

Development of a Consistent Food Security Index (KUFSI)

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Introduction



KUFSI: Korea University Food Security Index



Estimated Results by Selected Countries



Concluding Remarks

Research Backgrounds

o. Soaring International food price : agflation

- Global Climate Change
 - Difficult to predict the yields and huge price risk
- Continuously increasing in demand for grains
 - Global population growth
 - Increasing consumption of meat
 - U.S. bioenergy policy

o. Difficulties in the food importing country

- Costly food imports and Cause of political instability
- Many countries have experienced riots

Research Objectives

- o. **To develop principles of Food Security Index**
- o. **To develop consistent food security index**
 - Korea university food security index (KUFSI)

Previous Indices

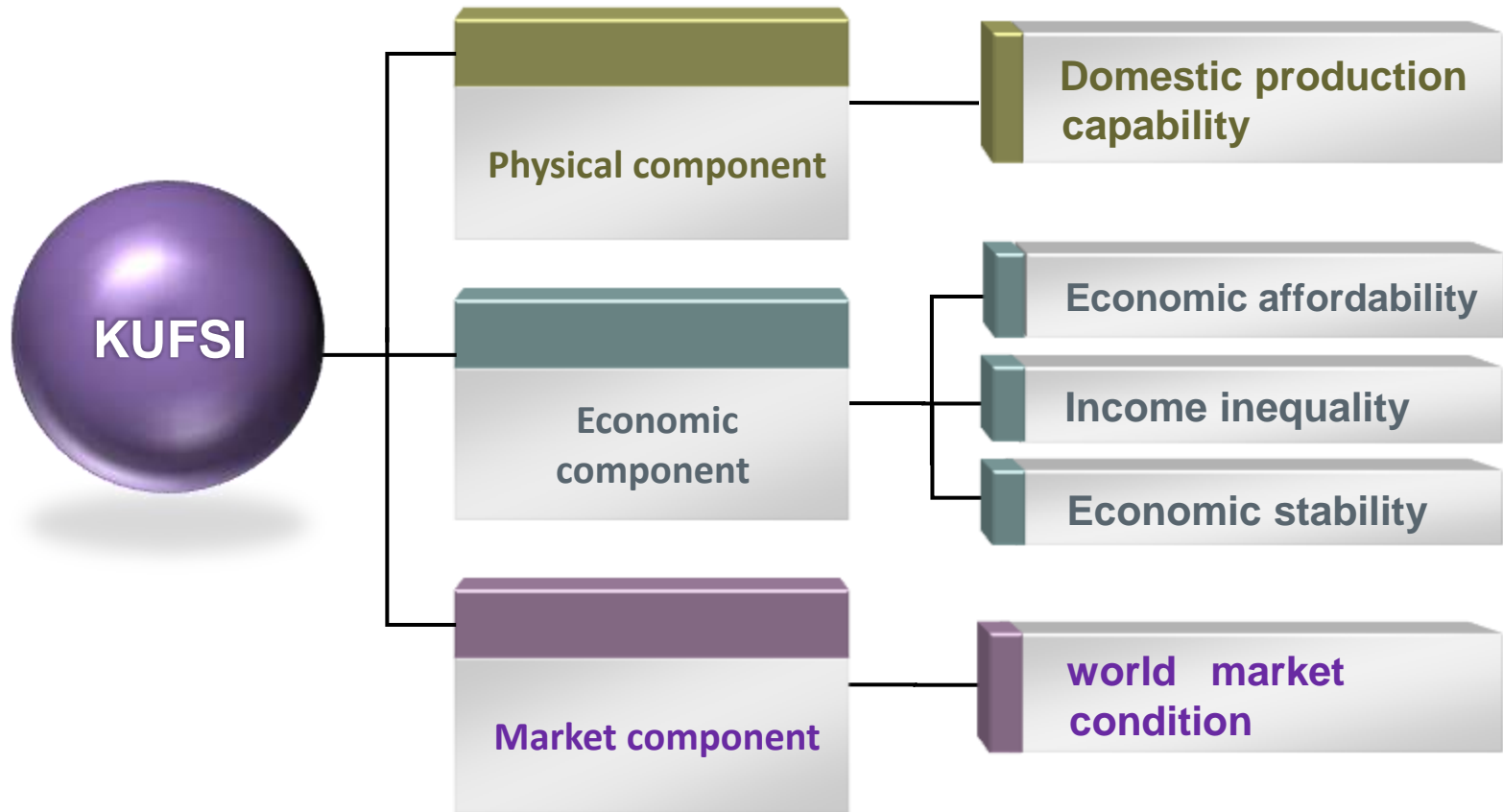
- **International Fund for Agricultural Development (1996)**
 - First to develop a FSI
- **KREI (2000) and NHREI (2009) extended IFAD's Index**
 - Cannot serve as an indicator of overall food security situation
- **KREI's New Food Security Index (2011)**
 - Improved but still ambiguous and too complicated
- **SERI's FSI (2011)**
 - incorporates two factors: food security and food safety
 - no clear implications
 - difficult for inter-country comparisons

The Principles

- **Boundedness**
 - FSI should give numbers bounded on $[0,1]$
- **Reliability**
 - FSI should be calculated with reliable data
- **Duplicability**
 - FSI's formula should be clear and duplicable
- **Applicability**
 - FSI should be easily applicable to any country

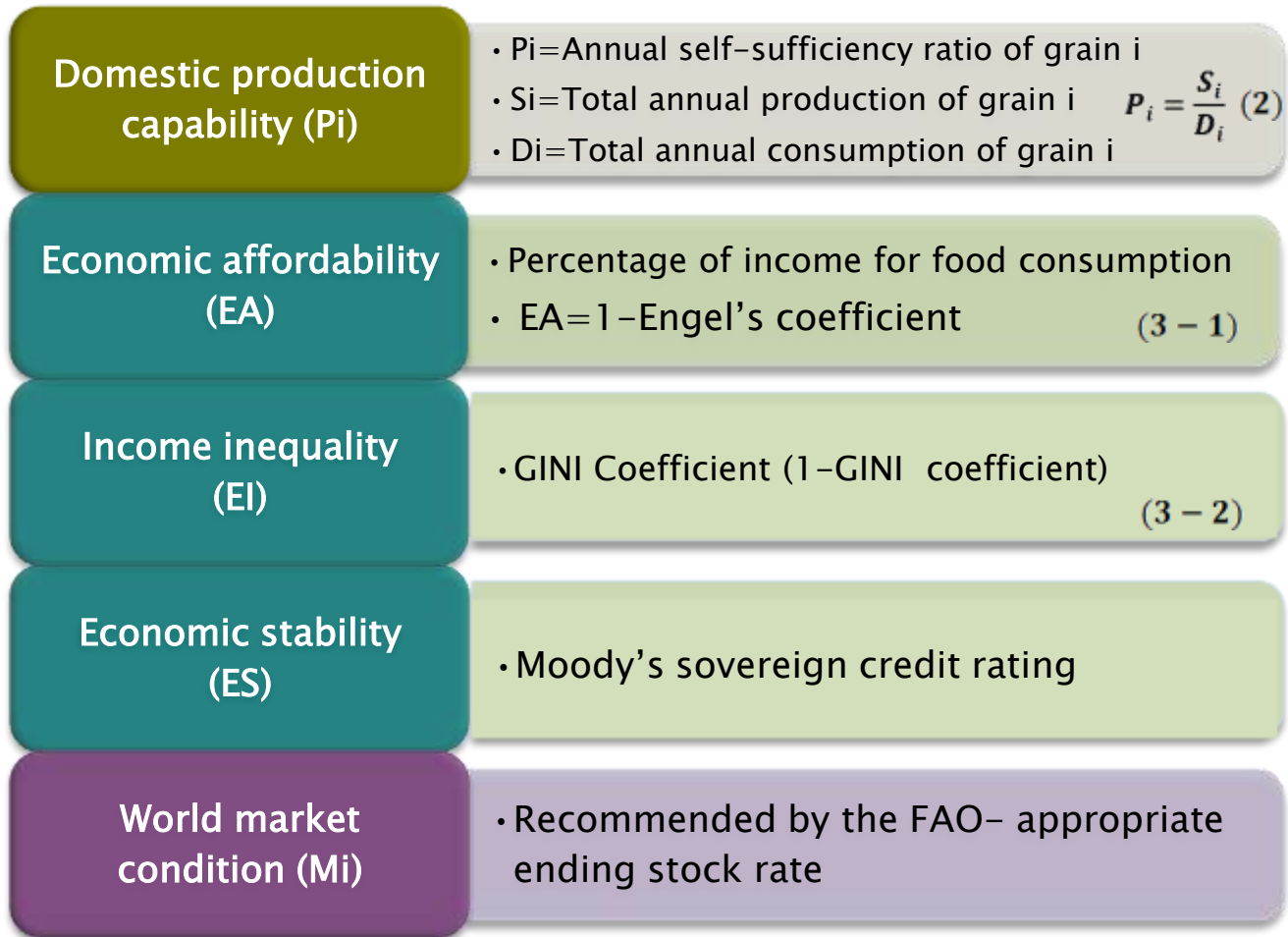
Structure of KUFSI

<Figure 2> Three Components of KUFSI



KUFSI - Model

Commodity $KUFSI_i = P_i * EA * EI * ES * M_i$ (5)



KUFSI - Model

KUFSI(aggregate) = Weighted sum of KUFSI_i

$$KUFSI = \sum_{i=1}^n W_i \times KUFSI_i \quad (6)$$

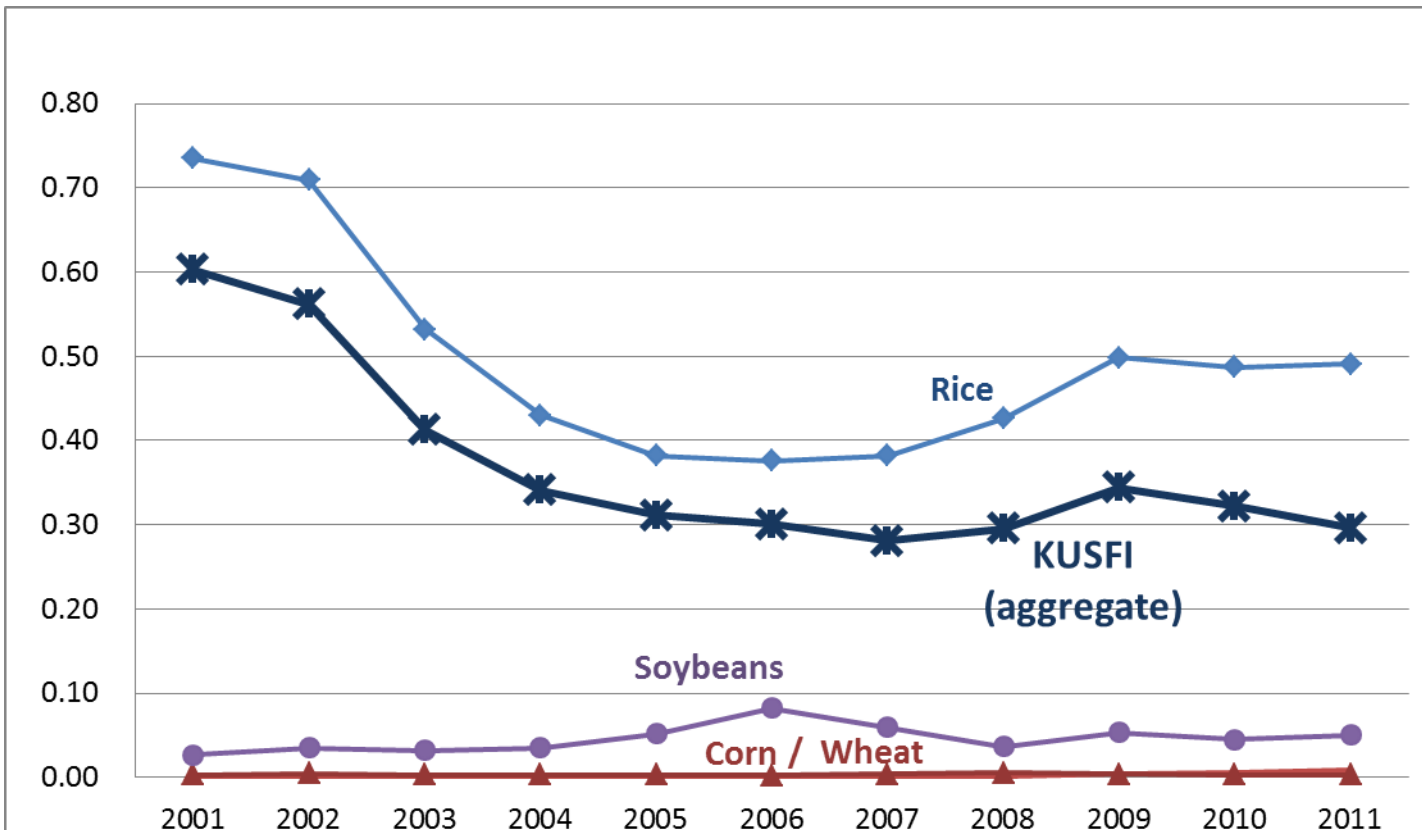
$$W_i = \frac{\text{Value of grain } i \text{ supplied}}{\text{Total value of grain } i \text{ supplied annually}} = \frac{(G_i \times Q_i)}{\sum_{i=1}^n (G_i \times Q_i)}$$

$G_i = \text{Price of grain } i$

$Q_i = \text{Annual supply of grain } i$

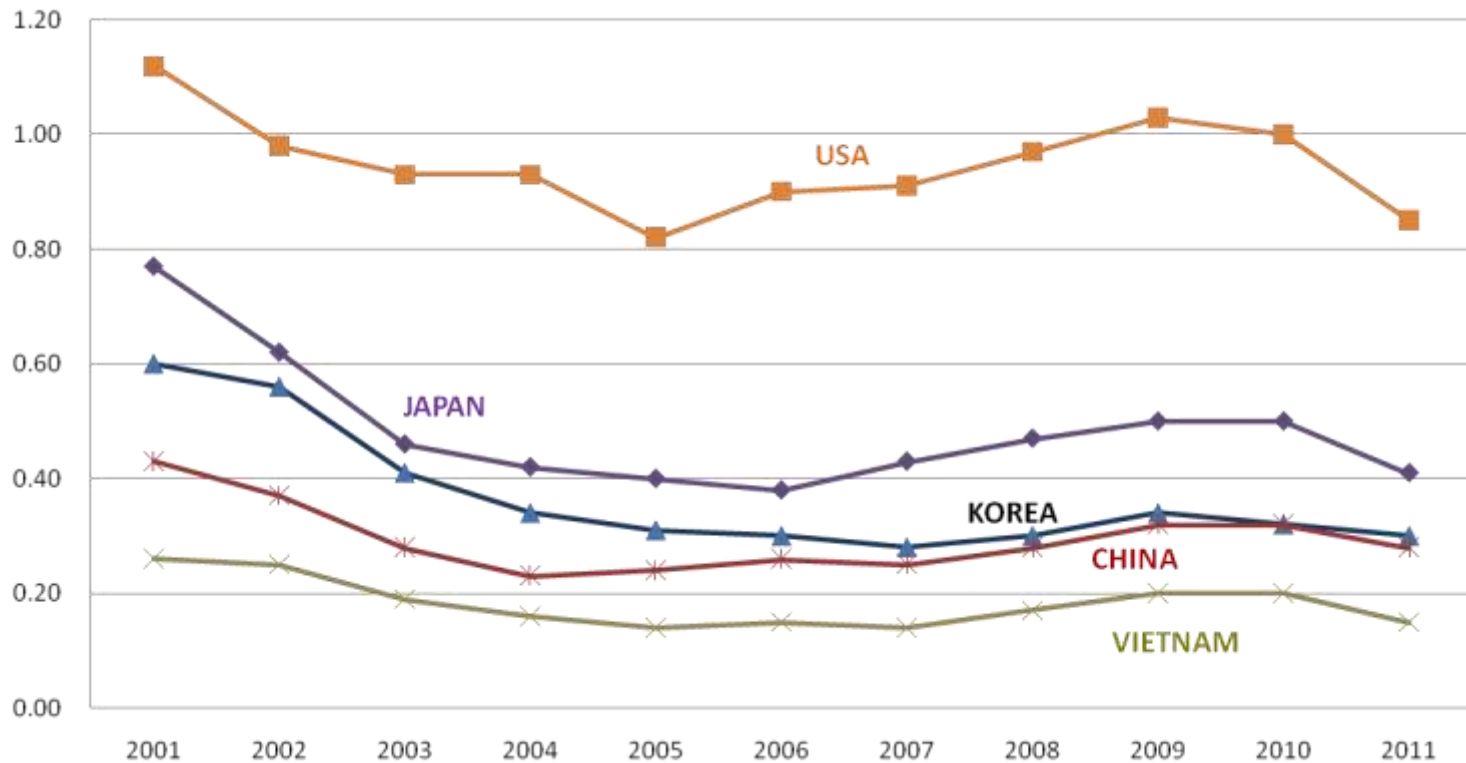
KUFSI - Results

<Figure 3> Commodity KUFSI of Korea: 2001-2011



Estimated KUFSI by Selected countries

<Figure 5> Aggregate KUFSI of Selected Countries: 2001-2011



Concluding Remarks

- This study developed a food security index that is consistent with four principles: **boundedness, reliability, duplicability, and applicability.**
- KUFSI is **easy to interpret and reliable.**
- The KUFSI is composed of three components: **physical, economic, and market component.**
- The KUFSI is calculated in **quantity term** as well as **calorie term.**
- It measures a country's capability of accessing to food needed as a whole.
- The KUFSI can be **compared across time and with other countries.**
- The index can also be used to build **early warning systems** for individual countries.



Dept. of Food and Resource Economics

Types of KUFSI

KUFSI

Quantity Based Index

- Used four main staple grains
- Easy to understand and Compute
- Consistent with general perception

Calorie Based Index

- Possible to include meat consumption in calculation of Self-Sufficiency Ratio
- Possible to reflect nutritional dimension
- Incorporates national dietary patterns

Calorie Based KUFSI

$$\text{Calorie KUFSI}_i = PC * EA * EI * ES * M \quad (7)$$

$$PC = \frac{\text{Domestic calorie supplied by total food}}{\text{Total calorie supplied by total food}} = \frac{\sum_{i=1}^n F_i \times K_i \times R_i}{\sum_{i=1}^n F_i \times K_i}$$

F_i = Quantity supplied by food_{*i*}

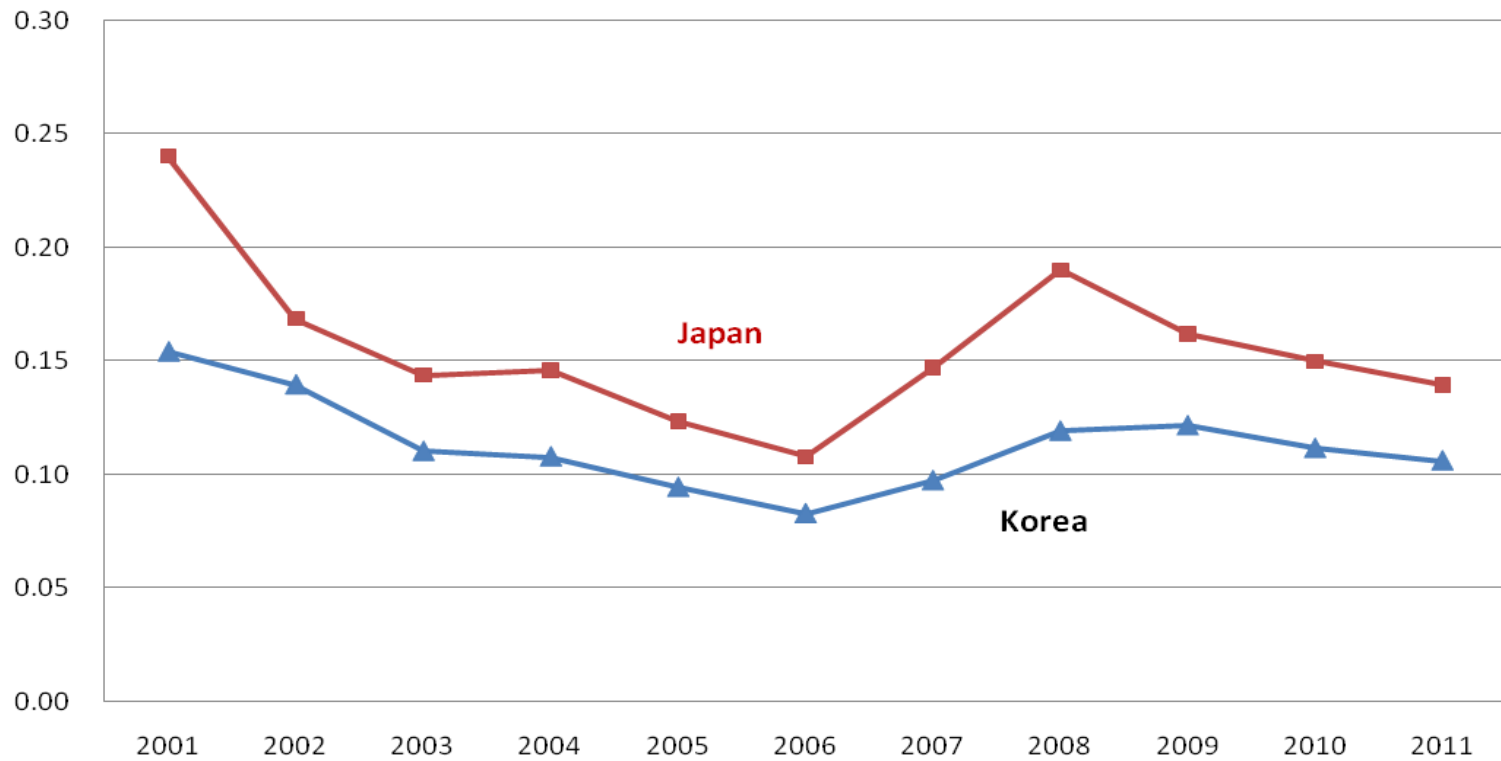
K_i = Calorie content per g by food_{*i*}

R_i = Self – sufficiency ratio by food_{*i*}

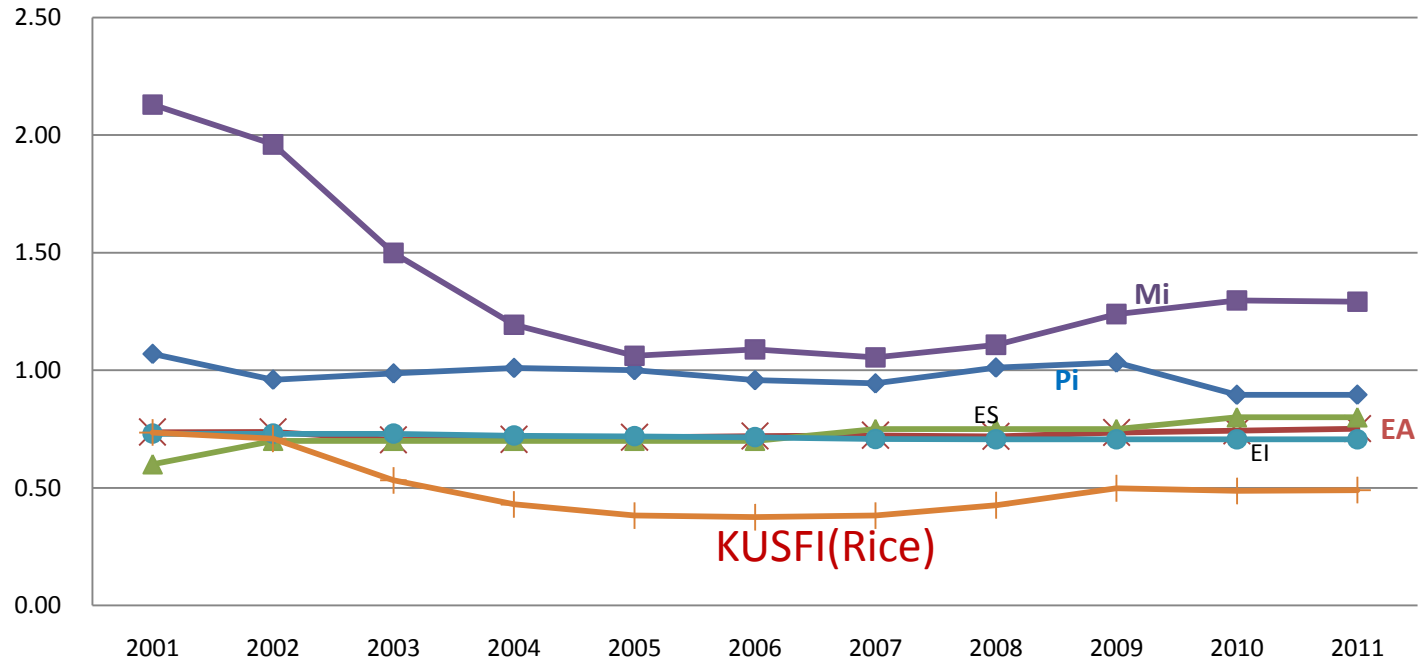
$$M = \frac{\text{Ending stock of world food}}{\text{Two month consumption of world food (FAO recommended)}}$$

Calorie Base KUFSI

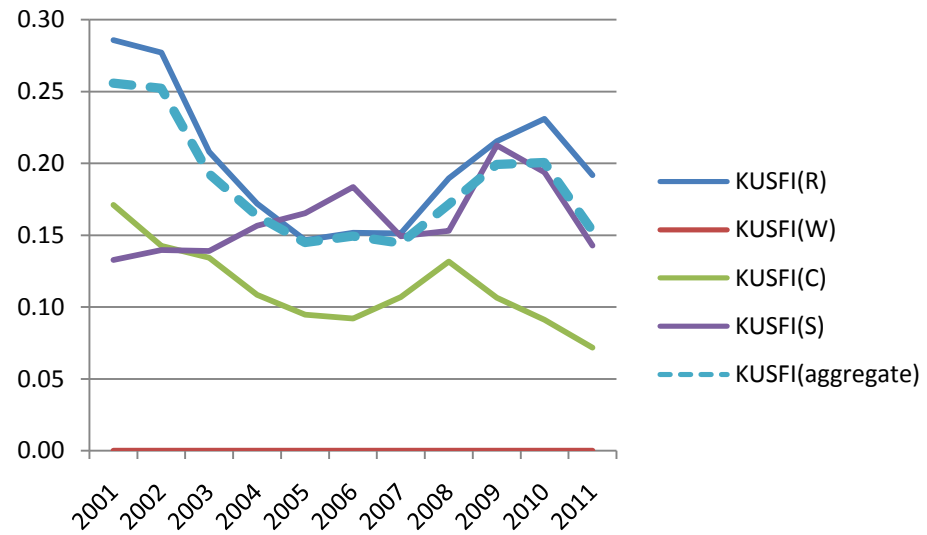
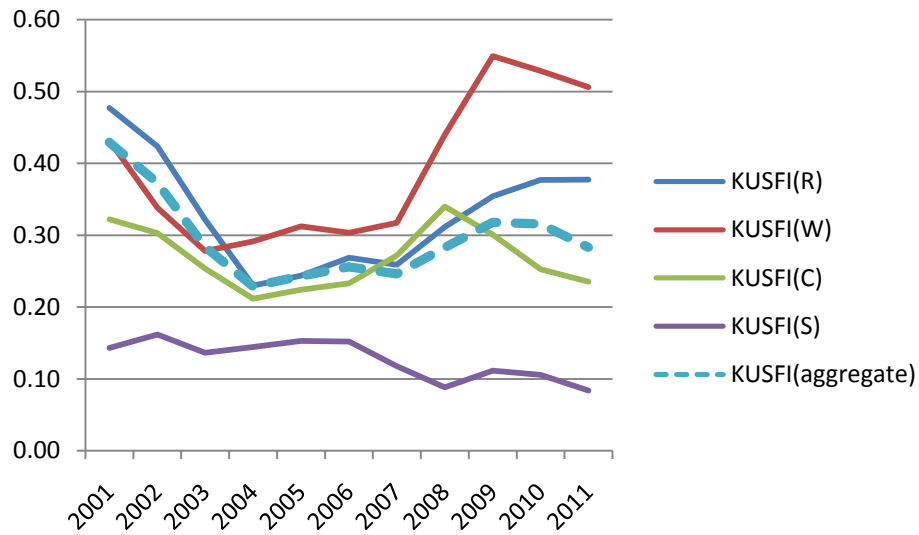
<Figure 6> Calorie KUFSI of Japan and Korea



Rice detail in Korea



China and Vietnam Data



USA and Japan Data

