IUFoST-IAFoST Scientific Session, as part of the Science Days of UN Food Systems Summit 2021.

'Global Food Systems Governance: The Role of Food Science and Technology'

July 5th 2021, 7:00-9:00 EDT, Online Session

Importance of Food Science and Technology in sustainable and resilient food systems – A Northeast Asian Perspective

Cherl-Ho Lee

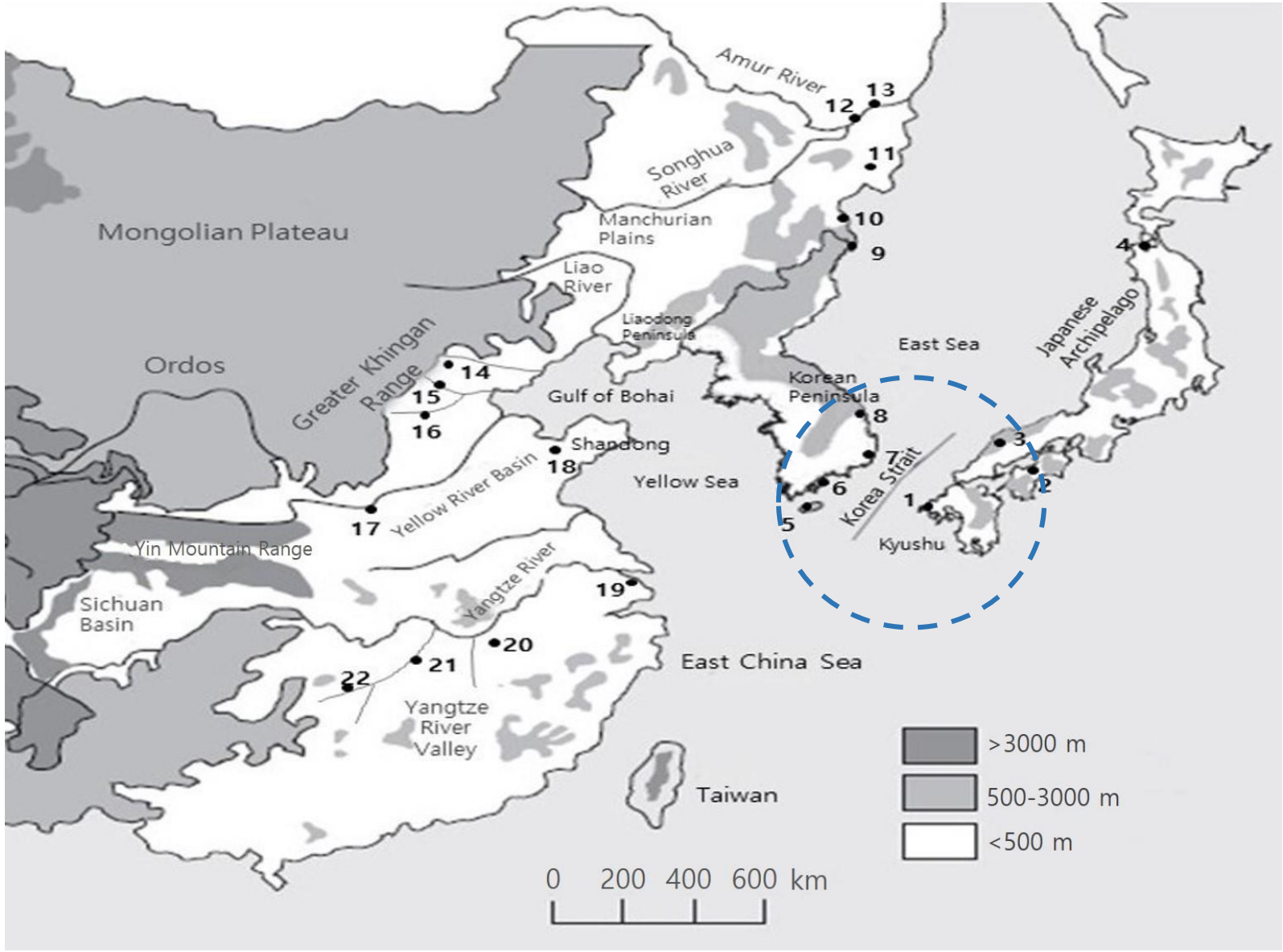
Korea Food Security Research Foundation

Emeritus Professor of Korea University

History of Food Science and Technology Development

- **Paleolithic Age – Use of Fire : Roasting and Drying**
- **Neolithic Age - Use of Pottery : Boiling and Fermentation**
- **Iron Age – Use of Pressure Cooker : Canning**
- **19th Century – Use of Electric Oven : Mass Production of Processed Foods**
- **20th Century – Use of Refrigerator : Plastic Packaging, Retort Pouch**
- **20th/21st Century – Use of Microwave Oven, Irradiation**

Primitive Pottery Sites along the Korea Strait Coastal Region



1 Fukui

2 Kamikuroiwa

3 Mawatari

4 Odai Yamamoto

5 Gosan-ri

6 Sangnodaedo

7 Dongsamdong

8 Osan-ri

9 Seopohang

10 Ustinovka

11 Almazinka

12 Gasya

13 Khummy

14 Hutouliang

15 Donghulin

16 Nanzhuangtou

17 Lijiagou

18 Bianbiandong

19 Shangshan

20 Xianrendong

21 Yuchanyan

22 Zengpiyan

(Cherl-Ho Lee, 2021)

Food Techniques in the Primitive Pottery Culture
(8000-5000 BCE)

- **Origin of Boiling Technique (Stew (*Jjigae)* and porridge cooking)**
- **Origin of salt-making technique from seawater**
- **Origin of salting of marine products (*Jeot-gal*, fish sauce)**
- **Origin of Kimchi fermentation**
- **Origin of *nuruk* and cereal alcoholic fermentation**

(Jjigae)

(Jeotgal)

(Kimchi)

(Maggeolli)

Nutritional anthropological significance of the Primitive Pottery Culture (8000-5000 BCE)

- **Improvement of food storage technology**
  - **Fermentation, Salting**
- **Improvement of nutrition and food hygiene**
  - ***Jjigae* culture**
- **Population increase**
- **Formation of tribal states (BCE. 3-4000)**
- **Megalithic culture, Eastern Archers tribe (*Dong Yi*)**

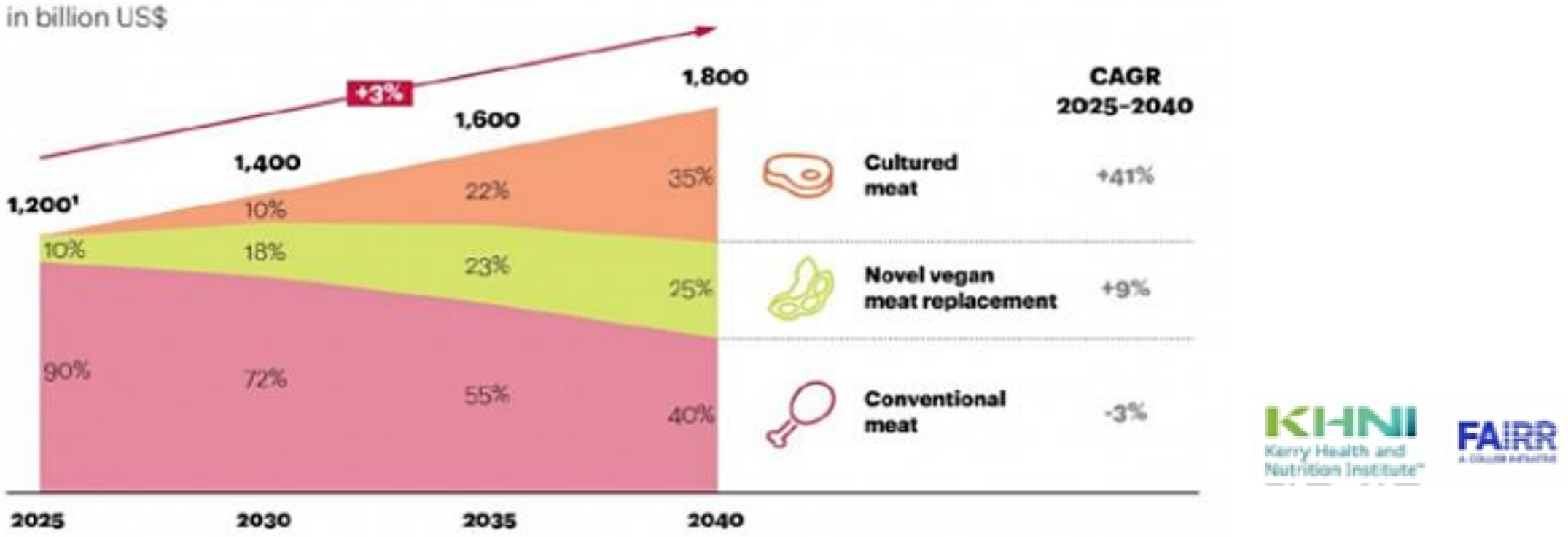
Food Use of Soybean and its Dissemination

- **Origin from South Manchuria and the Korean Peninsula**
- **Invention of Soybean Use for Food by Boiling Technology (ca. 2000 BCE)**
- **Invention of Soybean Fermentation by adopting Cereal Alcoholic Fermentation Technology from the Primitive Pottery Culture**
- **Transferred to China during the Spring and Autumn period (7th C. BCE)**
- **Spread out to Southeast Asia (ca. 4th-7th century CE.) by Chinese immigrants**
- **Introduced to Europe in the 18th century (Engelbert Kaempfer, German, 1712)**
- **First cultivation in USA by Samuel Bowen, Georgia, in 1764**
- **Breeding research by American agronomists for mechanical farming**
- **Important cash crop (Trade rate over 40%) produced mainly in US, Brazil and Argentina (World soybean production, 348 mill. tons in 2017)**
- **Among the 150 million tons of soybeans on the world market in 2017, 65% (97 million tons) was purchased by China**

World Food Crisis in the 21st Century

- Population increase: 750 mill. in 2020 ⟶ 900 mill. in 2050
- Climate change: global warming, CO_2 increase
- Animal food consumption: Who will feed China? (L. Brown, 1995)

Global meat consumption: By 2040, conventional meat supply will drop by more than 33%.

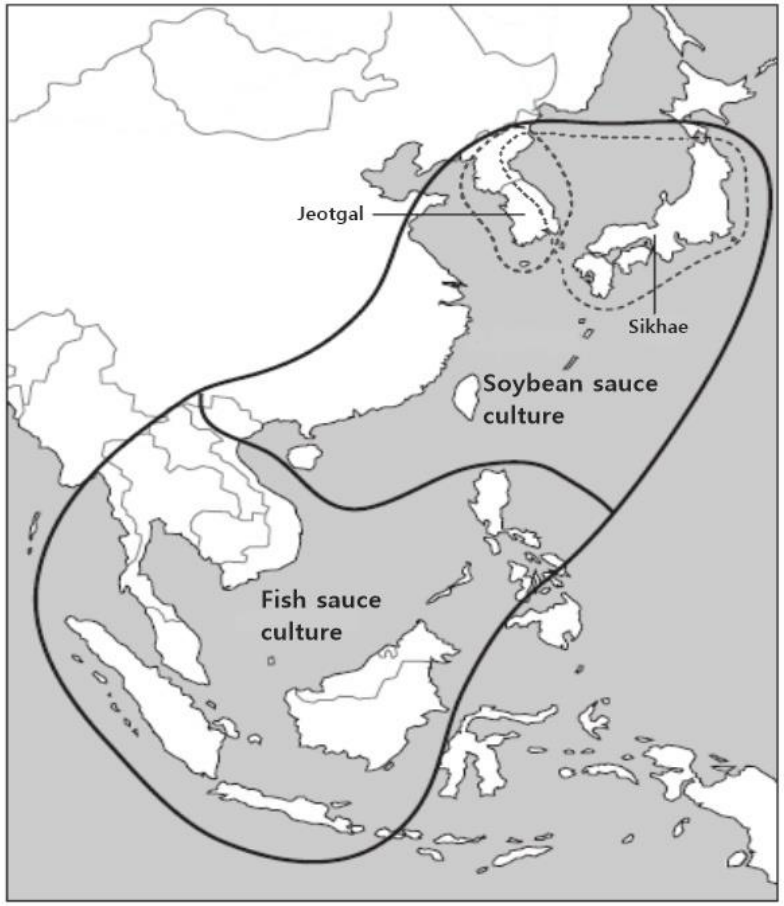


The first Meat Analog – *tofu* (soybean curd)

- **The origin is not known. Probably Northeast Asian nomads (*Dongyi*).**
- **First record appears in Song dynasty (960-1279) China.**
- **Veritable records of King Sejong (1434) of Joseon dynasty Korea describe the sending of tofu experts to Ming dynasty China.**
- **Korean captives taken to Japan during the Imjin War (1592-1598) opened *tofu* shops in Japan.**
- **A Korean food company, Pulmuwon USA, shares one-half of the US *tofu* market.**



Production of Meaty Flavor by fermentation



Division of Seasoned Food Culture in East Asia
(Ishige 1993, Modified by Lee C.H. 2021)

Fish fermentation – Fish sauce, Fish paste (*Jeotgal*)
Primitive Pottery Era (8000-5000 BCE)

Soybean fermentation – Soysauce, Soybean paste (*Doenjang*)
Bronze Age (ca. 1000 BCE)

Protein hydrolysis by enzymes/microorganisms – Peptides, Amino acids
Produce meaty flavor, Savory taste
Add palatability to the plane grain and vegetable foods
Protein conversion rate: soybean paste- 80%; beef- 5%

(*Jeotgal*)

(Sikhae)

(*Doenjang*)

What can Food Science and Technology Do?

- Economic use of food materials:
- Enhancing palatability of vegetable foods:
- Reducing food loss and waste:

The old wisdom in Traditional Foods will provide clues to solving future world food problems.