

Soy Sauce Production: From A Craft- to a Science-Based System



R. Valyasevi¹ and R. Rolle²

¹National Center for Genetic Engineering and
Biotechnology (Biotec), Thailand

²FAO Regional Office for Asia and the Pacific,
Bangkok, Thailand

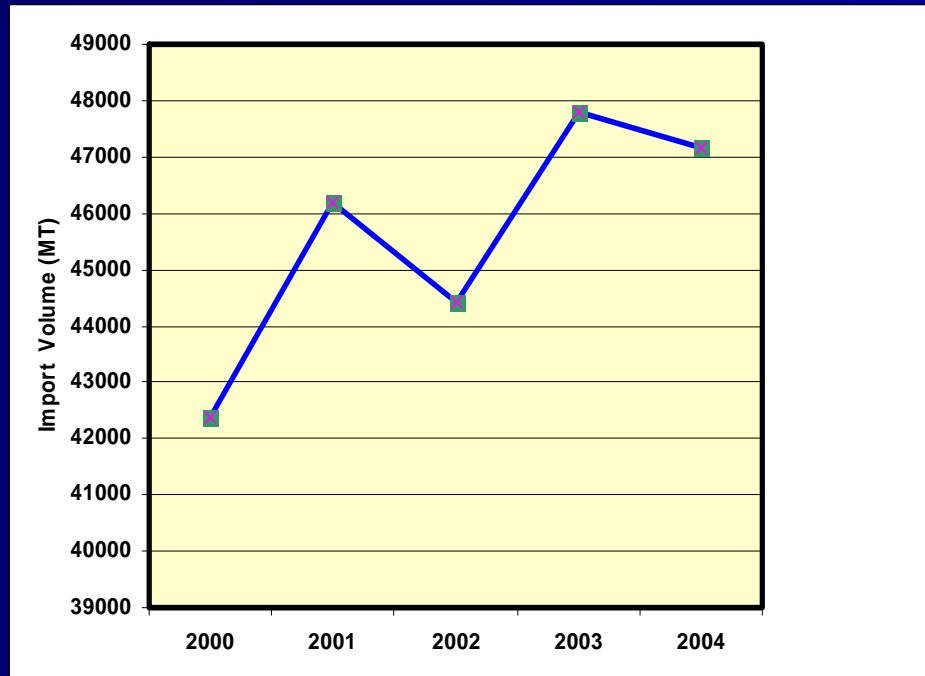
Soy Sauce

- Traditional Oriental food condiment
- Internationally known
- Popularly consumed
- Growing market opportunities
- Production contributes to livelihoods of small producers and processors



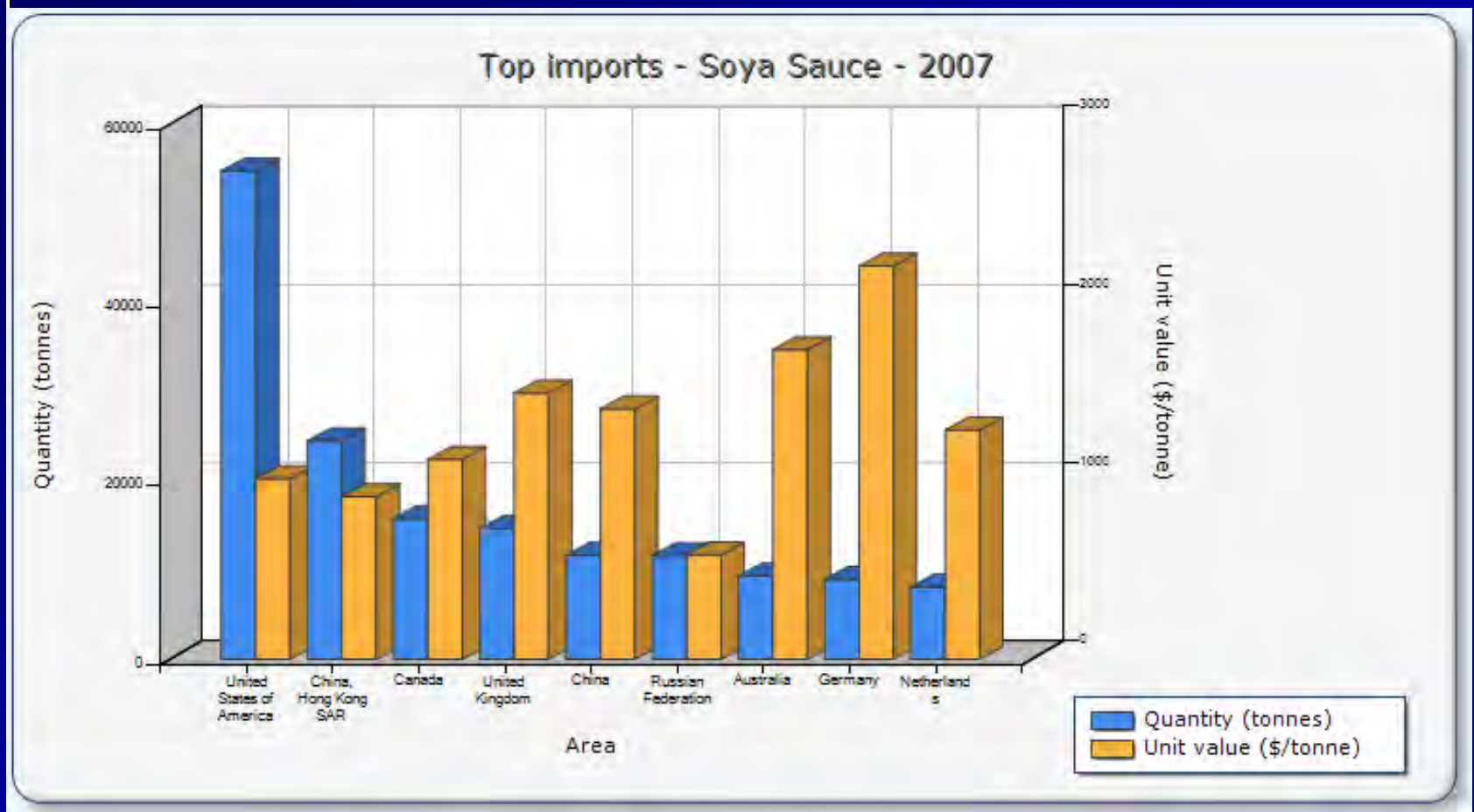
Soy Sauce

U.S. Imports of Soy Sauce (2000-2004)



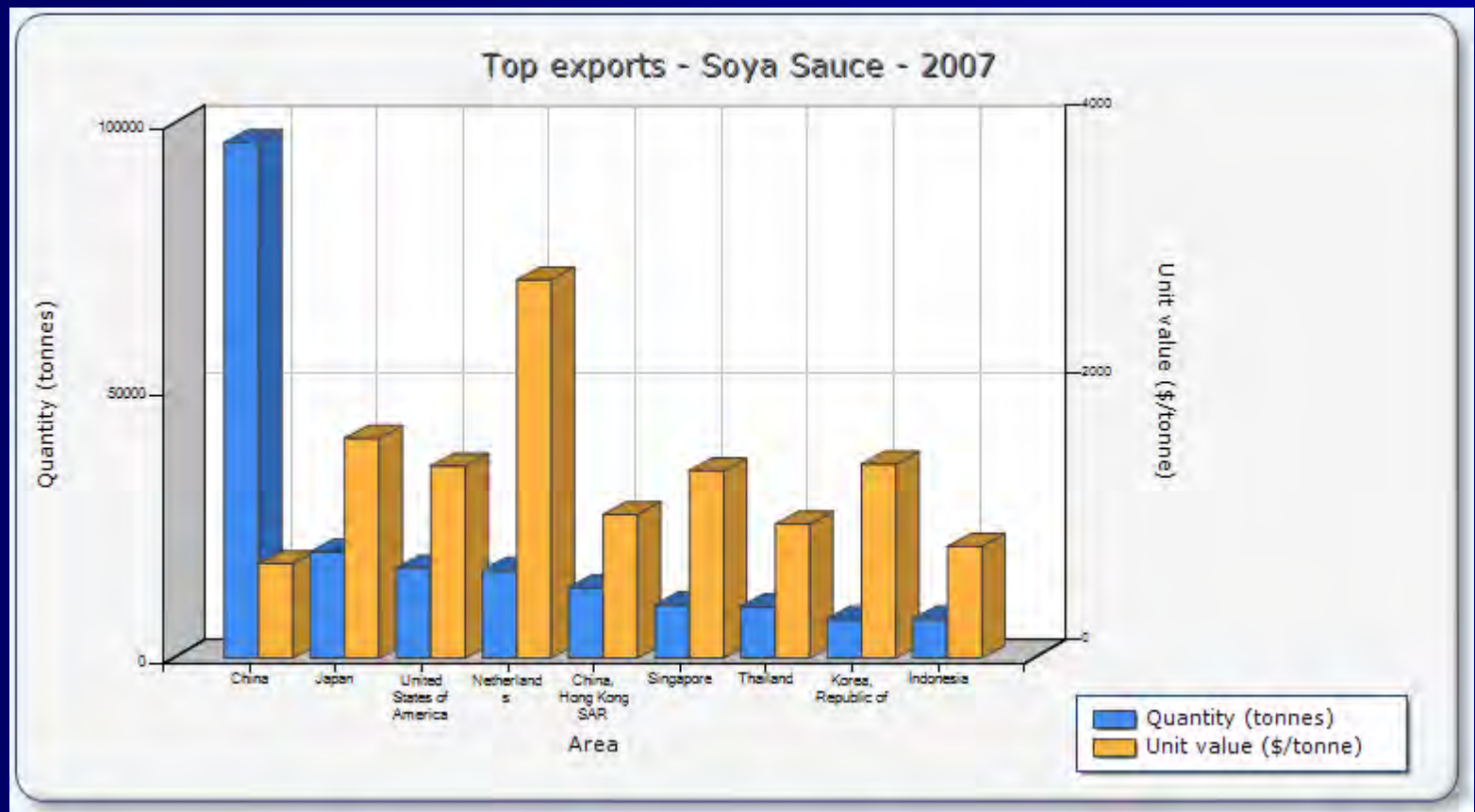
Source: FAOSTAT

Current Markets for Soy Sauce



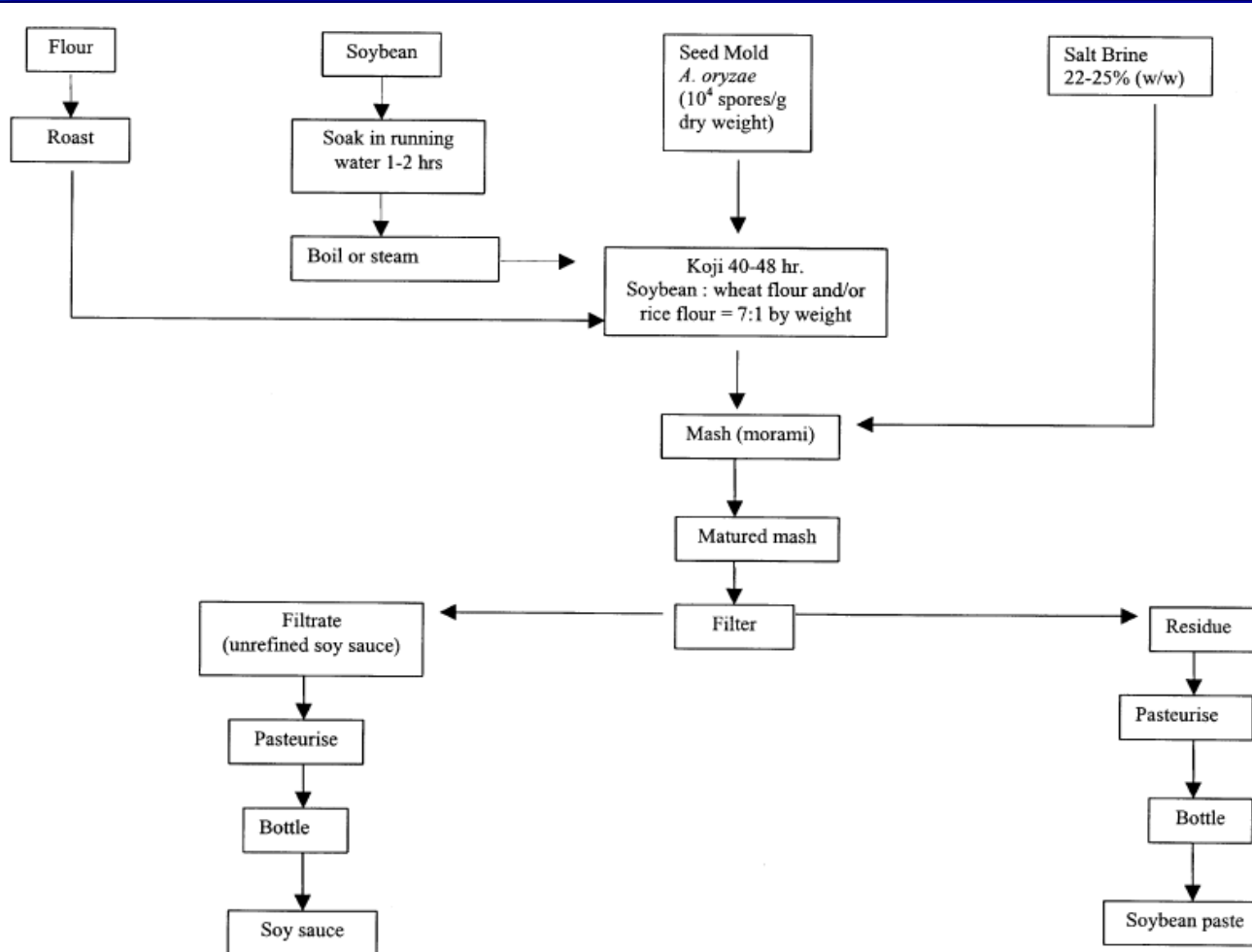
Source: FAO Stat

Producers and Exporters of Soy Sauce



Source: FAO STAT

Soy Sauce Production



Traditional Open-Air Fermentation of Koji



Soy:Wheat
(7:1) +
A. Oryzae

Time Frame for Proteolysis: 7 days

Improved Inoculant



- *Aspergillus flavus* var. *columnaris*
 - superior protease production
 - no detectable aflatoxin production
 - Good taste and aroma of the product
 - Soy-sauce with increased (6 %) soluble protein
 - Time frame for proteolysis reduced to 40 hours

Technological Innovation

(a)



(b)



- Bioreactor with controlled temperature and humidity.

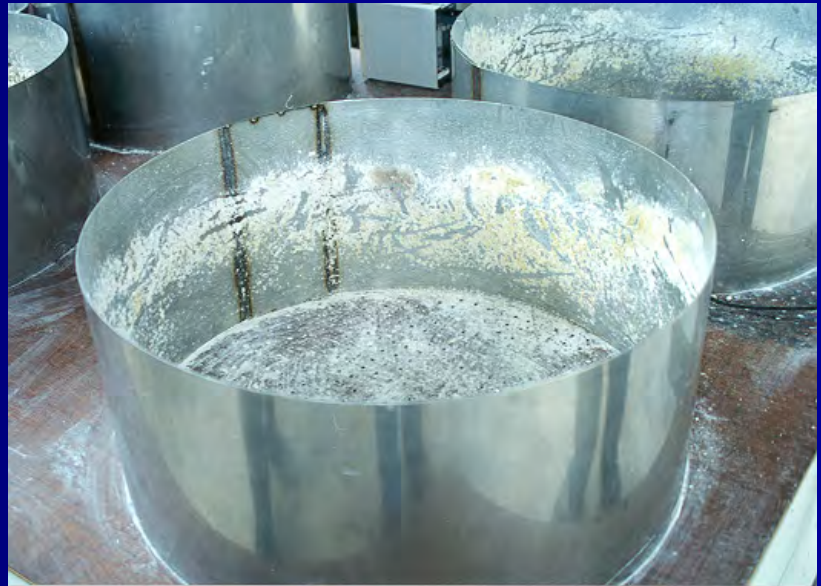


Fig. 2. The *koji* chamber developed by Chain, Thailand. (a) The chamber. (b) Interior of a *koji* chamber with the temperature probe inserted in the *koji* (photos courtesy of Mr. L. Linecharoenkiat, Chain).

Traditional *Moromi* Fermentation



- Earthenware jars
 - with no temperature or aeration control.
- Limited production capacity

Larger Scale Moromi Fermentation Tank



Technological Innovation

- Moromi fermentation tank with aeration system



Increased efficiency of fermentation



Aeration System inside tank

Drivers of the Innovation

- Market demand for soy sauce
- Organization within the Thai soy sauce industry
- Research support from an international organization, the Thai government and the Thai soy Sauce Industry

Impact of the Innovation

- Economic gain for the soy sauce industry
- More consistent product
- Safer product
- Market Access

THANK YOU

Rosa.Rolle@fao.org

