

From MDG to SDG

-Way Forward for Agriculture Development-

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1. WHY WE NEED TO WORK ON SDG GOAL 2?

SDG Goal2

Sustainable Development Goal 2

- End hunger, achieve food security and improved nutrition and promote sustainable agriculture

Why SDG goal 2?

1. Stable supply of safe and nutritious food is fundamental for all human activity
2. Nevertheless, 800 million population still suffer from hunger
3. Meanwhile, agriculture is single biggest source of income in developing country supporting 40% of employment
4. Number of natural calamity are growing due to climate change

Impact of nutritional improvement

Loss of opportunity

- Nearly half of all deaths in children under 5 are attributable to undernutrition*1
- Lower cognitive/physical ability limits employment opportunity
- Chronic disease increase the burden of medical cost



11% Loss of GDP (Asia and Africa) *2

*1: Progress for Children (UNICEF, 2015)

*2 : GNR 2014, (IFPRI)

Impact of nutritional improvement

- ✓ **\$1** investment against stunting returns **\$16** benefit (40 low/medium income countries)
- ✓ **Breastfeed** over 12 month (Brazil)
→ **Increased income** by 33%
- ✓ **One extra cm** of height (multi-country)
→ **Increased wage** by 4.5%

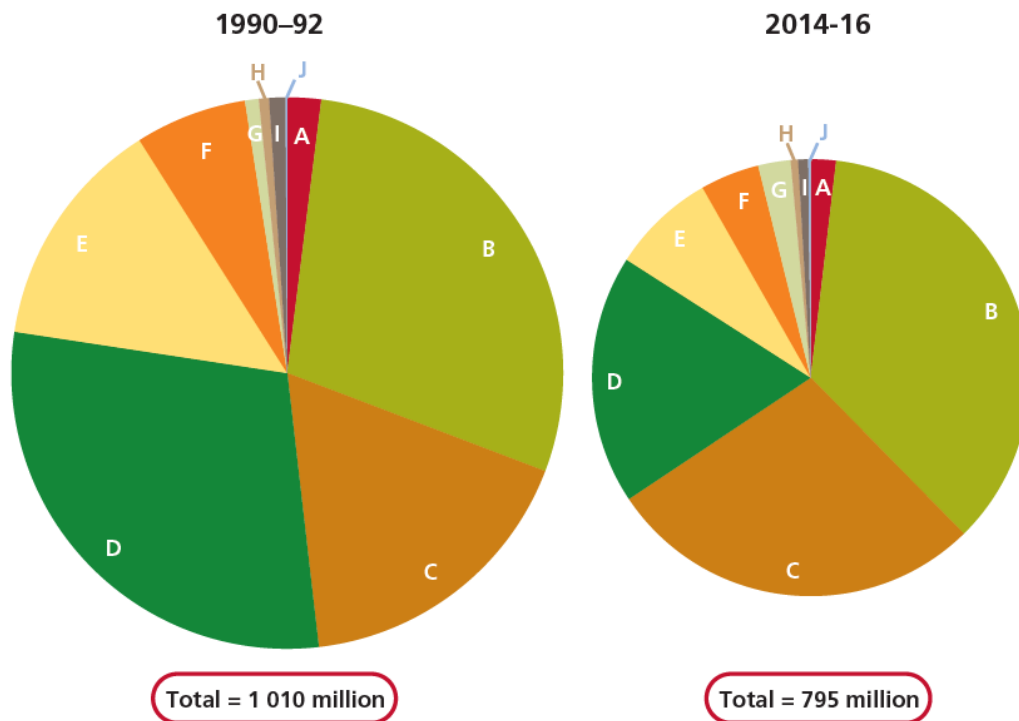
Source: GNR 2014, 2015 (IFPRI)



<Case in Peru: "My Future in My First Centimeters - World Bank">

800 million people still suffer from hunger

The changing distribution of hunger in the world: numbers and shares of undernourished people by region, 1990–92 and 2014–16

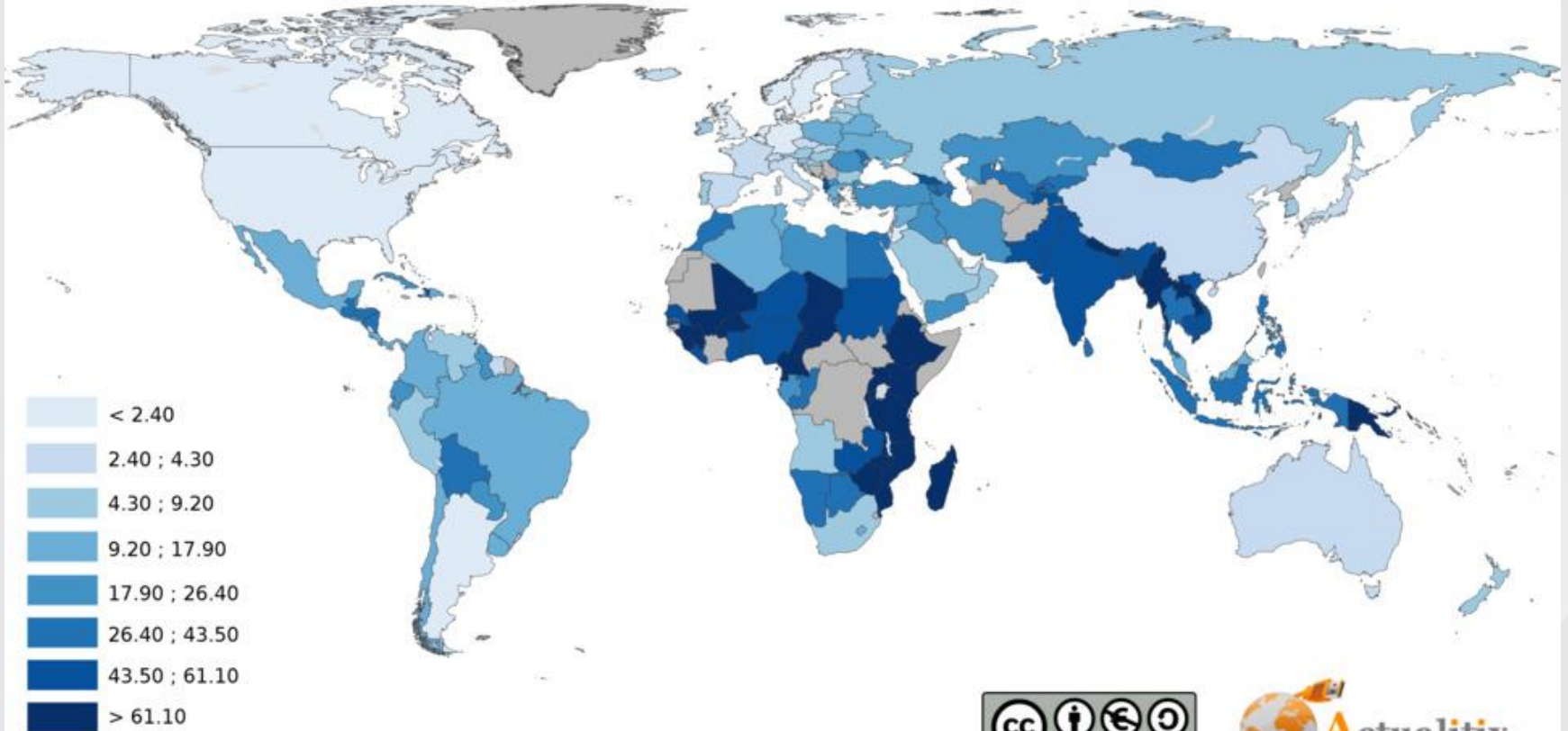


	Number (millions)		Regional share (%)	
	1990–92	2014–16	1990–92	2014–16
A Developed regions	20	15	2.0	1.8
B Southern Asia	291	281	28.8	35.4
C Sub-Saharan Africa	176	220	17.4	27.7
D Eastern Asia	295	145	29.2	18.3
E South-Eastern Asia	138	61	13.6	7.6
F Latin America and the Caribbean	66	34	6.5	4.3
G Western Asia	8	19	0.8	2.4
H Northern Africa	6	4	0.6	0.5
I Caucasus and Central Asia	10	6	0.9	0.7
J Oceania	1	1	0.1	0.2
Total	1 011	795	100	100

Note: The areas of the pie charts are proportional to the total number of undernourished in each period. Data for 2014–16 refer to provisional estimates. All figures are rounded.
Source: FAO.

Largest source of employment

Employment in agriculture (% of total employment)



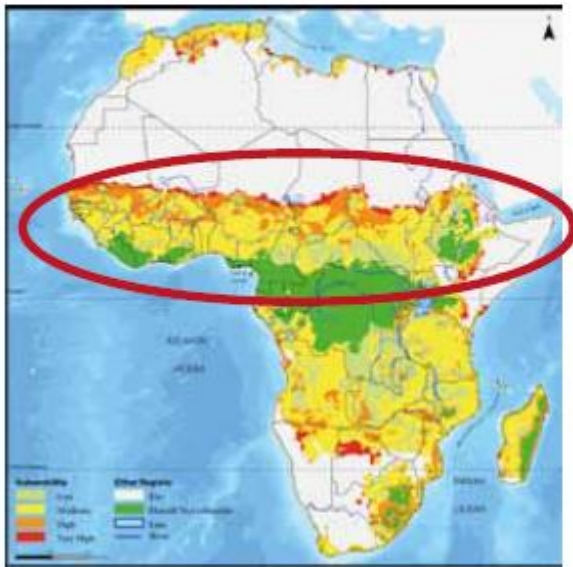
Source : The World Bank - 2014
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Food security and climate change

- In 2007, 80% of the major armed conflicts that affected society occurred in vulnerable dry ecosystems

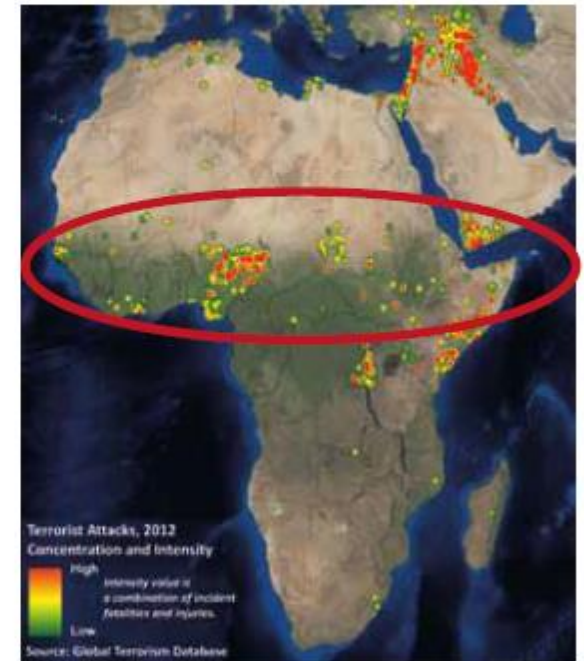
Desertification vulnerability in Africa (2008)



Conflicts and food riots in Africa 2007-2008

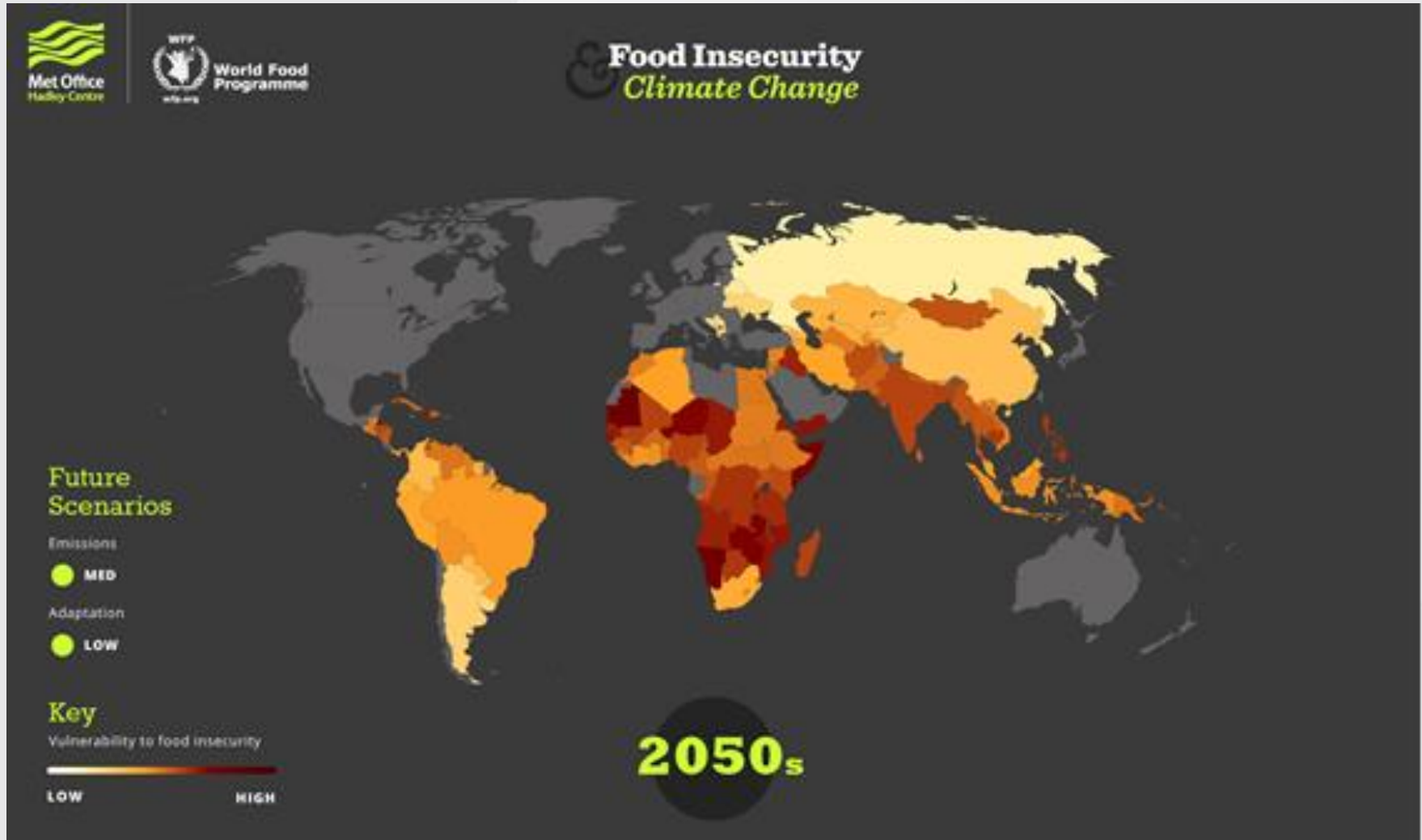


Terrorist Attacks 2012



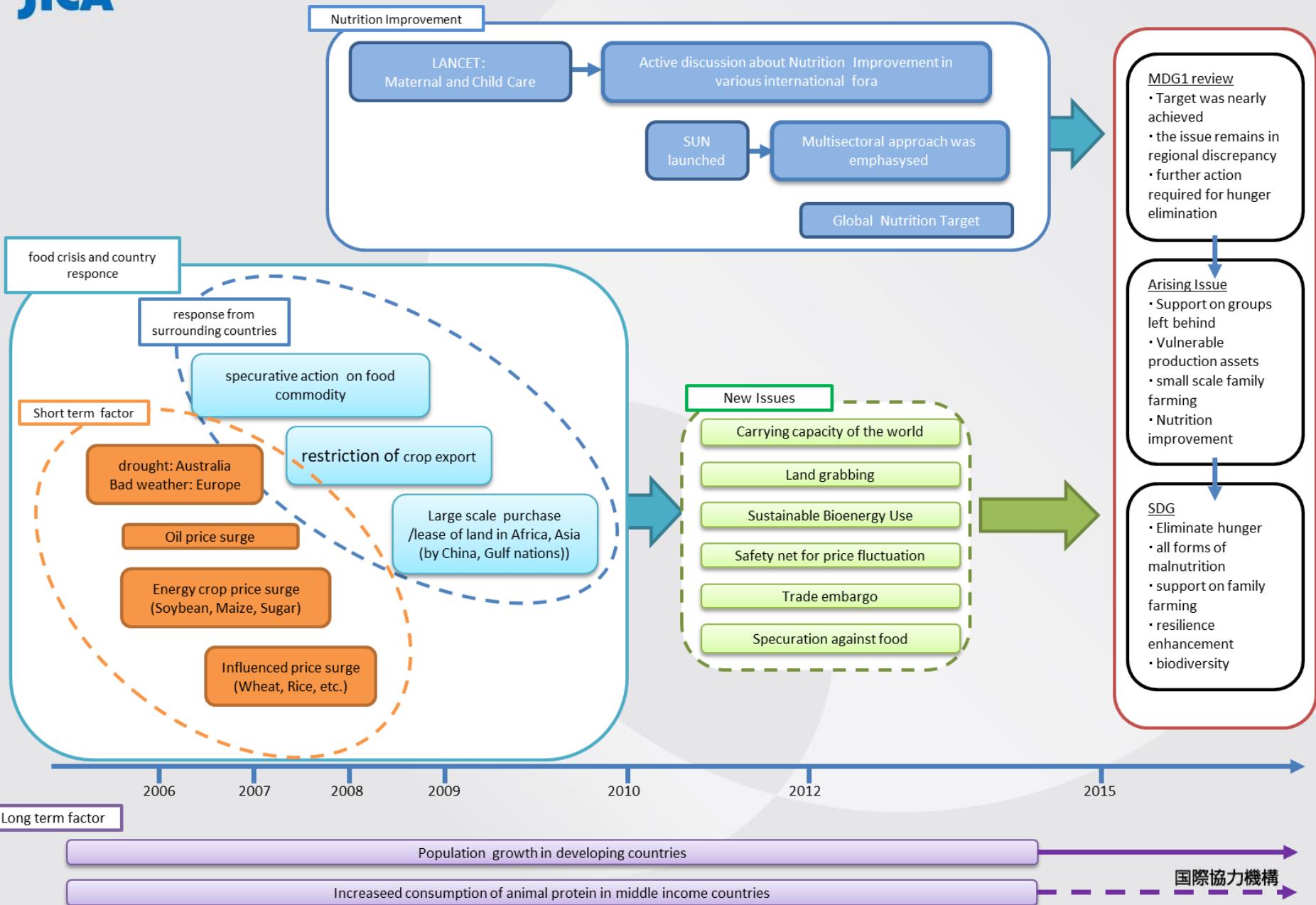
These three maps of Africa vividly show the concentrations of past terrorist attacks, food riots and other conflicts in areas that are vulnerable to desertification.

Increased risk by natural calamity associated with Climate change

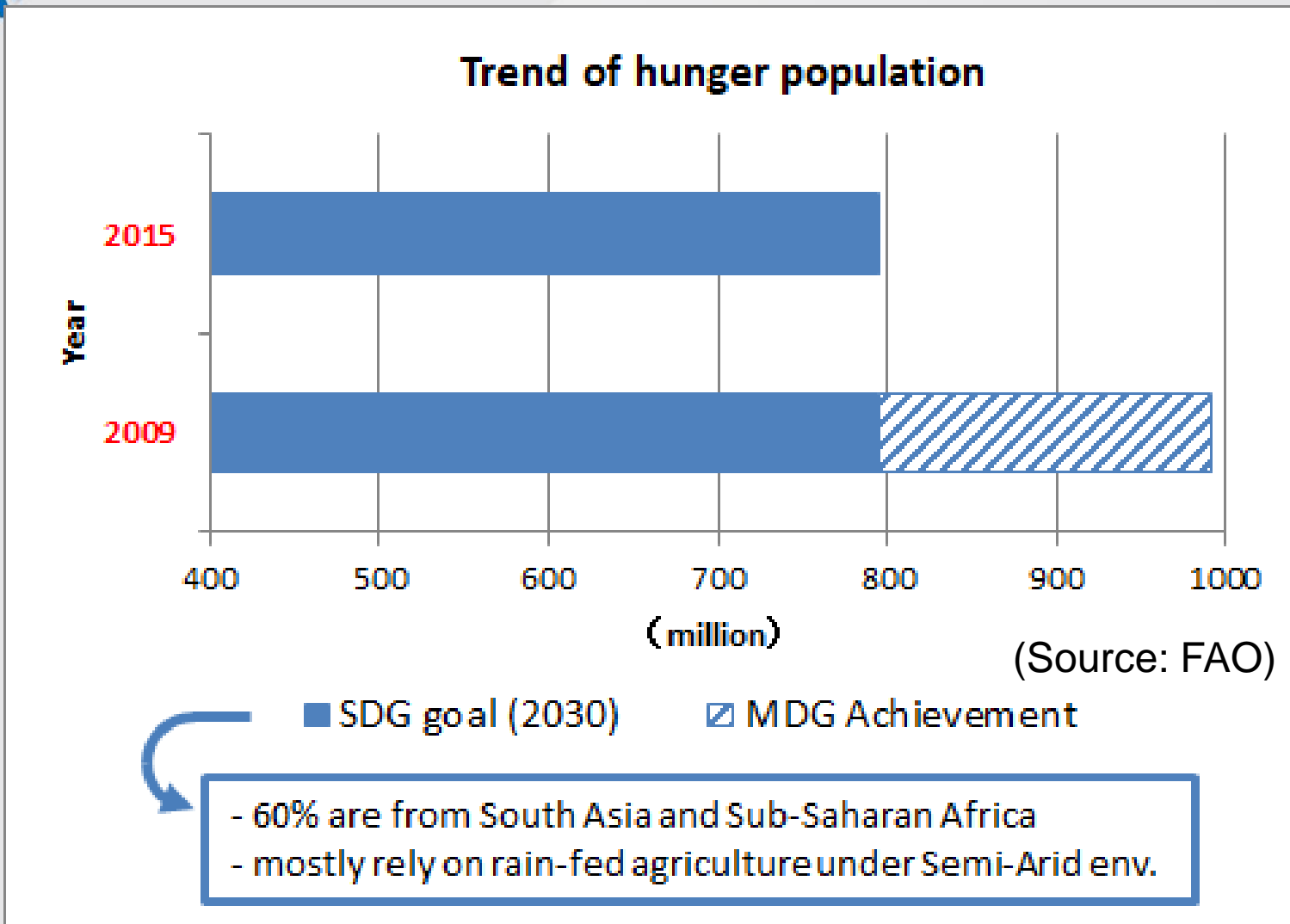


Source: <https://www.wfp.org/climate-change/climate-impacts/>

2. WHAT IS THE DIFFERENCE BETWEEN MDG AND SDG?



Difference between MDG and SDG



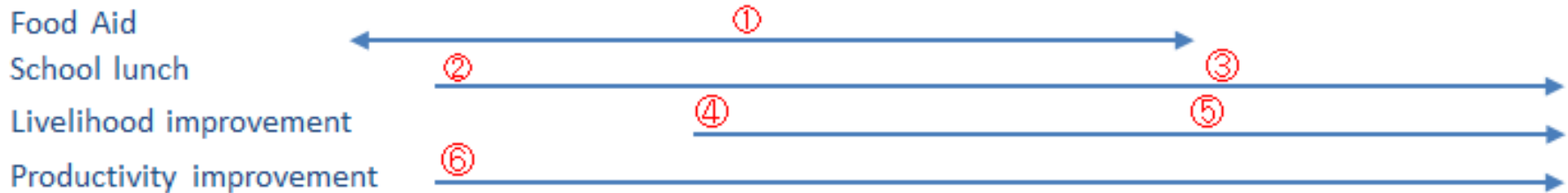
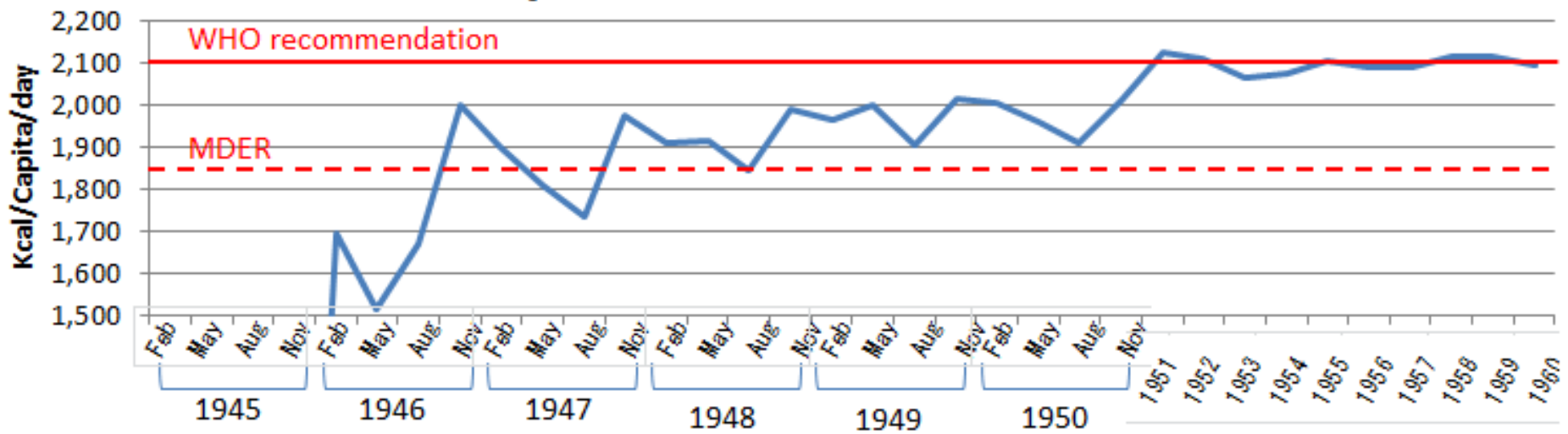
- ① Focus on rural vulnerable (no one left behind)
- ② Emphasized nutrition aspect

2. Summary

1. During last decade, one of the biggest incident related to food and agriculture was “Food crisis in 2007/2008” which was caused by multiple factor
2. This incident send a series of fundamental question to international community including “human carrying capacity of the earth”, “land grabbing”, “safety net for price fluctuation”
3. Meanwhile, after the Lancet release series of scientific paper in 2007, nutrition became attraction of international community and regarded as core issue in development
4. SDG was discussed based on the above situation and put emphasis on several issues such as “nutrition”, “resilience”, of “rural vulnerable”
5. This is actually one of the biggest challenge we have faced, “focusing rural vulnerable people, relying on rain-fed agriculture under vulnerable environment”

3. JAPANESE EXPERIENCE IN FOOD AND NUTRITION SECURITY

3.1 Recovery from serious hunger after WW2



- ① USA, UNICEF, NGO: 5.7 million ton of rice/wheat/barley in 6 years,
- ② school lunch resumption for 3million student with LARA assistance
- ③ Nationwide school lunch program,
- ④ livelihood improvement movement started,
- ⑤ bad dietary balance (world highest cereal dependency),
- ⑥ accelerated fertilizer production, rice frontier expansion to north, cold torelant farming technology

3.1.1 Food Aid

1. At the first stage of recovery, foreign aid showed significant contribution
2. 5.7 million tons of cereal (cereal, wheat, barley) were provided in 6 years UNICEF, USA, International NGOs
3. School lunch were also resumed with the support from foreign aid



Distribution of Ration



Demonstration by School children requesting food
Source: Tokyo Shimbun



Supply from foreign aid
Source: CARE JAPAN

3.1.2. Productivity enhancement

1. Land reform

- Released farmland from landowner to tenant farmer at minimal cost (7,570JPY/ha \doteq 1 ton of rice)

2. Accelerated production / utilization of fertilizer

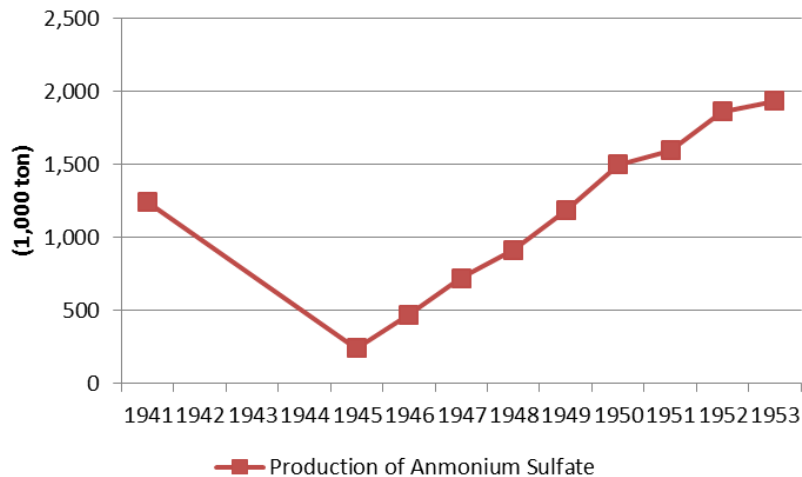
- "priority production system" for focusing a major part of the available material, financial, and labor resources to the target

3. Rice frontier expansion to Northern Japan

4. Cold tolerant rice farming technology

Contributing factors for rice productivity growth

Production of Anmonium Sulfate

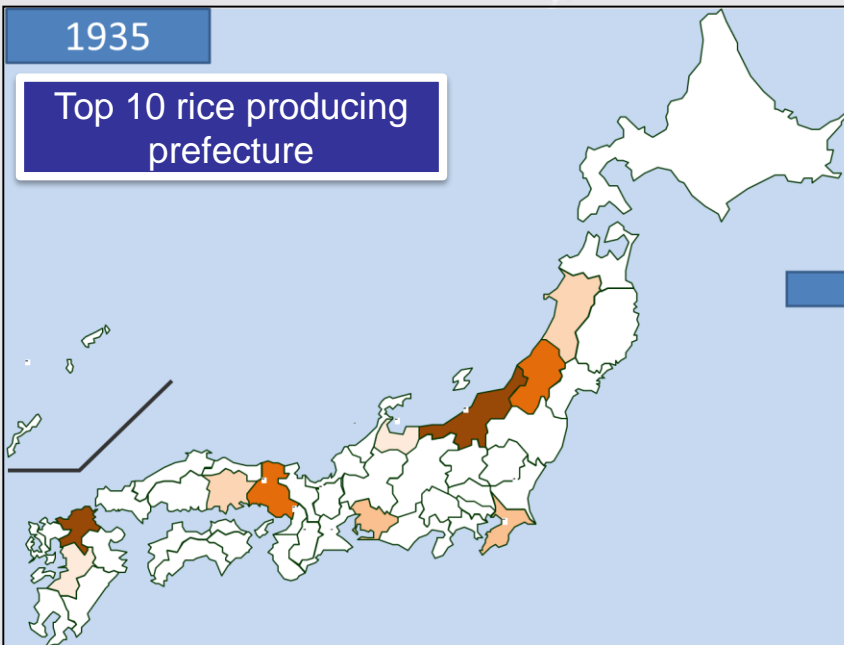


Cold tolerant rice farming technology



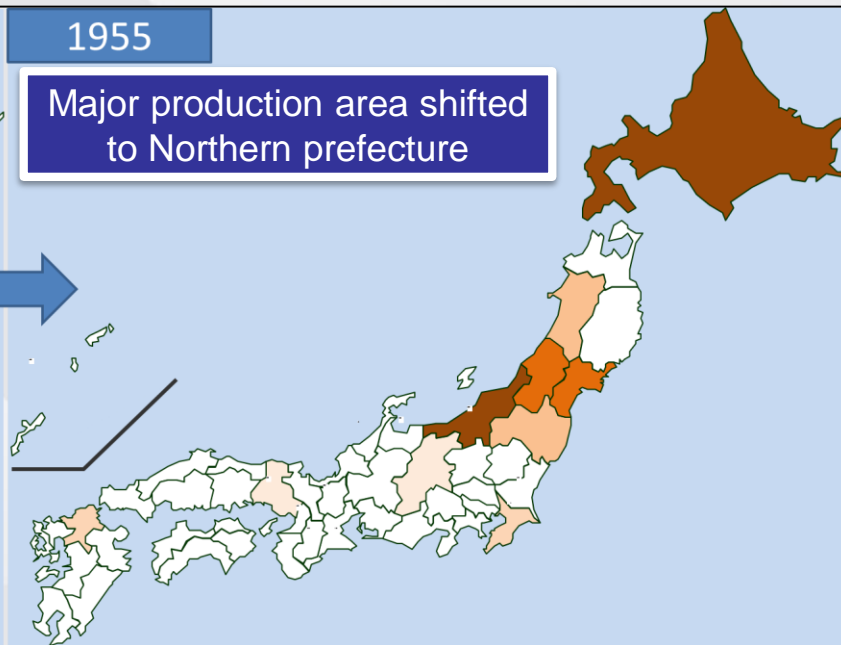
1935

Top 10 rice producing prefecture

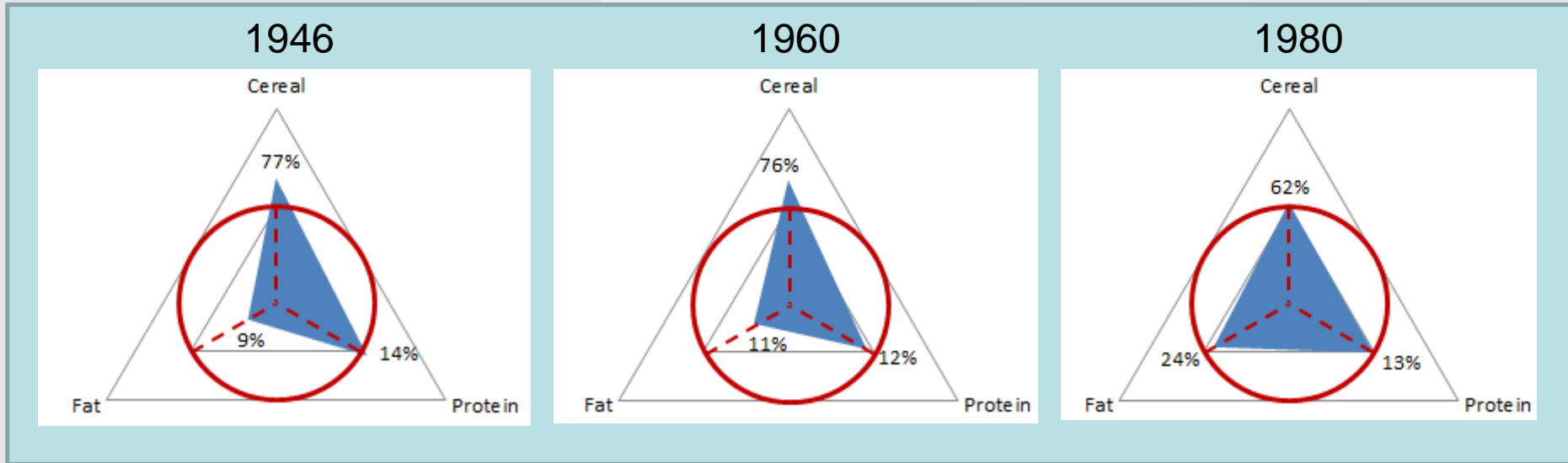


1955

Major production area shifted to Northern prefecture



3.2. Behavior change in diet



- After WW2, Japanese satisfy its energy requirement mostly from rice.
- High volume of rice consumption was associated with high amount of salt, which cause high blood pressure, stomach cancer.
- Nutrition education and cooking guidance under livelihood improvement movement, together with diversified food supply gradually changed diet pattern.
- However, it took more than 20 years to reach to the optimal diet balance. And now, 30 year after attainment of optimal balance, Japanese diet is again became imbalanced. This time, excess fat because of westernized diet.
- Currently Japanese gov. conducts national program called “shoku-iku” (food education) to promote well balanced Japanese style diet.

3.2.1. Livelihood improvement movement “KAIZEN in daily life”

1. Community development focused on women group
2. Covers all aspect of livelihood: Nutrition, household condition, labor saving, income generation
3. Make best use of local resources
4. Problem solving by themselves

Food taboos for pregnant women

全国の食べてはいけない迷信を集めると

妊娠中、母、流早産、栄養失調、脚気、先天弱性、産

甘いもの (全口各地)

辛いもの (全口各地)

すいもの (全口各地)

油もの (全口各地)

魚類 (九州、中国)

貝類 (九州、中国)

鶏 (7県)

豚 (7県)

兎 (32県)

ごぼう (中国)

迷信調査研究会編「俗信と迷信」より 迷信の存在形態に関する調査

Assessment of work load during cooking in an inefficient kitchen environment

ある農家の主婦が 或る日の昼の食事の準備に歩いたあと

1回の炊事に (農業技術研究所調べ)

歩いた距離 86回 2尺

使った時間 55分30秒

流しとかまどの間をもっと近くしたら
こんな仕事は考えなくて済むでしょう

Activities under Life improvement program includes,

- Changing dietary habit
- Improving kitchen environment for labor saving as well as health / hygiene improvement

Livelihood improvement movement



戸別に配分しておき、子どもやお年寄りが取りに来る 1962年
(愛媛県 近藤百合子氏提供)

Group based cooking
for labor saving

Activities were classified into three, 1) With Capital, 2) W/O Capital, 3) Capital Generating



Activities under Life improvement program includes,

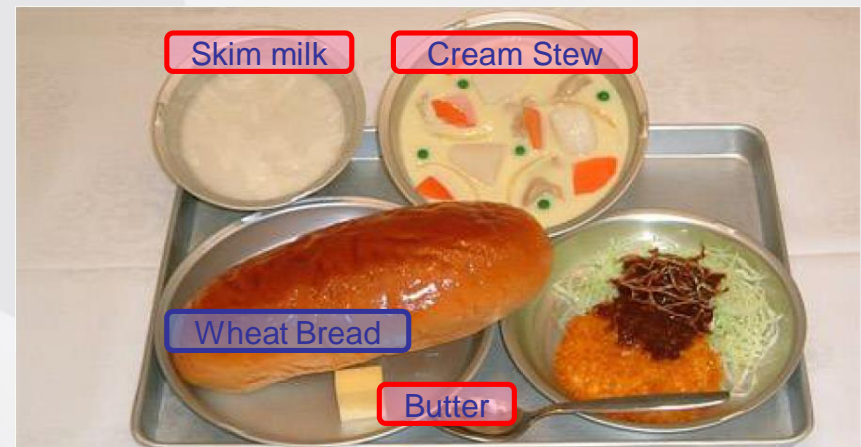
- Group based cooking to reduce women labor and improve nutrition
- At that time, no budget was available for activities and thus, extension officer classified activities into 3 category (1) with capital, 2) w/o capital, 3) capital generating) and advised women group to make implementable plan

3.2.2. School lunch

1. 1889: School lunch started, but halted during WW2
2. 1947: Resumed for 3 million children in large city with a support from foreign aid
3. 1954: School lunch operated as National program
4. School lunch became a major driving force to promote wheat bread and dairy products in Japan



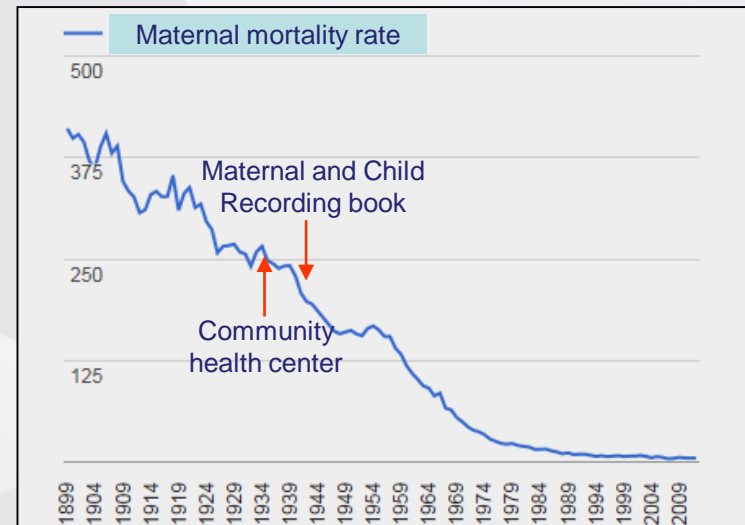
School lunch in 1942



School lunch in 1950

3.2.3. Maternal and Child recording book

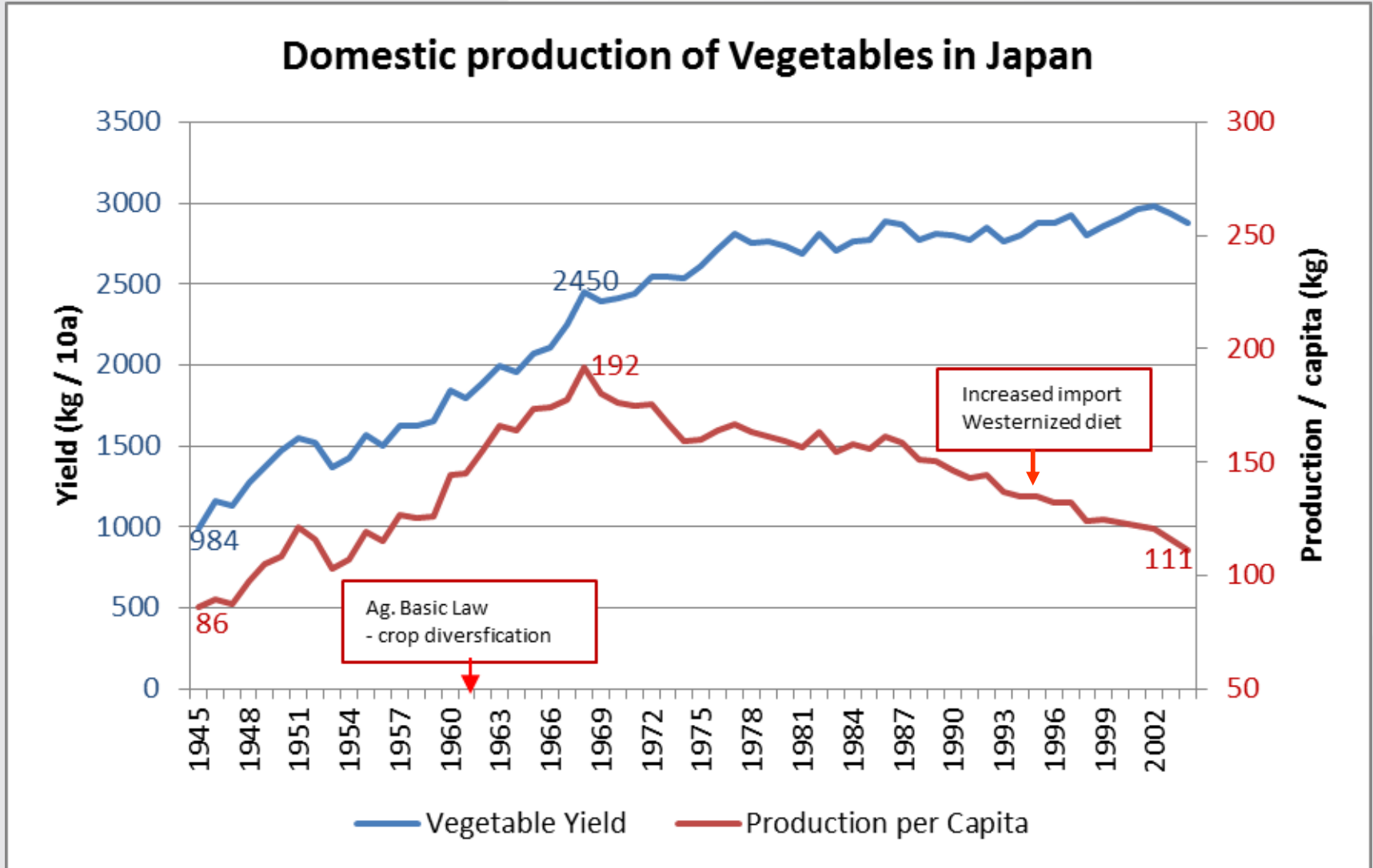
1. It started in 1942 as health care guidance during pregnancy to reduce death birth
2. With its privilege to get extra ration, it was rapidly promoted to pregnant women (over 70% in a few years)
3. After WW2, the coverage was expanded to include child care after delivery
4. It includes 1) health care guidance, 2) health care check list, 3) record of growth and health service



3.2.4. Crop diversification after 1960's

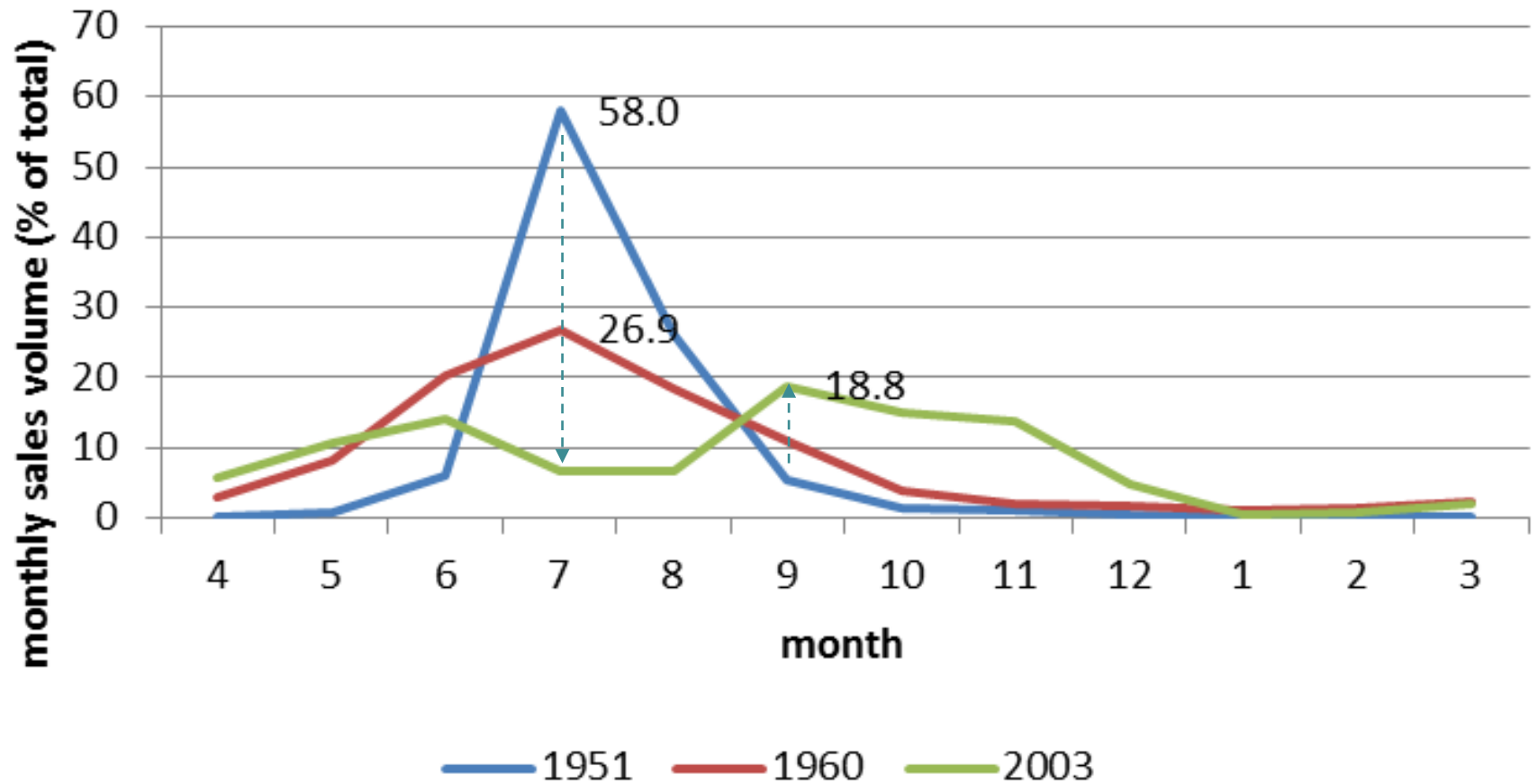
1. Establishment of research network (6 National Ag. Research institutes)
2. Variety introduction
 - (Public) More than 200 vegetable varieties from around the world
 - (Private) Promotion of high yielding F1 varieties
3. Year round supply system
 - Varieties (early / late maturing)
 - Cultivation practice (greenhouse, tunnel, Nursery)
 - Shifting cultivation (North-South, High-Low elevation)
 - Storage / Transportation (cold chain, packaging)
4. Agricultural basic law (1961)
 - Selective expansion of agriculture (shift from rice based agriculture toward diversified Ag. -> horticulture, livestock)

Rapid expansion of Horticulture after WW2



Establishment of Year round supply system

Toward year round supply (case of tomato)

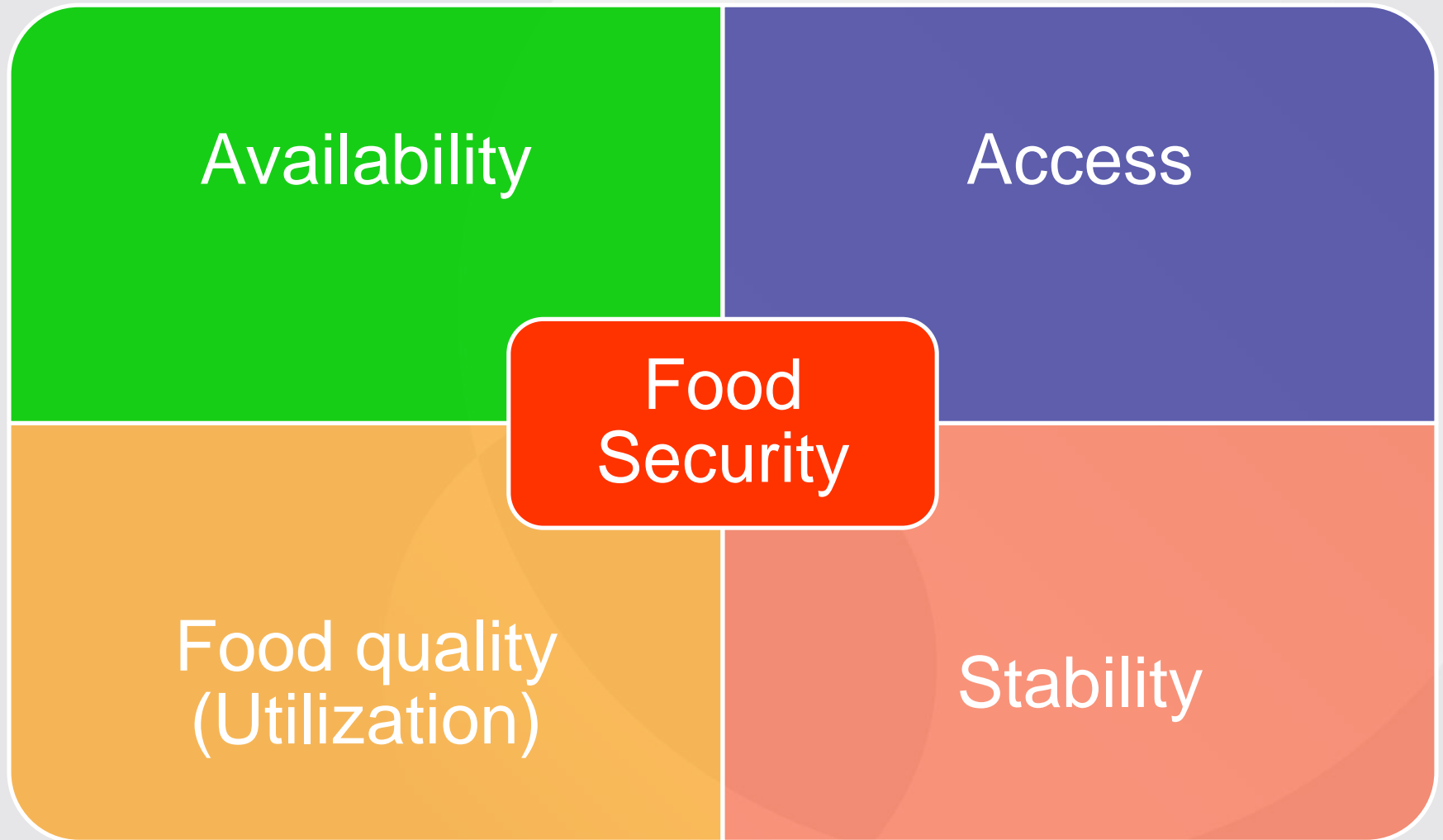


3.3 Summary

1. Foreign Aid contributed significantly to quick recovery from serious hunger
2. Following foreign aid, different intervention have been made from agriculture, community worker, health care, education to become self-reliant
3. Even after overcoming critical stage of undernutrition, Japan have been facing issue of imbalanced diet
4. Again, it was improved with the intervention from multiple sector. However it took several decades to change dietary habit of Japanese
5. Japan still has nutrition issues. This time, overnutrition due to westernized diet is an emerging challenge

4. FOCUS AREA IN SDG2

Tackle SDG2 through four pillars of food security



Four pillars of food safety: Proposed and agreed in World Food Summit (1995)

JICA's focus on SDG goal 2

	Japanese experience	Priority are of action
Availability	Variety development, Crop production technology, Irrigation, Aquaculture	Development planning survey, Rice farming (CARD), Irrigation, Post harvest, Aquaculture
Accessibility	Crop diversification Food safety OVOP	SHEP, Value addition, SPS, Pesticide management, Quality certification system
Utilization	Livelihood Improvement Maternal & child recording book, School feeding, Nutritionist	IFNA Livelihood improvement Maternal & child recording book
Stability	Pond irrigation, Farm guide in accordance with weather forecast	Drought resistant technology Water saving irrigation Crop insurance

CARD: Coalition for African Rice Development

SHEP: Smallholder Horticulture Empowerment and Promotion

IFNA: Initiative for Food and Nutrition Security in Africa

5. HOW WE TRY TO ADDRESS FOOD AND NUTRITION SECURITY? (THREE CASE)

How we try to address Food and nutrition security?

Apply old approach to a new challenge

5.1 Nutrition

- Livelihood improvement

Tackle to the challenge through research & innovation

5.2 Productivity

- Development of crop genotype suited for local environment through innovative approach

5.3 Resilience

- Sustainable Food Production and Efficient Water Use by Advanced Aquaponics

5.1 LIVELIHOOD IMPROVEMENT (KAIZEN)

- APPLY OLD APPROACH TO A NEW CHALLENGE -

WHY NUTRITION BECOME A PROBLEM?

- Food is limited due to low productivity
- Staple is satisfied, but dietary diversity is limited
- Lack of purchasing power for nutritious food
- Knowledge in nutrition is limited
- hygiene and sanitation

⇒ there could be many reason,
However we can also observe another situation in Africa

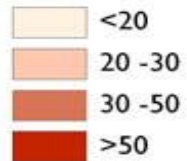


Nutrition status in Madagascar

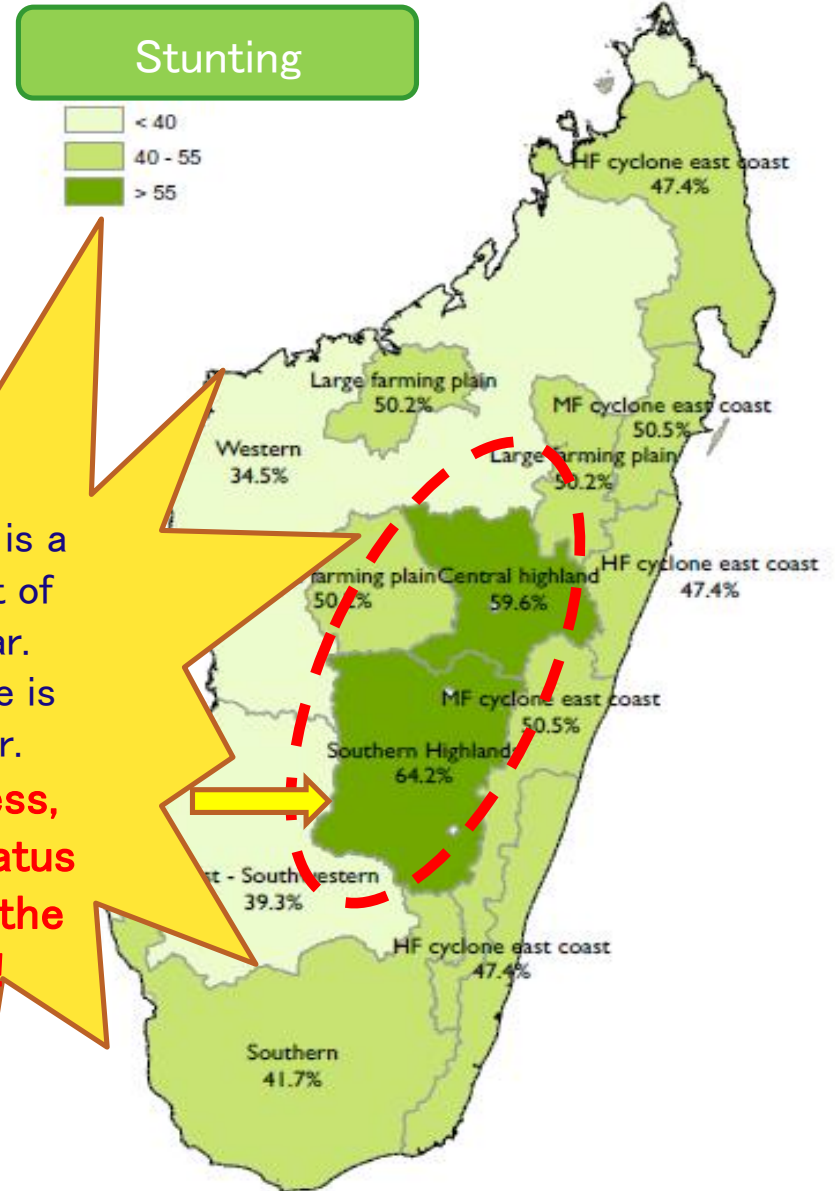
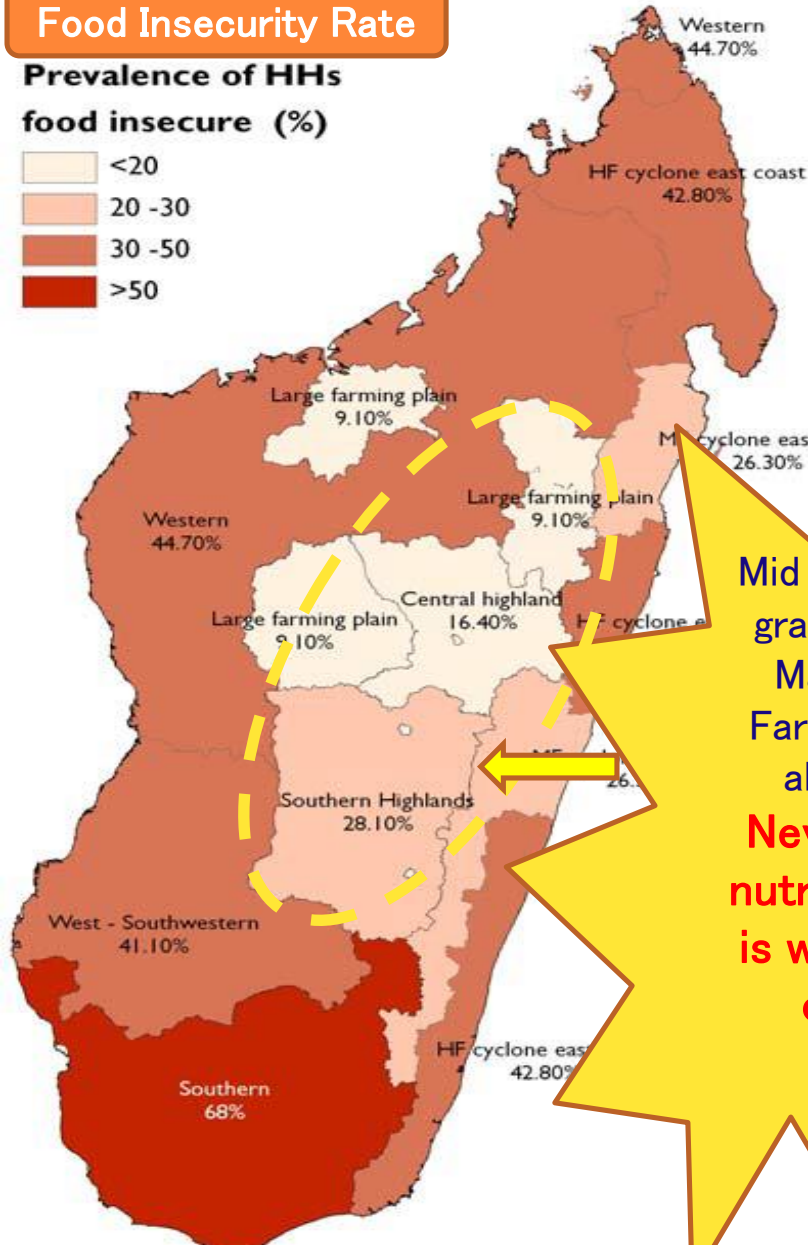
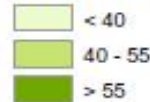
Let's compare two maps below!

Food Insecurity Rate

Prevalence of HHs food insecure (%)

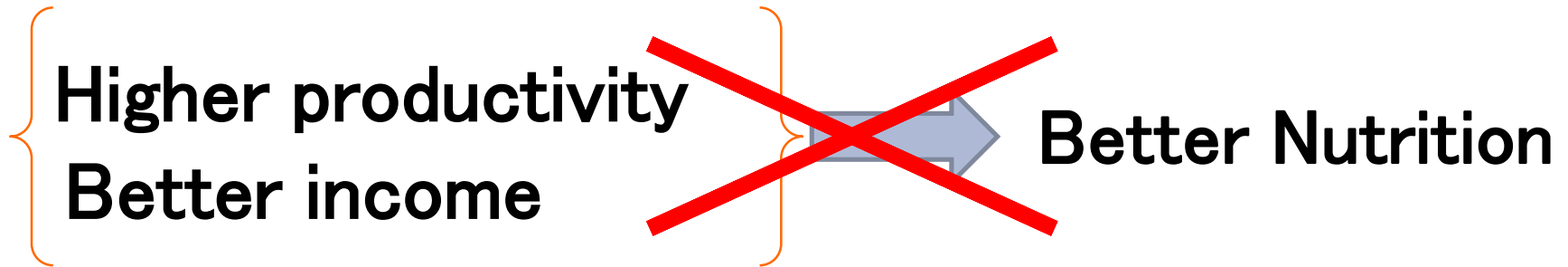


Stunting



Mid highland is a grain basket of Madagascar. Farm income is also better. Nevertheless, nutrition status is worst in the country!

A COMMON PITFALL



【Another case: Cyuve District in Rwanda】

Land development project: Maize/wheat production × 6 times!

Potato/cassava production × 3 times!

⇒ Income 60% increase

Farmer have enough amount of food

Nevertheless, stunting in this area is stagnant around 44–66%

(“Understanding Rwanda’s puzzling nutrition paradox”(2015) by International Center for Tropical Agriculture(CIAT))

⇒ **Production / income only cannot improve nutrition!**



CASE:

NUTRITION IMPROVEMENT THROUGH “LIVELIHOOD IMPROVEMENT” IN MADAGASCAR

- Target Area: Bongolava, Vakinankaratra, Itasy (Central highland)
- Implementation cycle:

- Prompt implementation after farmer introductory training
 1. Problem/gap assessment: root cause of the identified issue? , 3M(Muda, muri, mura)?, resource(time, money, food) availability?,
 2. Action planning: Start from simple action which does not require extra resource. Seek for technical advice as required
 3. Action implementation
 4. Action evaluation: including discussion of next action
- Continue cycle 1–4
- “Action” is called as “Kaizen (progressive improvement)”

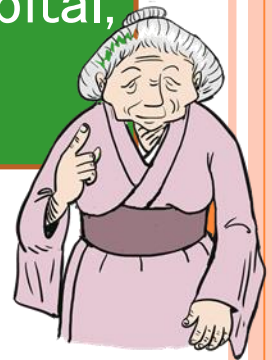
ORIGIN OF “LIVELIHOOD IMPROVEMENT”

- Initiated during WW2 recovery process
 - similarity with current challenges in Africa
- Focusing on “total quality of life”
- Implemented through “Women extension worker”
 - Special focus on vulnerable rural women
- **KAIZEN**: production management system of world leading automobile manufacture, “TOYOTA”



Five principle in Livelihood improvement

- ① **Dual track approach**: Agricultural productivity and total quality of life
- ② Fostering **Self reliant farmer**: to identify problem and solution by themselves, without relying on external support
- ③ Make most use of **locally available resource**, start from what you can do now (limited budget is not an excuse)
- ④ **Progressive approach** (not an innovation!): start from small & easy step, followed by next action (Spiral implementation)
- ⑤ recommend **group based approach**: to share idea, capital, and labor, but not mandatory



Five principle in Livelihood improvement

① Balance between productivity and quality of life

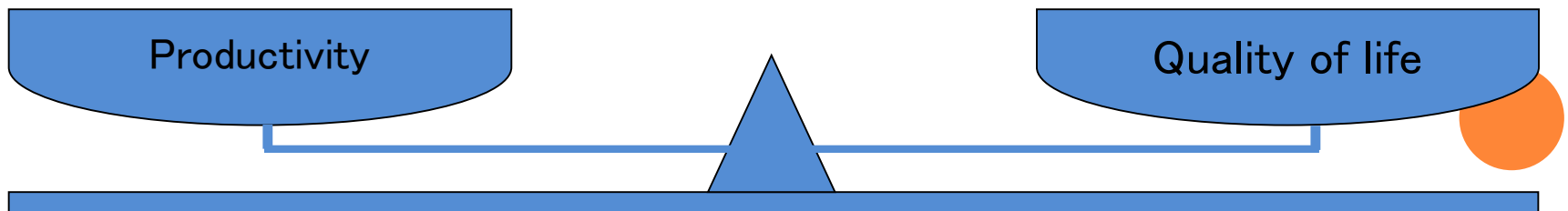
Two wheel on the axle to achieve poverty reduction

Productivity=

- Crop production
- Other income generation
- Ag. inputs (ex. Seed, fertilizer, machinery)

Quality of life=

Nutrition, Health & care,
literacy, water,
environment, neighborhood
safety, healthy, lifestyle



Five principle in Livelihood improvement

② SELF RELIANT FARMER

self reliant farmer = «think by themselves»

- Identify problems from daily life, analyze it and find solution by themselves
- Do not rely on external support (government, donnor)
- make use of what is available, start from what they can do now by themselves (start from small and easy action)
- spiral implementation of the above process



WHAT IS 3M?

- **MUDA** (= waste)
(save time, labor, resource)
- **MURI** (= beyond the limits)
(lack of feasibility, overwork)
- **MURA** (= uneven performance)
(planning, household budget management)

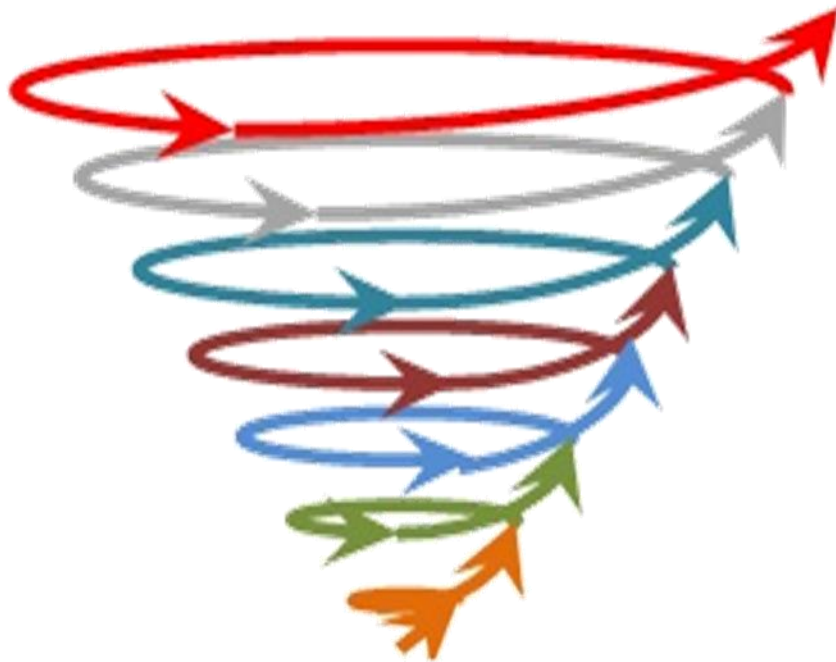


Five principle in Livelihood improvement

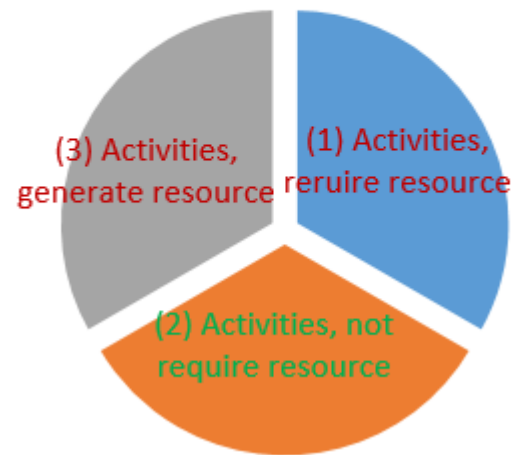
③ progressive implementation (spiral approach)

Spiral approach based on PDCA

- Plan
- Do
- Check
- Act



Three category of activity
from (1) to (3)



Spiral implementation case (cook stove)



Problem 4 : too much smoke, indoor air polluted.



Solution 4 : chimney.



Problem 3 : too low, backache.



Solution 3 : Level up.



Problem 2 : broken in contact with water.



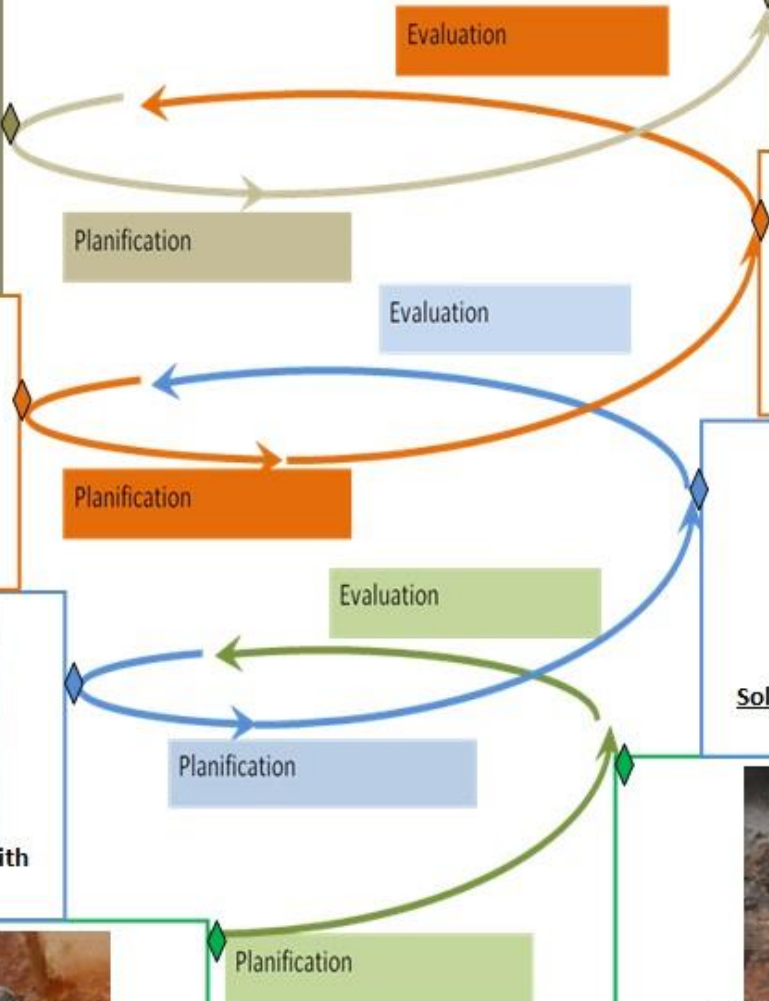
Solution 2 : Strengthen by more red earth and less clay.



Problem 1 : Lack of firewood.



Solution 1 : use of improved stove.



During livelihood improvement, extension officer provide only tips. It is farmer to improve initial model in a progressive manner (durability, workability, smoke emission)

COMPATIBILITY BETWEEN “LIVELIHOOD IMPROVEMENT” AND “NUTRITION”

- **Improve production and life through combined approach**

Production is necessary, but not sufficient condition.

Activity in daily life including, “selection of food”, “cooking”, “dietary practice”, “hygiene practice” have to be added to achieve final nutrition target

- **Activity focused on women in household**

Women (mother) = key actor for HH nutrition improvement

Women’s common interest = child health, cooking, shopping

- **Multi sectoral activity**

Nutrition improvement is multi sectoral in nature

- **Conduct “trial and error” from different aspect**

Impact of nutrition improvement is not easily visible at early stage. Livelihood improvement can try variable approach through spiral implementation



NUTRITION IMPROVEMENT THROUGH “LIVELIHOOD IMPROVEMENT”

【Direct impact】

- **Nutrition education at community level**
Foster nutrition trainer in a community through training by health department
- **Cooking recipe development**
Focus on taste rather than Nutrition
- **Food processing (preservation/value add)**
dried food, cheese, groundnut oil, cassava powder
- **Kitchen garden**
work with nutrition department
- **Fish farming**
Tilapia, Carp
- **Livestock (poultry, swine)**
Bottleneck = Vaccination
- **Seek for local nutritious food resource**
Moringa, silkworm
- **School feeding**



NUTRITION IMPROVEMENT THROUGH “LIVELIHOOD IMPROVEMENT”

【Indirect impact】

《hygiene & sanitation》

- well
- toilet installation
- Wash campaign



《Environment》

- afforestation (for firewood)
- ## 《Women empowerment》
- Literacy education

《Income generation》

- small business for women
- HH budget management



《develop kitchen tool》

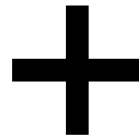
- Improved cook stove/Solar cooker
- grass char
- Grater
- Oil expresser



WHAT IS REQUIRED FOR NUTRITION IMPROVEMENT

- MULTI SECTORAL NATURE OF LIVELIHOOD IMPROVEMENT -

Food access



Dietary habit

- Crop productivity
- Farm income
- Crop diversification
- Value chain development

- Dietary behavior change
 - ⇒ Balanced diet
 - ⇒ Selection of nutrition dense food
 - ⇒ Appropriate cooking method

Water & sanitation

Diarrhea

Gender

- Maternal knowledge, involvement to decision making (literacy, HH budget management, processing and cooking)
- Small business

Other

- Irrigation development
- Environmental protection



5.2 PRODUCTIVITY

**PROJECT FOR THE DEVELOPMENT OF CROP GENOTYPES FOR
THE MIDLANDS AND MOUNTAIN AREAS OF NORTH VIETNAM**

Project concept

Challenge: Narrowing gap between Urban and Rural

Challenges of rice production in the midland and mountain areas of North Vietnam

- Low yield
- Pest & disease
- Non uniform varieties
- Lack of suitable varieties

Activity

Output 1: Breeding method is improved using high-throughout genotyping technology

Output 2: Promising line with short growth duration, high yielding, and disease and insect resistance are developed

Output 3: Eco-physiology of promising line is characterized

Project purpose: Rice breeding system is strengthened to develop promising lines adapting for natural and socio-economic conditions in the midlands and mountain areas of North Vietnam

Science and Technology
Research Partnership for
Sustainable Development

- short growth duration (10 days shorter)
- High yielding (5-10%)
- disease resistance, cold tolerance

- 地域環境に適した米の安定生産
- 早生イネ品種導入による多毛作
- 稲作収入増による貧困削減

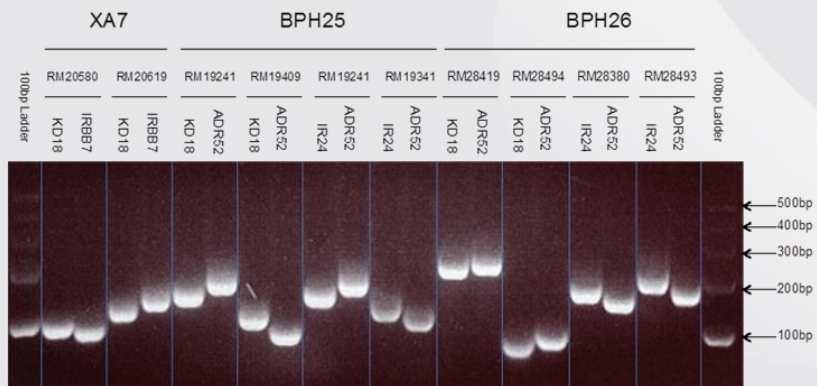
Output 1: Breeding method is improved using high-throughput genotyping technology

Challenge 1: Conventional breeding technology require number of years

Activity

- Genetic survey to identify useful genes
- Optimize DNA Marker Assisted Selection by high-throughput genotyping technology
- Shuttle breeding making use of high temperature in Mekong delta

DNA marker assisted selection reduce period of breeding cycle dramatically



Shuttle breeding also shorten period of field test by half

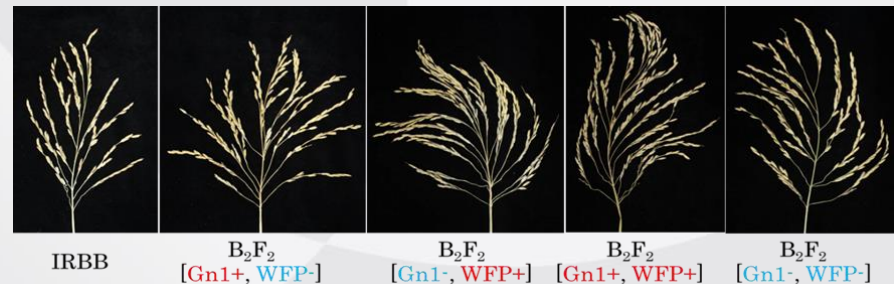


Output 2: Promising line with short growth duration, high yielding, and disease and insect resistance are developed

Challenge2: Cool temperature in Northern mountainous area allow one production season during a year, resulted in low productivity

Activities

- Develop promising lines with single useful genes
- Accumulate useful genes (pyramiding) in promising lines
- Evaluate phenotypical traits of promising lines

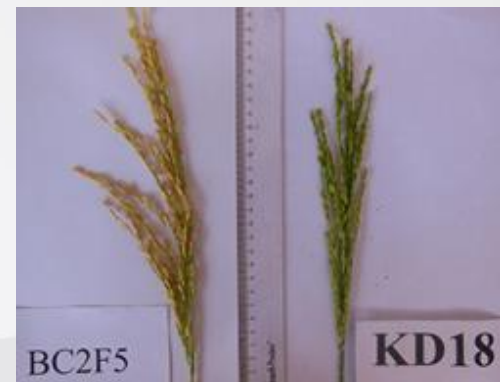
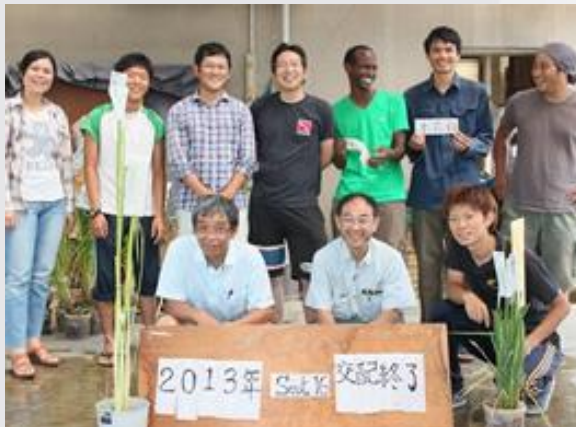


Output 3: Eco-physiology of promising line is characterized

Challenge2: Cool temperature in Northern mountainous area allow one production season during a year, resulted in low productivity

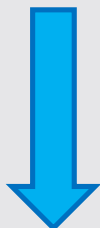
Activities

- Characterize physiological property of available and newly developed lines
- Test ecological adaptability of available and newly developed lines
- Compile information for recommended cultivation method of promising lines



Impact of the project

- short growth duration (10 days shorter)
- High yielding (5-10%)
- disease resistance, cold tolerance



Newly identified two breeding lines have already introduced to 500ha of farm in Northern Vietnam in 2016



- Application at other monsoon Asia
- Extension to Africa

世代促進



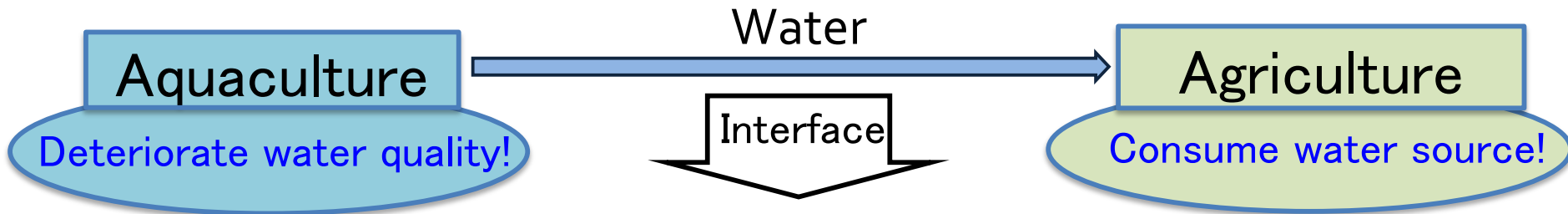
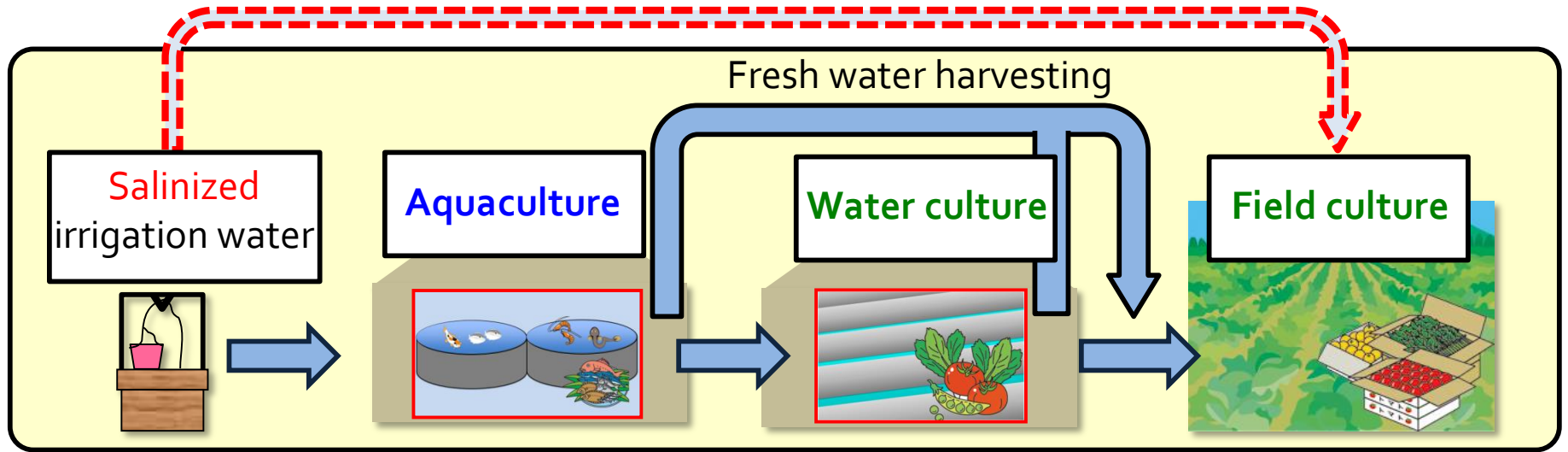
5.3 RESILIENCE

**SUSTAINABLE FOOD PRODUCTION AND EFFICIENT WATER
USE BY ADVANCED AQUAPONICS WITH FISH AND CROPS
ADAPTING TO ARID REGIONS IN MEXICO**

Objective

- ① Establishing new aquaponics adapting to arid region
- ② Capacity Development

Current water use



【Environmental Conservation】 Efficient water use ! Less salinity !

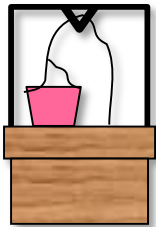
【Food Production】 Sustainable food production !

Steps

Use of salinized irrigation water → Aquaponics →
Water culture → Field culture
→ { Efficient water use • desalinization
Food production

Irrigation water

Salinized



Salts

N • P etc.

Aquaculture

Adapting species



constant

increase

Water culture

Salt-loving crops



decrease

decrease

Field culture

Valuable crops



irrigation

Water reuse



Efficient water use

Salt-loving crops



Desalinizing water and soil

Manual publication



Progressing popularization

Thank you very much!

Any question / feedback?

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