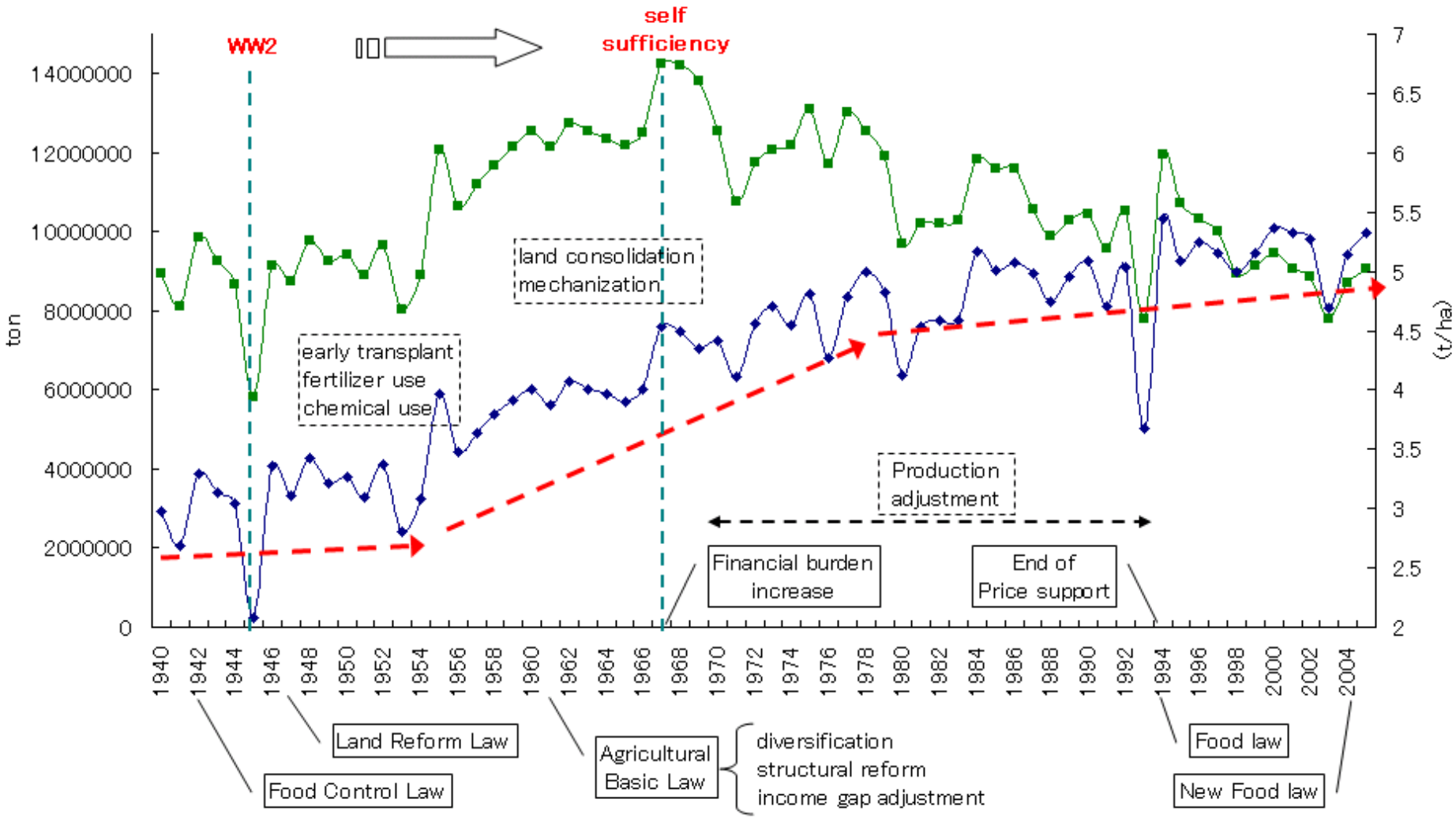
| Year | Rice | Wheat | Tuber | Vegetable | Fruits | Meet | Egg | Dairy | Fish | Sugar | oil | GDP$ / capita |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1911 – 1915 | 358 | 27 | 156 | 239 | 25 | 4 | 2 | 3 | 10 | 15 | 1 | 1,356 |
| 1921– 1925 | 391 | 40 | 146 | 216 | 22 | 6 | 4 | 6 | 22 | 30 | 2 | 1,859 |
| 1931 – 1935 | 385 | 38 | 128 | 221 | 36 | 6 | 6 | 8 | 28 | 33 | 2 | 1,837 |
| 1946 | 254 | 40 | 166 | 151 | 19 | 3 | 1 | 4 | 26 | 2 | 0 | 1,555 |
| 1960 | 315 | 71 | 83 | 273 | 61 | 14 | 17 | 61 | 76 | 41 | 12 | 3,988 |
| 1973 | 249 | 85 | 44 | 302 | 118 | 47 | 39 | 144 | 93 | 77 | 30 | 11,439 |
| 1980 | 216 | 88 | 47 | 302 | 106 | 62 | 39 | 170 | 95 | 64 | 38 | 13,429 |
| 1983 | 207 | 87 | 49 | 294 | 107 | 65 | 40 | 183 | 94 | 59 | 41 | 14,308 |



# Agricultural development and its social impact

1. Change in supply side
   - ✓ Chemical fertilizer, improved variety, irrigation have been contributed to productivity increase
   - ✓ Labor surplus arising from productivity increase is allocated to other industry
2. Change in demand side
   - ✓ One of the fundamental demand of human is, to eat delicious food until full stomach
   - ✓ This demand have always been satisfied in a stepwise manner, namely, full stomach first, followed by delicious food, in accordance with productivity/income growth

# Trend of rice production and rice policy in japan after WW2



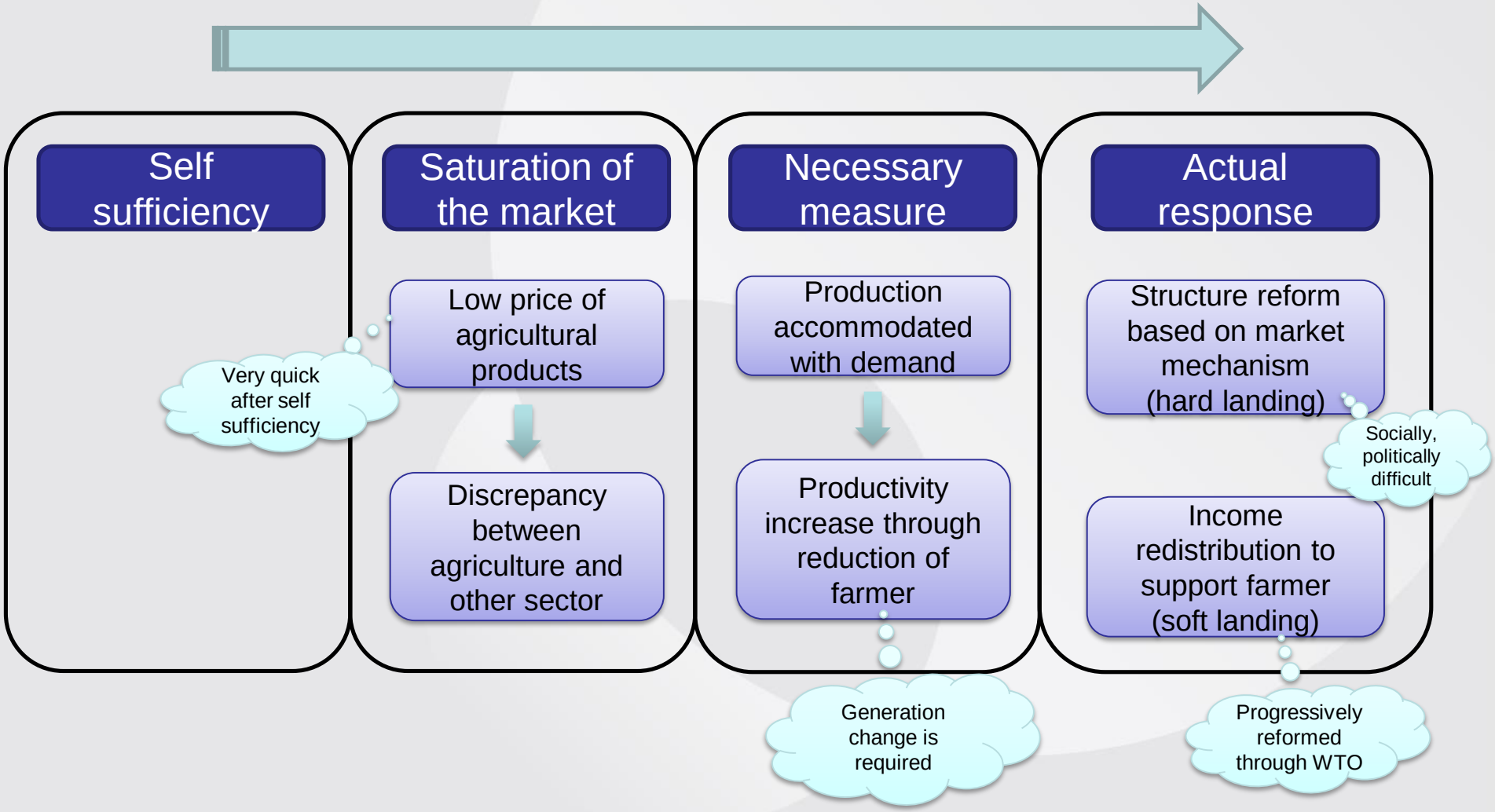
Common problem which industrialized countries will face

# STAGNANT PERIOD AFTER 2ND GROWTH

# Common agricultural problem for industrialized country

- Two limitations arise in the course of agricultural development
  - ✓Demand limitation (after self sufficiency, farmer have to struggle with price fall)
  - ✓Resource limitation (Land and water)
- “movement of human resource” is slower than that of “movement of goods”
- Relatively weak agricultural sector tend to be protected in the form of income redistribution

# Fundamental issue of Japanese agriculture is that Sectorial reform cannot catch up with rapid decreasing demand.



# JAPANESE EXPERIENCE EXTENDED TO OTHER COUNTRIES

# What happened in Japan?

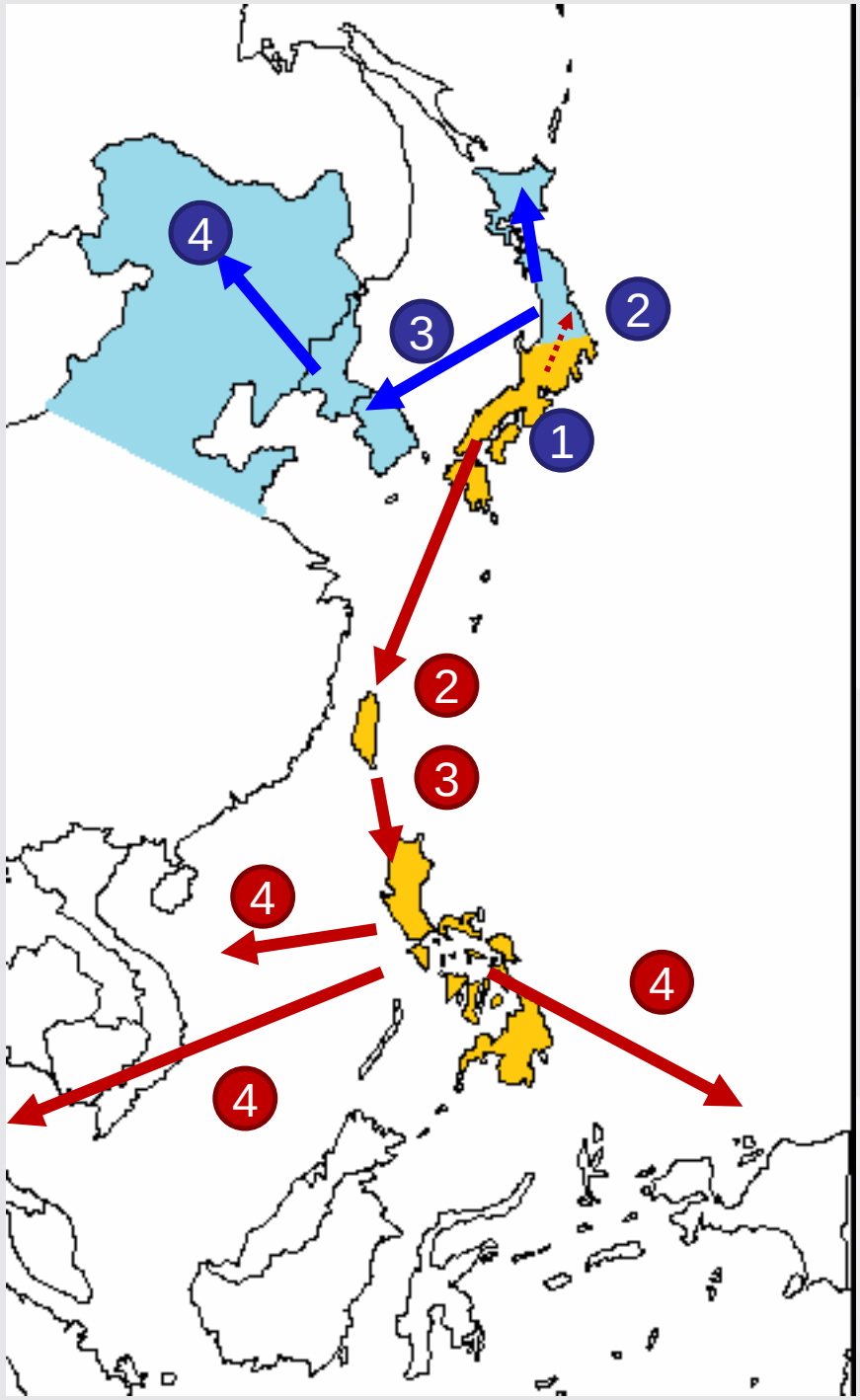
**Three steps in rice farming technology dissemination in Japan**

1. **Technology development**
   Fertilizer responsive varieties (West)
2. **Adaptation** to the environment
   Cold tolerant varieties (West ⇒ East)
3. **Modification** of the environment
   Irrigation development (prime land ⇒ marginal land)

**⇒ Same process occurred in surrounding countries**

Nov 2018

# Dissemination of rice technology - variety development & irrigation -




| Fertilizer responsive rice variety | | |
|---|---|---|
| 1 | 1900- | Variety dev. in West Japan |
| 2 | 1920 | Cross breed with Taiwanese var. |
| 3 | 1962 | Cross breed with Indonesian var. |
| 4 | 1965-1975 | Disseminated to all Asia (Green revolution) |
| **Cold tolerant rice technology** | | |
| 1 | 1900- | Variety dev. in East Japan |
| 3 | 1910- | Variety promoted in Korea |
| 4 | 1920- | Variety moved to Northern China with irrigation dev. |
| 2 | 1920- | Further variety improvement for cold tolerance |

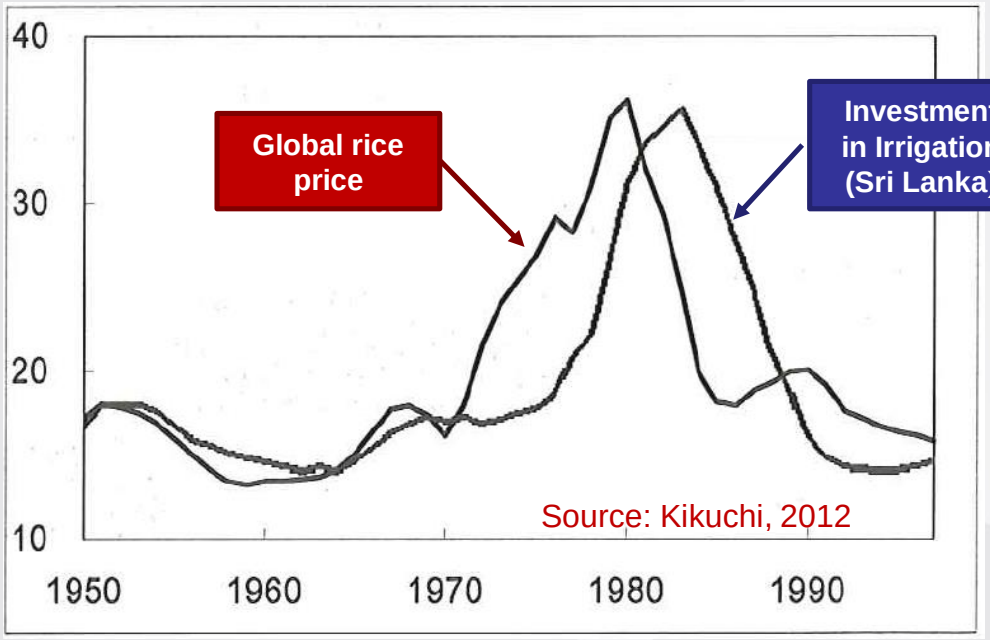
# What happened in Asia?

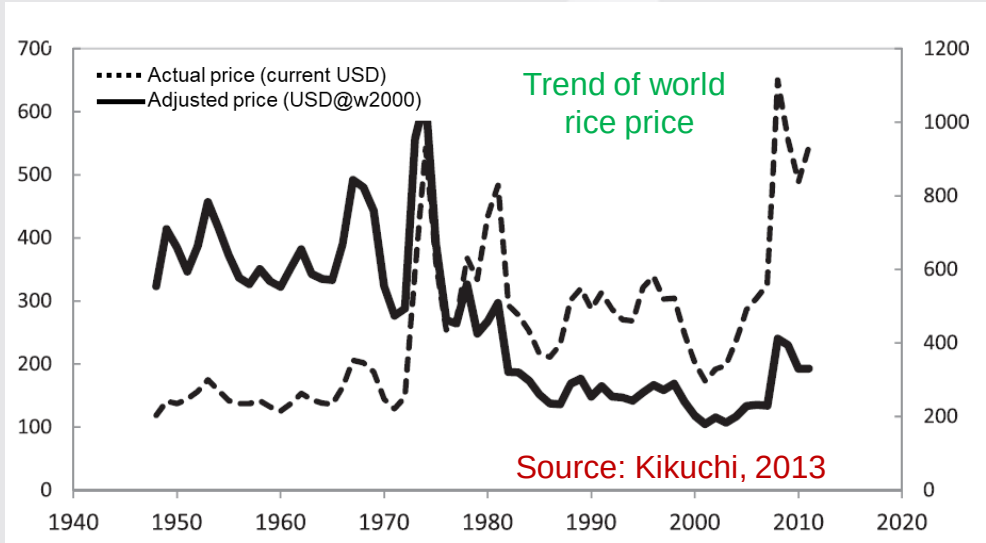
Three steps in rice farming technology dissemination in Asia

1. **Technology development**
   - Fertilizer responsive varieties (Japan)
   - Cold tolerant varieties (Japan ⇒ Korea ⇒ China)
2. **Adaptation** to the environment
   - Tropical varieties (Japan ⇒ Taiwan ⇒ Philippine:IRRI)
3. **Modification** of the environment
   - Irrigation development

⇒ Contribution of Japanese technology to “two green revolution”

# Challenges for latecomer




1. Investment efficiency of irrigation is determined by “cost of investment” and “return from products”
2. Accordingly, investment tends to be accelerated when commodity price is high (see the graph above)
3. Challenge is, since green revolution during 1970s’, commodity price is constantly decreasing
4. This means, investment efficiency of irrigation is decreasing year by year

# Coalition for Africa's Rice Development (CARD)

## Membership of CARD

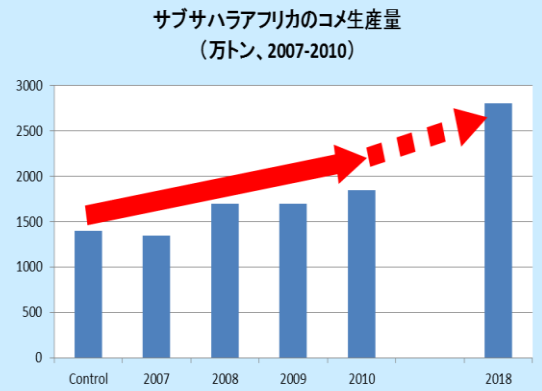
[1st Group]
Cameroon
Ghana
Guinea
Mali
Mozambique
Nigeria
Senegal
Sierra Leone
Tanzania
Uganda
Madagascar

[2nd Group]
Gambia
Liberia
Cote d'ivoire
Burkina Faso
Togo
Benin
Central Africa
Democratic
Rep. of the
Congo
Rwanda
Ethiopia
Zambia

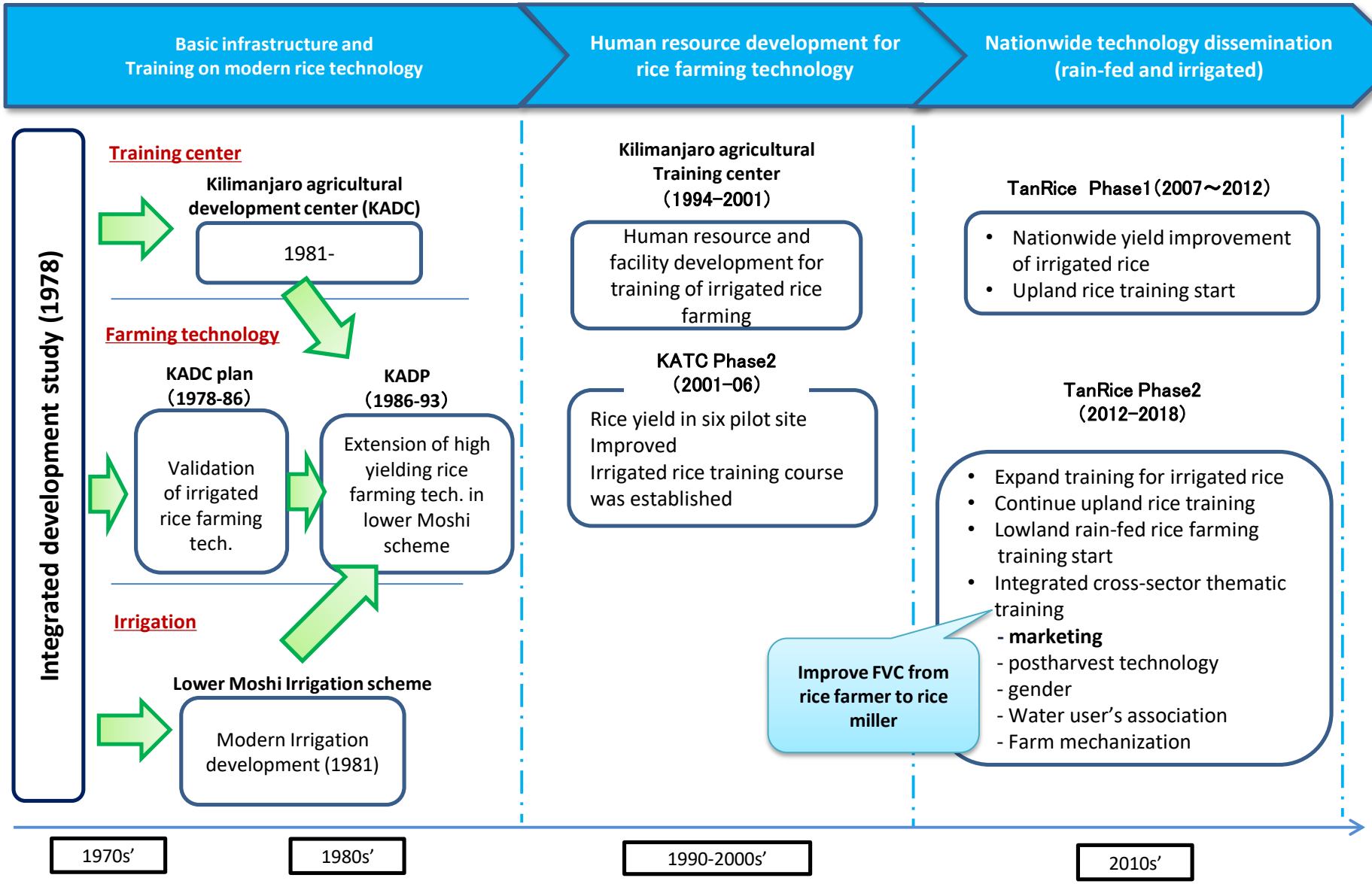
- CARD is a coalition of African countries and donor agencies, initiated by Japan and AGRA (African Green Revolution Association). This initiative was a part of Japan's commitment in TICADIV 2008.
- CARD aims at doubling annual rice production in Sub-Saharan Africa from the average level of 14 million tons in early 2000's to 28 million tons by 2018.
- Under CARD initiative, 22 countries have developed National Rice Development Strategy. It includes 31 projects (seed production, irrigation, postharvest facility, etc.) under Japanese support as well as hundreds of projects contributed by the partners of CARD

## Rice Production in Sub-Saharan Arica

2009年で1700万トン。
平均12%で増加



# Integrated rice farming support in Tanzania



# VALUE CHAIN ENHANCEMENT

# Value chain development in Japan

1. Until 1960, main focus of Japanese agriculture was self sufficiency of rice. Price support was important measure to ensure supply
2. In 1961, when rice sufficiency was expected reach 100%, heavy financial burden was expected to maintain price support system (over production)
3. Government decided to change agriculture policy from “rice only” to “diversified agriculture”, expecting minimization of rice demand/supply gap while increasing farm income. And introduced number of support measure for diversification (technical, financial)
4. In this process, farmer cooperative played key role to identify market, quality control, group farming and technical service
5. Since then, number of successful/failure observed throughout the country. Experience and knowledge accumulated accordingly.

# 1. What is SHEP?

- Stands for "**S**mall-holder **H**orticulture **E**mpowerment and **P**romotion" Approach

- Developed in Kenya through technical cooperation project by JICA which started from 2006 and succeeded in increasing farmers' income


- An approach which realize "Market-Oriented Agriculture"

# 2. SHEP's 4 Important Steps

| 4 Steps | Activities |
|---|---|
| 1. SHEP selects target beneficiaries and the implementers and beneficiaries share the vision/goal. | Sensitization Workshop<br>Selection of Target District<br>Selection of Target Beneficiaries |
| 2. SHEP helps the farmers discover knowledge and opportunities. | Participatory Baseline Survey<br>FABLIST (Farm Business Linkage Stakeholder) Forum<br>Market Survey |
| 3. SHEP helps the farmers formulate a plan | Crop Selection<br>Action Plan Making |
| 4. SHEP facilitates the realization of the plan by providing technical solution to the farmers. | In-field trainings after TOT |

# 1. Sharing the vision/goal
# Sensitization Workshop

- All levels of stakeholders attend the workshop
- Participants understand what they are going to do
- Participants identify their roles and responsibilities
- All stakeholders share how to realize Market-Oriented Agriculture

**Participants of the Sensitization Workshop**

# 2. Awareness of situation
# **Market Survey**

- First, farmers and extension staff are trained how to conduct the Market Survey
- Farmers understand not only price but also required quality and quantity, selling condition, price fluctuation, etc.
- Both market stakeholders and farmers can share their own information

**Exercise on Market Survey**

# 3. Decision Making
# Crop Selection

- Based on the results of Market Survey, group members of farmers prioritize their target crops by themselves

Ex)

| Crops | Experience | Time for planting and Duration | Expected yield / acre (kg) | Average / Expected price (Ksh) | Expected total income (Ksh) | Cost of production (Ksh) | Expected benefit (Ksh) | Market condition | Ranking |
|---|---|---|---|---|---|---|---|---|---|
| Carrot | No | April, 3 months | 4,000 | 20 | 80,000 | 25,000 | 55,000 | Middle size, cash, shape | 2 |
| Onion | No | March, 6month | 2,000 | 15 | 30,000 | 10,000 | 20,000 | Large size, cash | 4 |
| Kale | Yes | March, 3month | 8,000 | 3 | 24,000 | 5,000 | 19,000 | Fresh, cash | 3 |
| Tomato | Yes | May, 4month | 6,000 | 30 | 180,000 | 50,000 | 130,000 | Well matured, middle size | 1 |

# 4. Provision of Technical Solution
# **Demand Driven In-field Training**

- Extension staff are trained on crops or skills according to farmers' needs
- All skills are easy for farmers to adopt
- Farmers learn what they want to know, so adoption rate is high

**Extension Officer training Farmer Group**

**User friendly skills**

# 5. What can SHEP bring about change?"

## Change of farmers' mind on marketing from **"Grow and Sell"** to **"Grow to Sell"**

**Market Survey by Farmers**

| Name & Contact of Produce Dealer | Produce & Variety | Produce Quality Market Requirements | Peak Demand (months) | Quantity (kg) & Frequency (daily/weekly etc) of Supply | Unit Price (Ksh./kg) | Mode of Payment | Terms of Payment | Marketing challenges | Dealer's Willingness to purchase the Produce from the Group |
|---|---|---|---|---|---|---|---|---|---|
| S. K. Mwai (0722-xxxxxx) | Tomato (cal j) | - Medium size<br>- Half ripen | March, April, & May | 1,000 kg/week | 100 | Cash | Cash on Delivery | Inadequate Storage Facilities | Willing |
| J. O. Ouma (0736-xxxxxx) | Tomato (cal j) | - Large size<br>- Half ripen | February & March | 2,500 kg/week | 120 | Cheque | Two Weeks after Delivery | Inadequate Storage Facilities | Willing |
| O. J. Aduu (0720-xxxxxx) | Tomato (cal j) | - Medium size<br>- Half ripen | December & January | 2,500 kg/week | 115 | Cash | A week after Delivery | Inadequate Storage Facilities | |

**e.g.) Results of the Market Survey**

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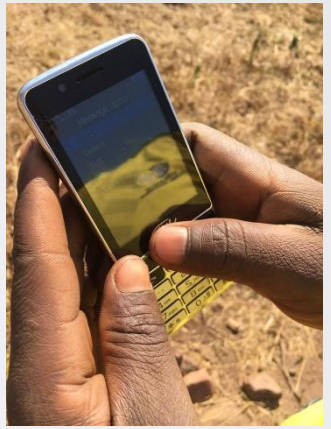


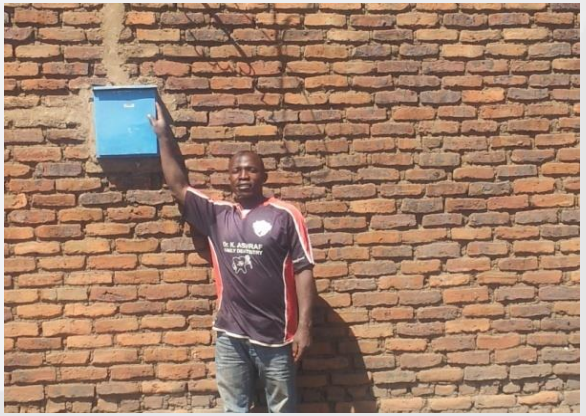

**Before** **After** **Others**

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# Improvement on Gender/Family budgeting

## SHEP's training for Gender/ family budgeting

- Gender Awareness training
- Family budgeting Training

"A household management unit"

- Invite both men and women to training so that both will acquire skills and knowledge.
- Women and men will participate in the household decision-making.
- Sensitize both men and women on the importance of shearing workload and responsibilities.

↓

Both incomes from horticultural farming and happiness of the family are enhanced.

After attending the SHEP Gender Awareness Training, I started valuing the role my wife played and started to include her in the management of our income. We are all very happy since we now respect each other and also because our livelihood has actually improved a lot from horticultural farming.

Mr. Bernard from Kisumu, Kenya

# 6. SHEP Expansion

- *"We would like to transition away from agriculture "that enables the farmer to eat" to agriculture the farmer to earn money."*
- by Prime Minister Mr. Shinzo ABE@TICAD V in 2013

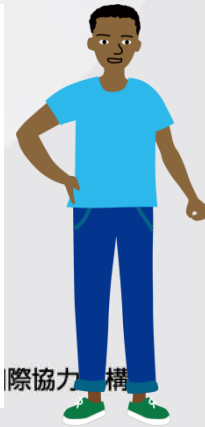

## Japan's Assistance Package for Africa at TICADV

### III. Empowering Farmers as Mainstream Economic Actors (Agriculture, Food and Nutrition Security)

- Double rice production in Sub-Sahara Africa to 28 million tons by 2018 (continuing efforts of CARD (Coalition for African Rice Development)
- Transform farmers to move from subsistence to commercial agriculture through SHEP approach*2 in 10 countries
- Capacity building of 1,000 skilled agricultural trainers
- Organize smallholders cooperative consisting 50,000 people

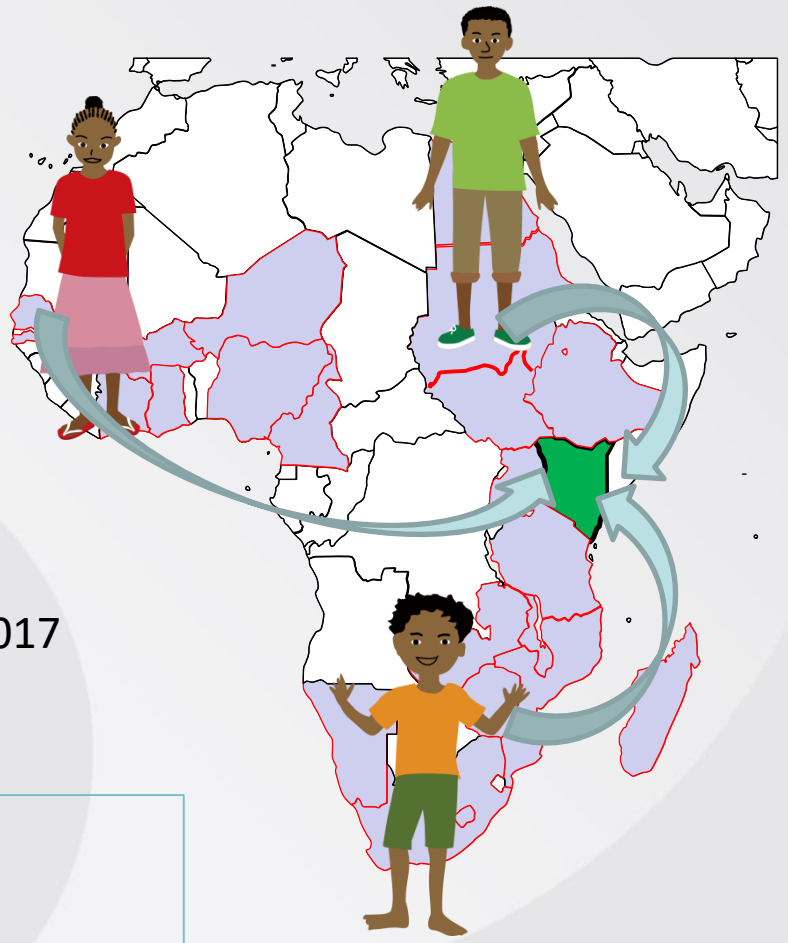
*2 SHEP is an effort to assist increasing income of smallholders such as through training on market research

http://www.mofa.go.jp/files/000006375.pdf



# SHEP expansion – progress so far –

- 1,900 official from 23 country participated SHEP training
- 42,468 farmers benefit from SHEP activities in respective countries
- African countries sharing their experience each other through key country, Kenya (English speaking) and Senegal (French speaking)
- And now, SHEP activity can be observed in Asia and Latin America



As of April, 2017

**①SHEP training course（in Japan/Kenya）**
**（for extension officer and program officer）**
**②South Africa SHEP regional workshop**
**followed up by JICA regional expert**
**③Technical Cooperation Project**

# Thank you very much!

Any question / feedback?

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