

20th International Pepper Conference

Present State and Prospect of Korean Red Pepper Industry

2010. 9. 12

Jae Bok Park Ph.D

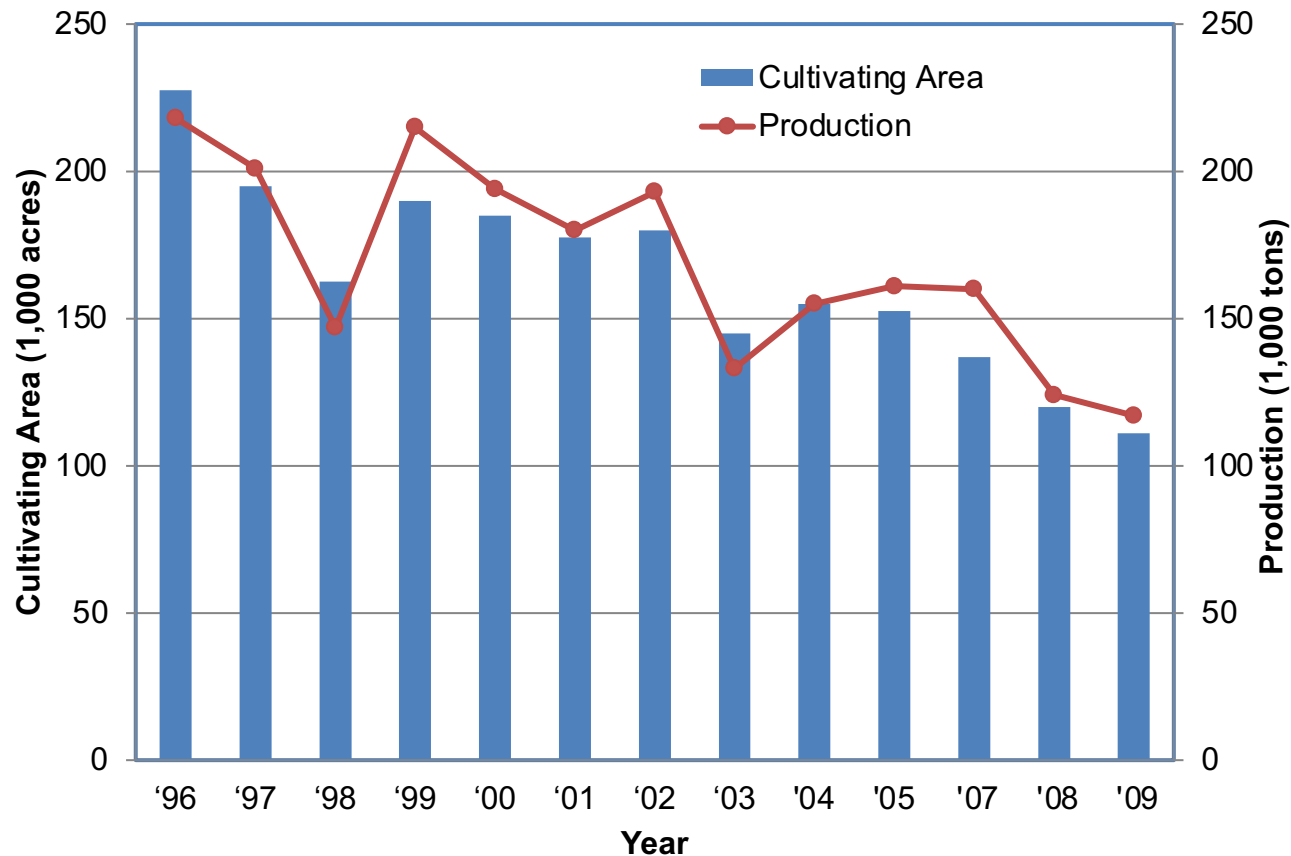
Korea Food Research Institute

www.kfri.re.kr

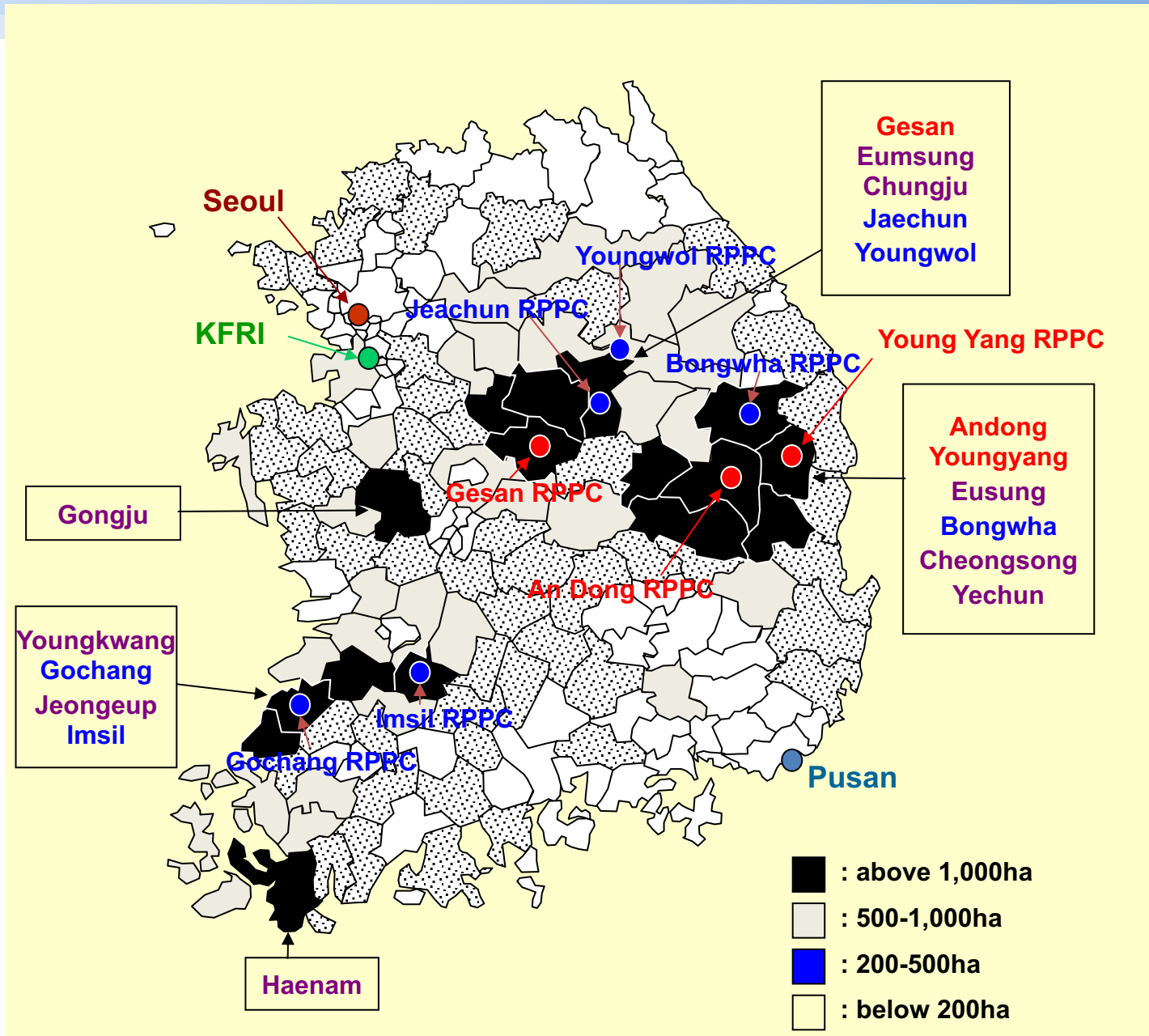
Present State of Korean red pepper industry

■ Decrease of cultivating area and production

- Area(acres): 227,000('96)→111,000('08)
- Production(tons): 190,000('96)→117,000('09)
- 5% decrease per year

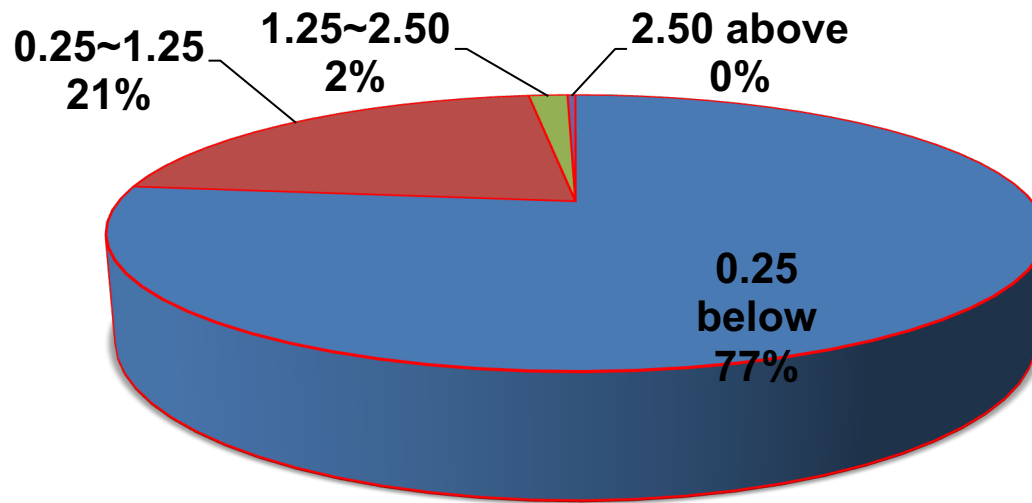


Main red pepper cultivating county



▪ Small cultivating area and aging of farmers

- 56% of total farms(2005) = 714,000 houses
- 77% of red pepper farms is below 0.25 acreage(2005)



- Farmers are mostly the above 65 years of age

Red pepper harvesting operation(Youngyang county, 2009. 9)



- Much yield loss due to red pepper plant diseases during harvesting period

- Annual yield loss: \$100 million
- 5 to 20 % of total production



■ Higher increase of Chinese red pepper import

- 38% of domestic consumption('07): 83,000 tons(dry weight)
- Import price for Chinese red pepper (CIF): \$1.6 / lb,
- Korean red pepper price: \$10.2 / lb



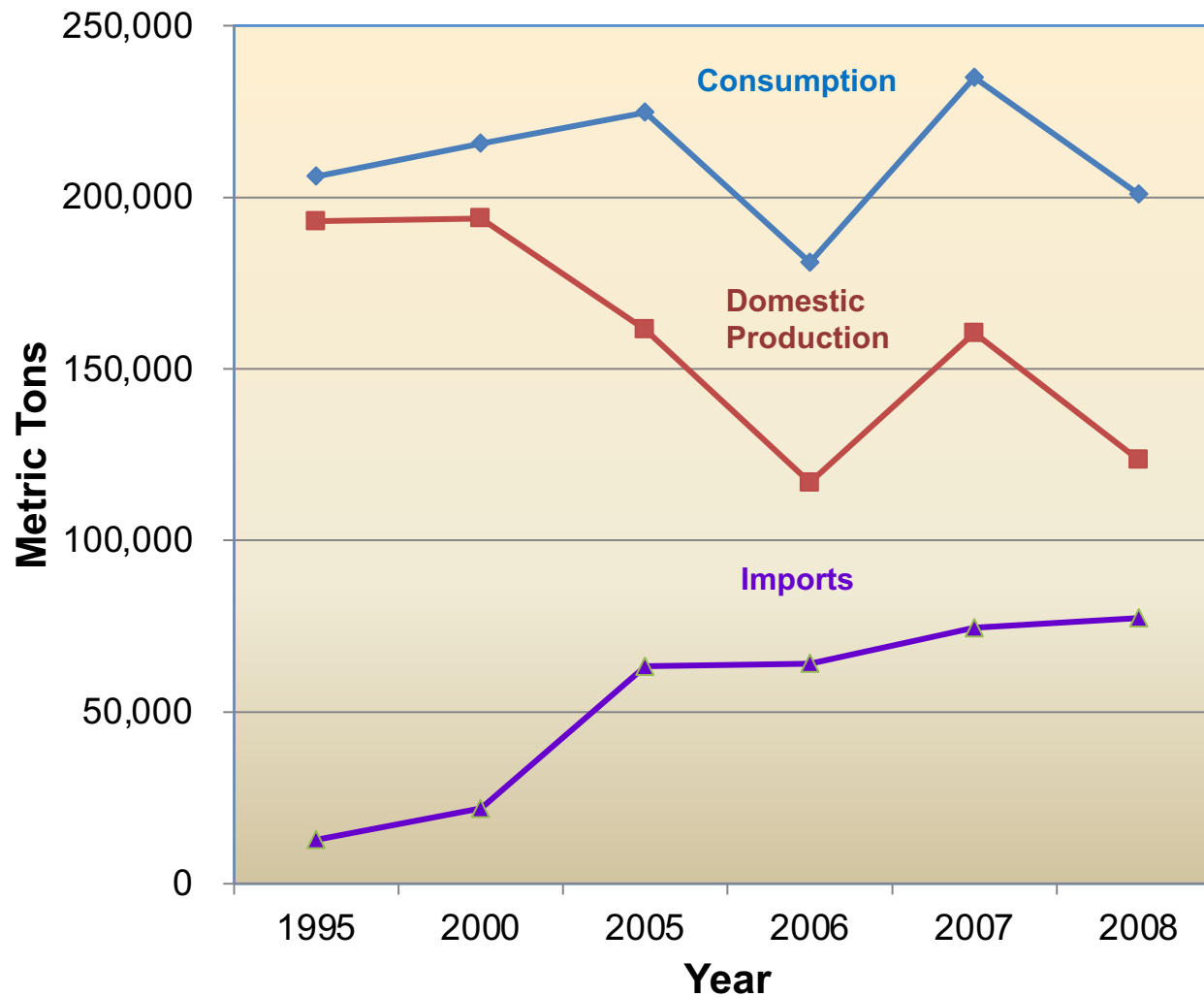
Status of domestic demand and supply of red pepper

(unit: 1000 tons)

Item	'95	'00	'05	'06	'07	'08
Supply	206.1	215.7	224.7	181.0	234.9	200.9
- Production	193.3	193.8	161.4	116.9	160.4	123.5
- Import	12.8	21.9	63.3	64.1	74.5	77.4
Demand	206.1	215.7	224.7	181.0	234.9	187.9
- Consumption	204.4	208.6	221.3	177.9	231.4	180.6
- Export	1.7	7.1	3.4	3.1	3.5	7.3
Self sufficiency(%)	93.8	89.8	71.8	64.6	68.3	65.7

(Ministry for Food, Agriculture, Forestry and Fisheries 2009)

Red pepper consumption and sources of supply (1995 – 2008)

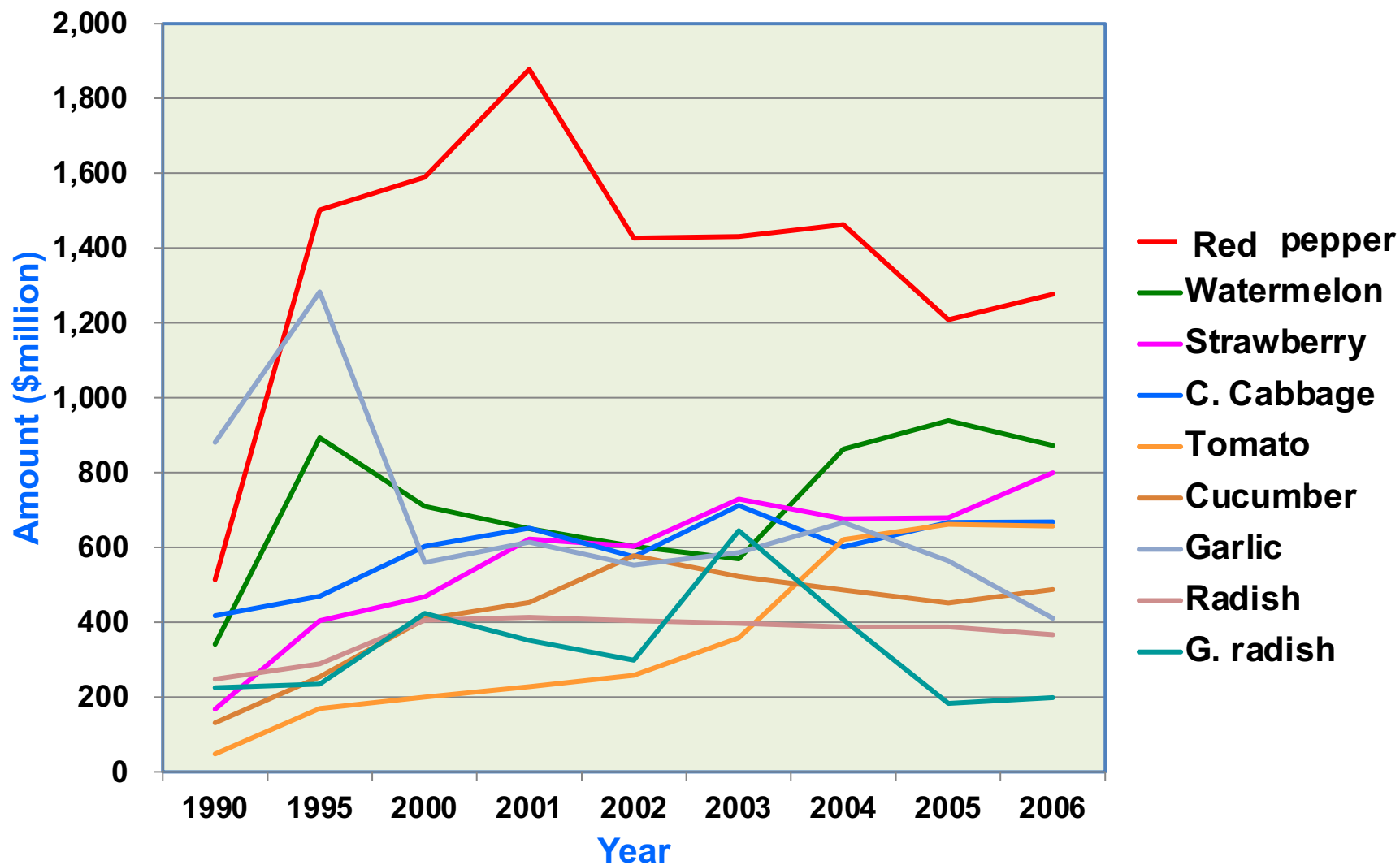


- Red pepper is very important economical crop related with farm income.

Main agricultural products for farm income(2006)

Rank	Item	Amount(\$million)
1	Rice	8,848
2	Pork	3,779
3	Korean Beef Cattle	3,446
4	Red Pepper	1,270(Dried RP: 852 Green P: 418)

Transition of main vegetable amounts in Korea



Korean traditional foods with red pepper

- ♣ Red pepper introduction to Korea: 1614 year
- ♣ Dried red pepper consumption per capita: 10 lb/yr



Kimchi



Gochujang(red pepper paste)



Deokbokgi(Hot rice cake)



kfri Kackdugi(Radish Kimchi)



Yukgejang(Beef soup)



Buldack(Hot grilled chicken)

Prospect of Demand and Supply

(based on dried red pepper)

Item	2009	Prospect	
		2014	2019
Area(1,000acres)	117	107	97
Demand(1,000tons)	212	201	198
Domestic Production	118	118	112
Import (1,000tons)	86	94	97
Export (1,000tons)	8	11	12
Consumption per capita (kg)	4.2	4.0	3.9

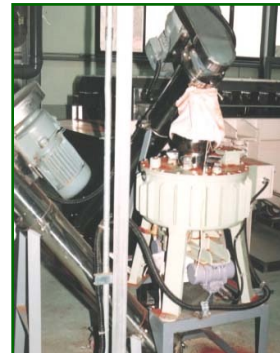
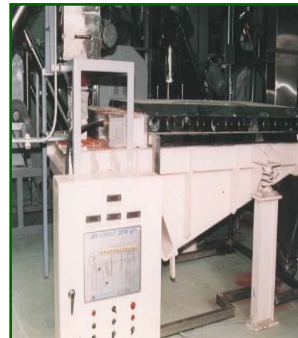
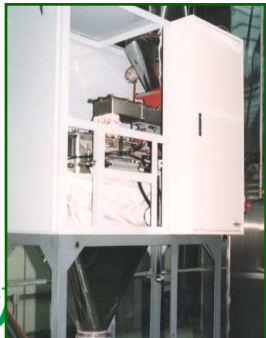
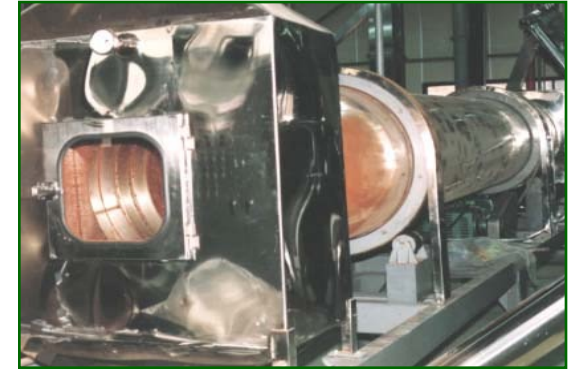
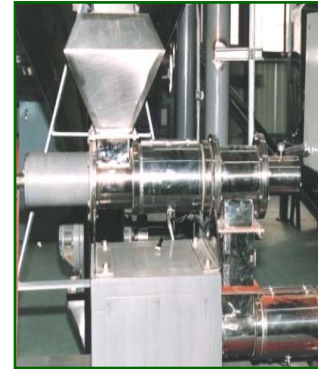
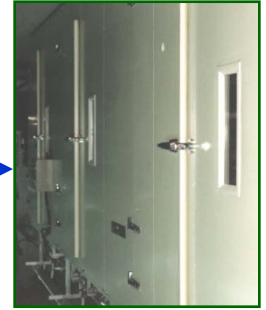
(KERI 2009)

Prospect of Korean red pepper industry

- Cultivating area(acres): 120,000- 144,000
- Farm house(numbers): 600,000 (50% of total farm house)
- Production(tons): 120,000 – 130,000
- Demand(tons): 200,000 – 220,000
- Import (tons): 80 – 100
- Export (tons): 10,000 – 20,000

Review of Red Pepper Processing Technology (1990-2010)

- Sanitary red pepper milling process (Patent no.064936, 1993)



■ Drying characteristics of various pretreatment for RP(1992)



Drying temp. 90 °C,
kfri RH 30%

Drying temp. 80 °C, RH
30%

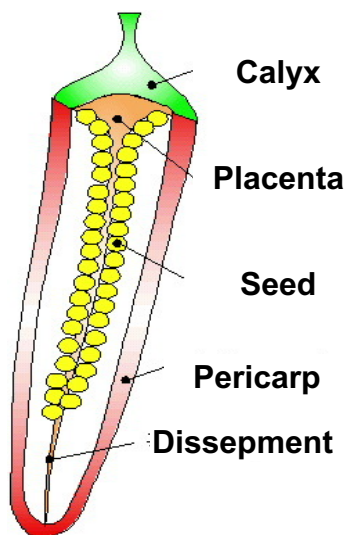
Drying temp. 70 °C, RH
30%

■ Redpepper drying process in small scale hot air dryer(2003)



■ Mechanical red pepper pungency controlling technology
(Patent no. 034038, 2002)

Part	Capsaicinoids (mg/100g)	
	Range	Mean
Total	0.9 – 156.5	65.7 ± 46.6
Pericarp(A)	0.3 – 93.1	22.9 ± 22.3
Placenta(B)	29.3 – 2715.9	1116.6 ± 841.8
Ratio (B/A)	14.4 - 94.6	45.4 ± 22.7



Pericarp

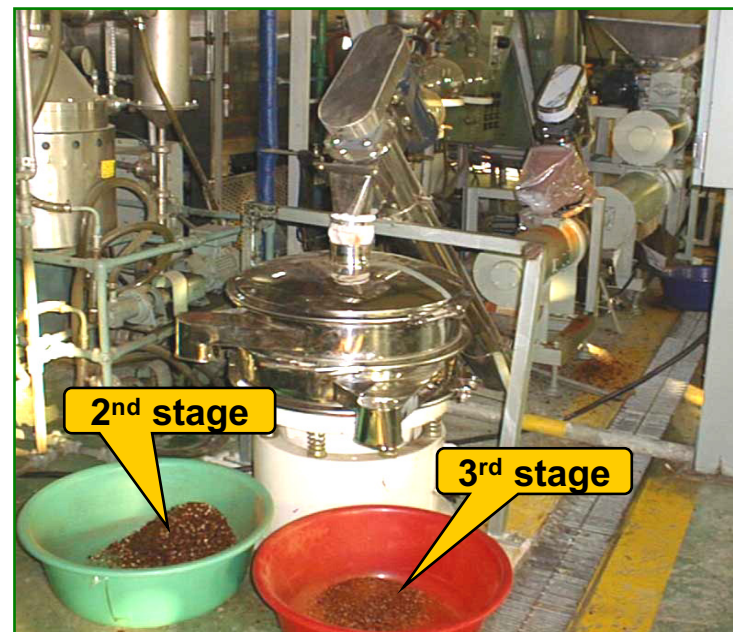
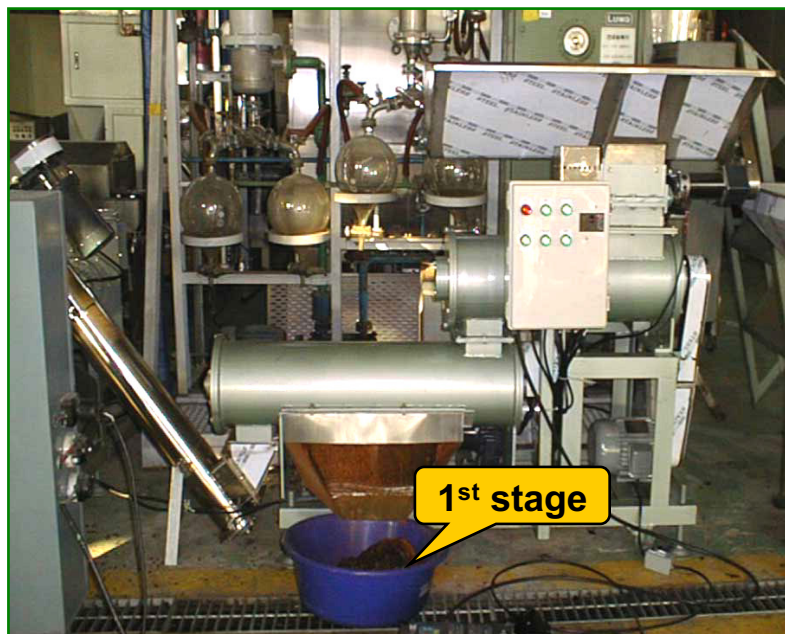


Placenta



Seed

Fig. Prototype for red pepper pericarp and placenta separating system



Variety	Moisture content (%)	Stage	Weight (g)	Ratio(%)	Capsaicinoids (mg/100g)
Daebok	11.1	Sample	1815.6	100	40.5
		1st	134.3	7.4	374.3
		2nd	1102.7	60.7	10.6
		3rd	578.6	31.9	49.1

- Model equation for measuring red pepper quality by Near Infrared Reflectance Spectroscopy (NIRS)(2005)

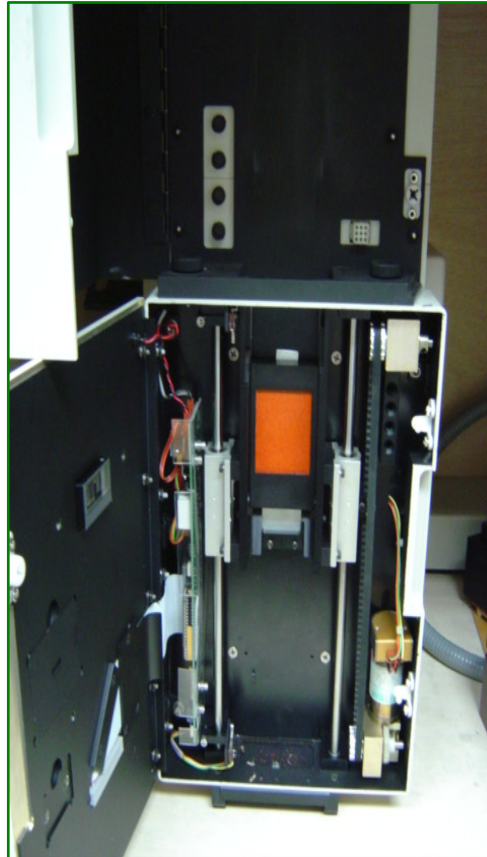


Fig. Equipment of NIRS(FOSS NIRSystems 6500, USA)

Fig. Near infrared reflectance spectra of red pepper powder

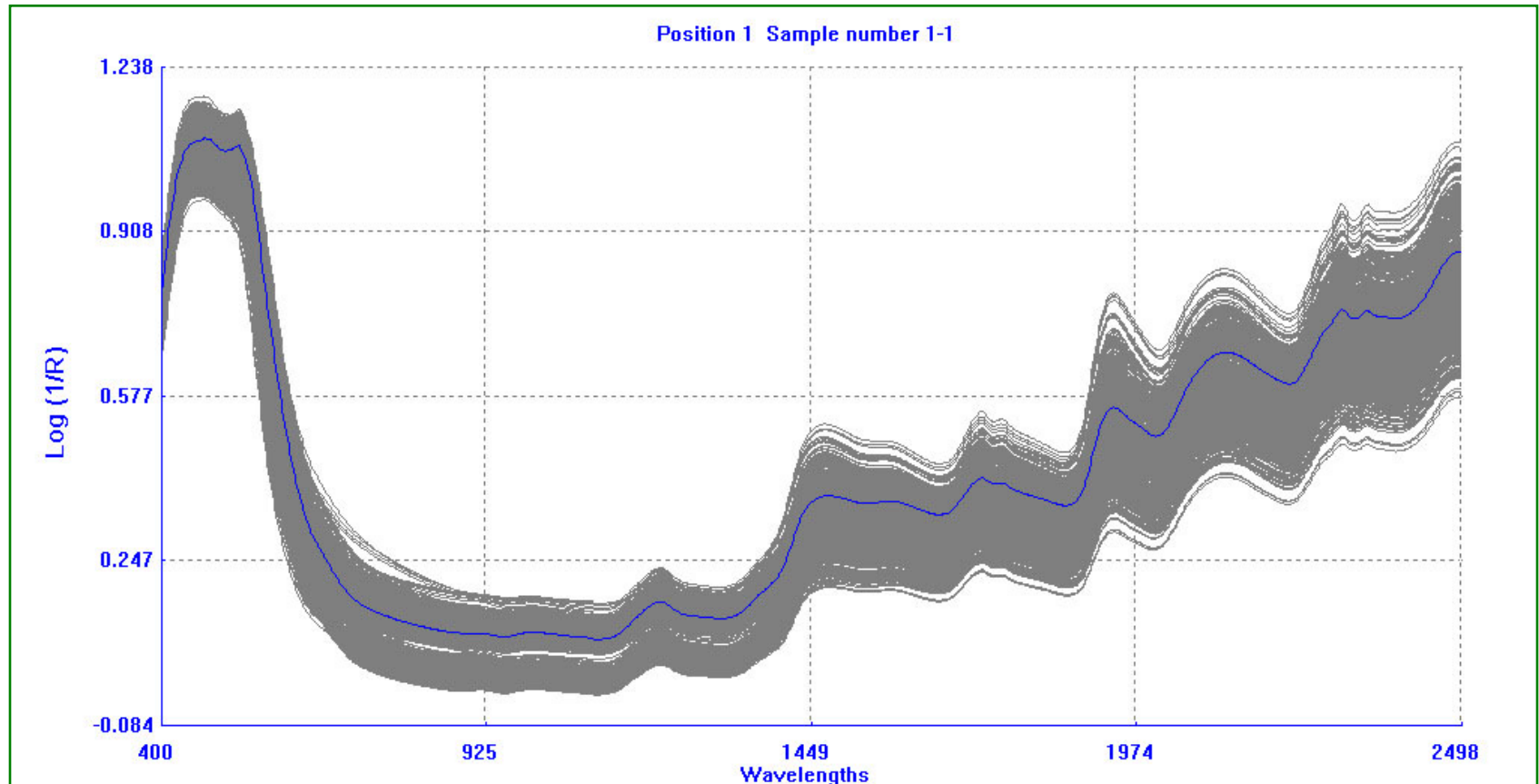
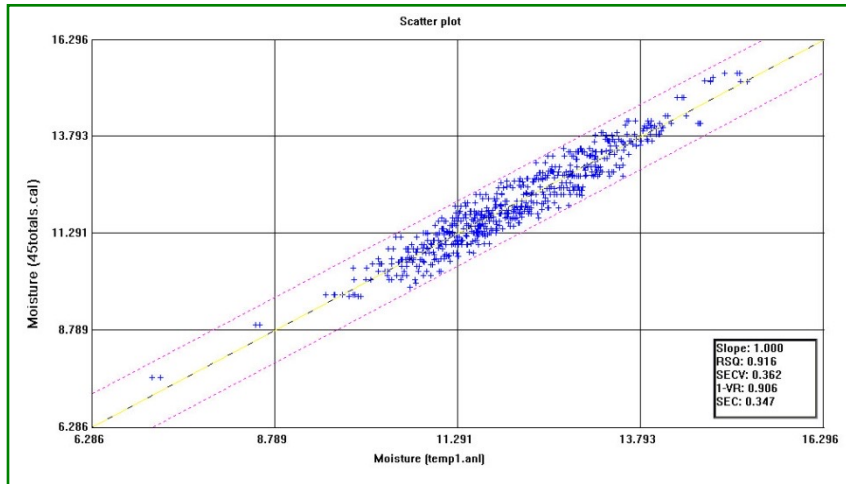
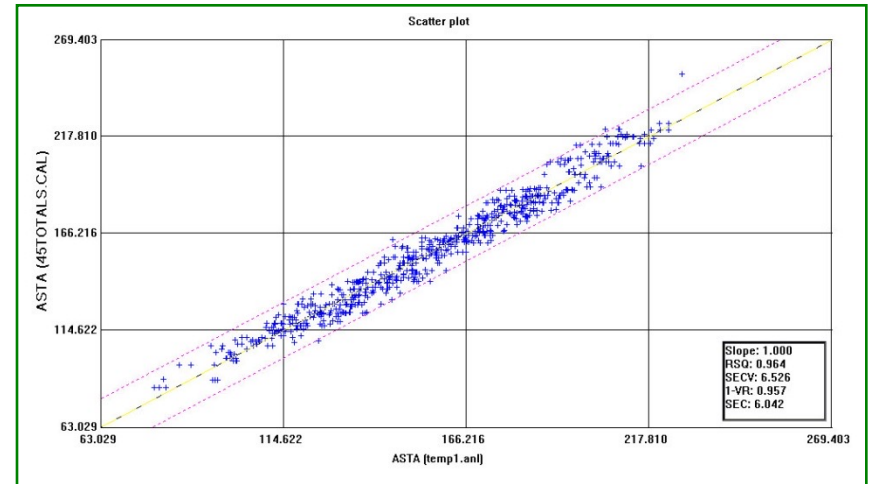


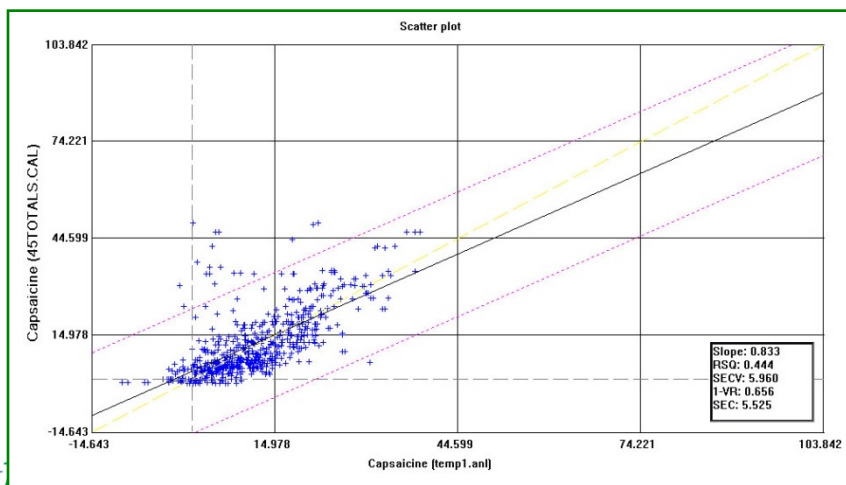
Fig. Calibration curves of quality measurement of red pepper powder by developed model equations



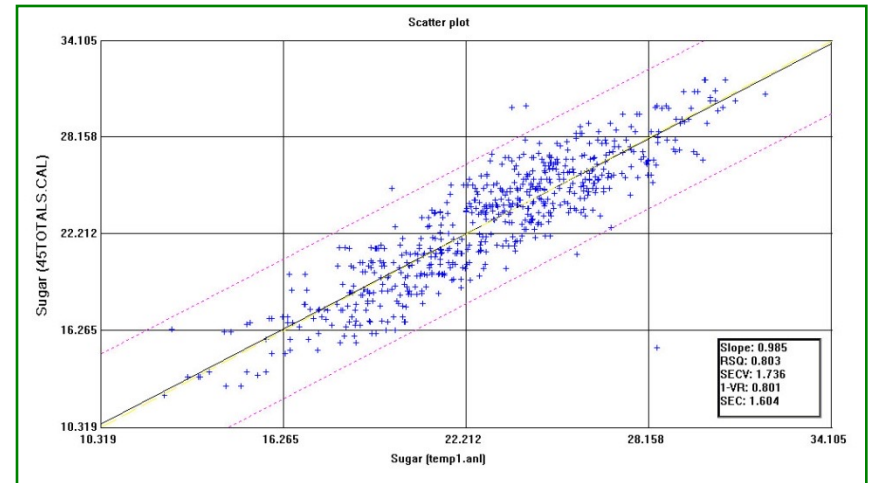
Moisture content(%)



ASTA color



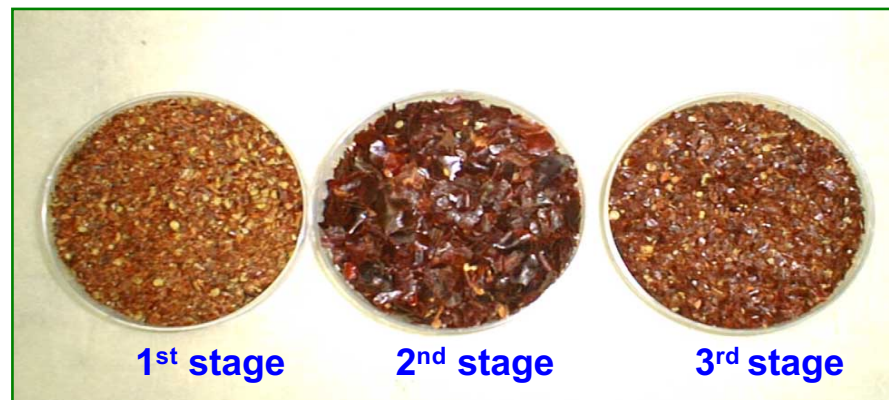
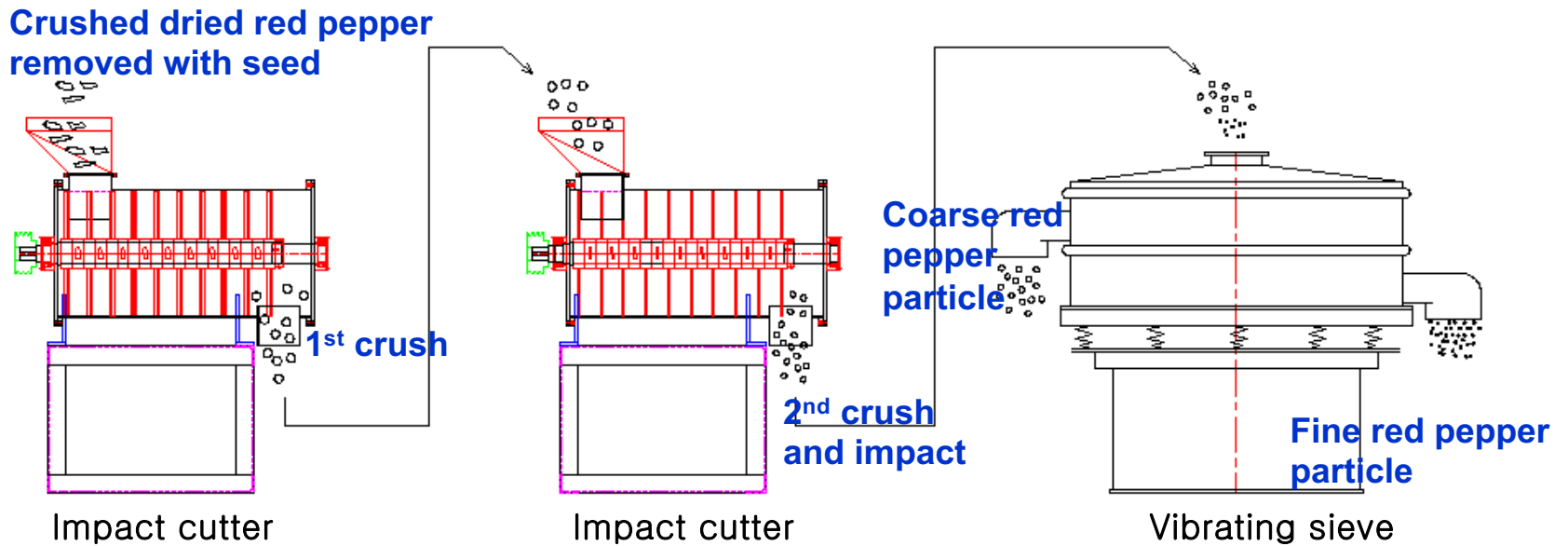
Capsaicinoids(mg/100g)



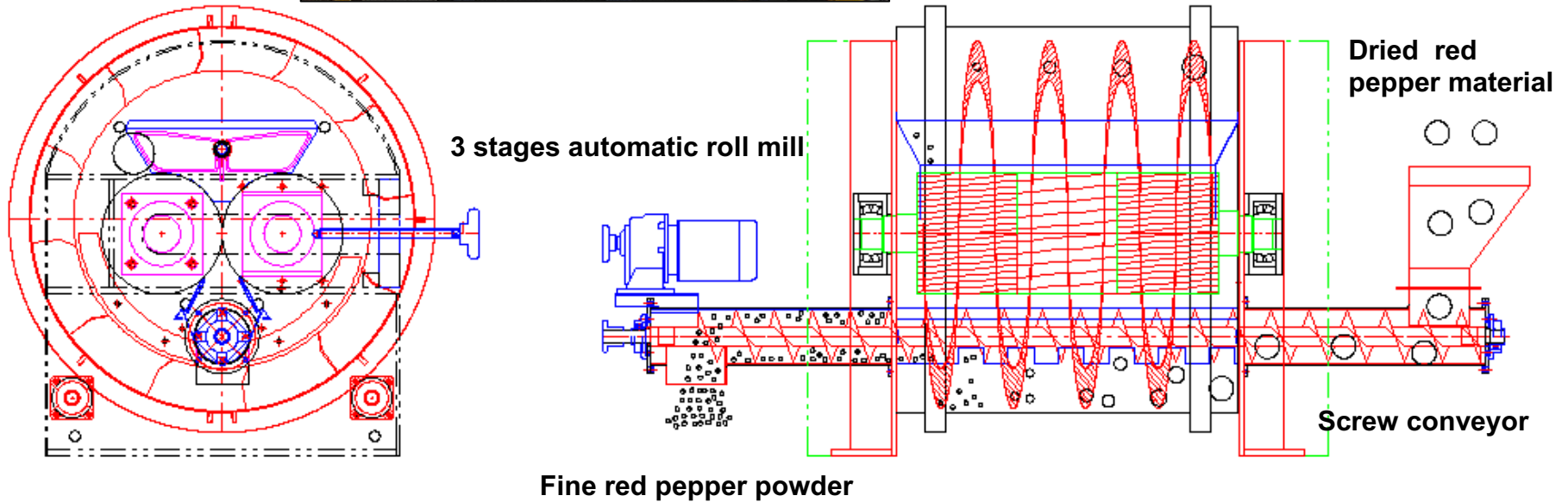
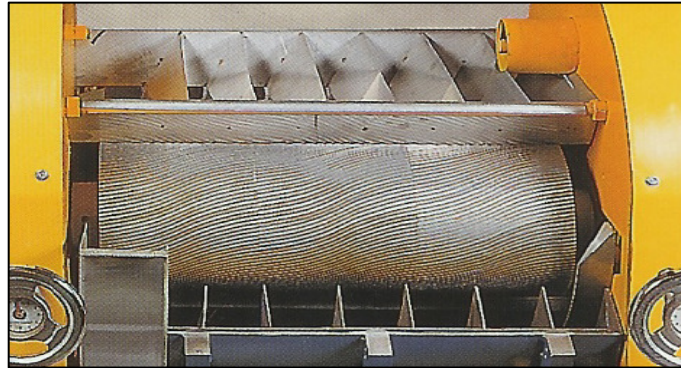
Free sugar content(%)

Advanced milling process for red pepper(2004)

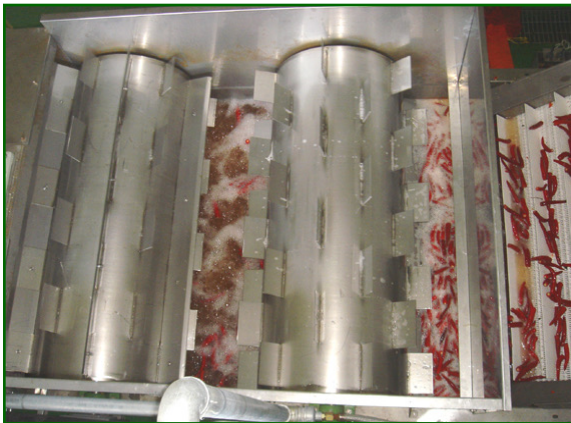
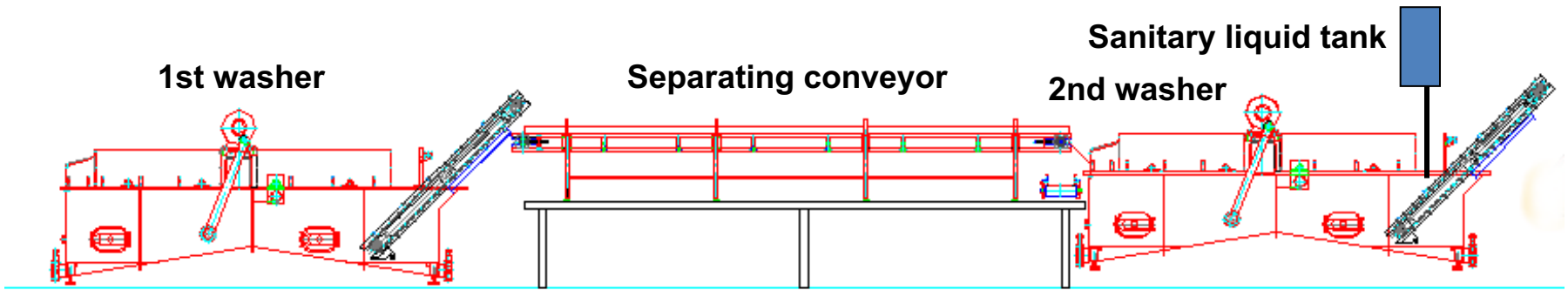
-Technology for controlling pungent content of dried red pepper material



- Automatic roll mill for red pepper powder(patent no. 1150180, 2003)



Washing and separating process for fresh red pepper(2004)



- New drying system for fresh red pepper in RPPC(2005)

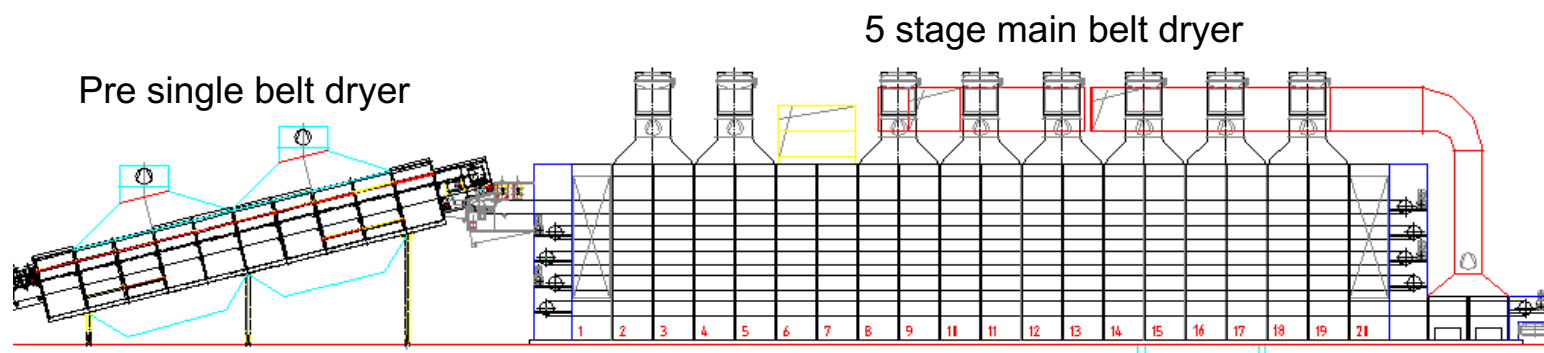


Fig. Multistage belt dryer for red repper(Binder, Germany)

■ Prototype for inclined compression type de-stemmer(2006)

- Capacity: 150kg/hr
- Compression rate for chile pepper: 50%
- De-stemming rate:
 - Large size sample: 90%
 - Small size sample: 85%



Test results for inclined compression roll type de-stemmer



Small size



Large size

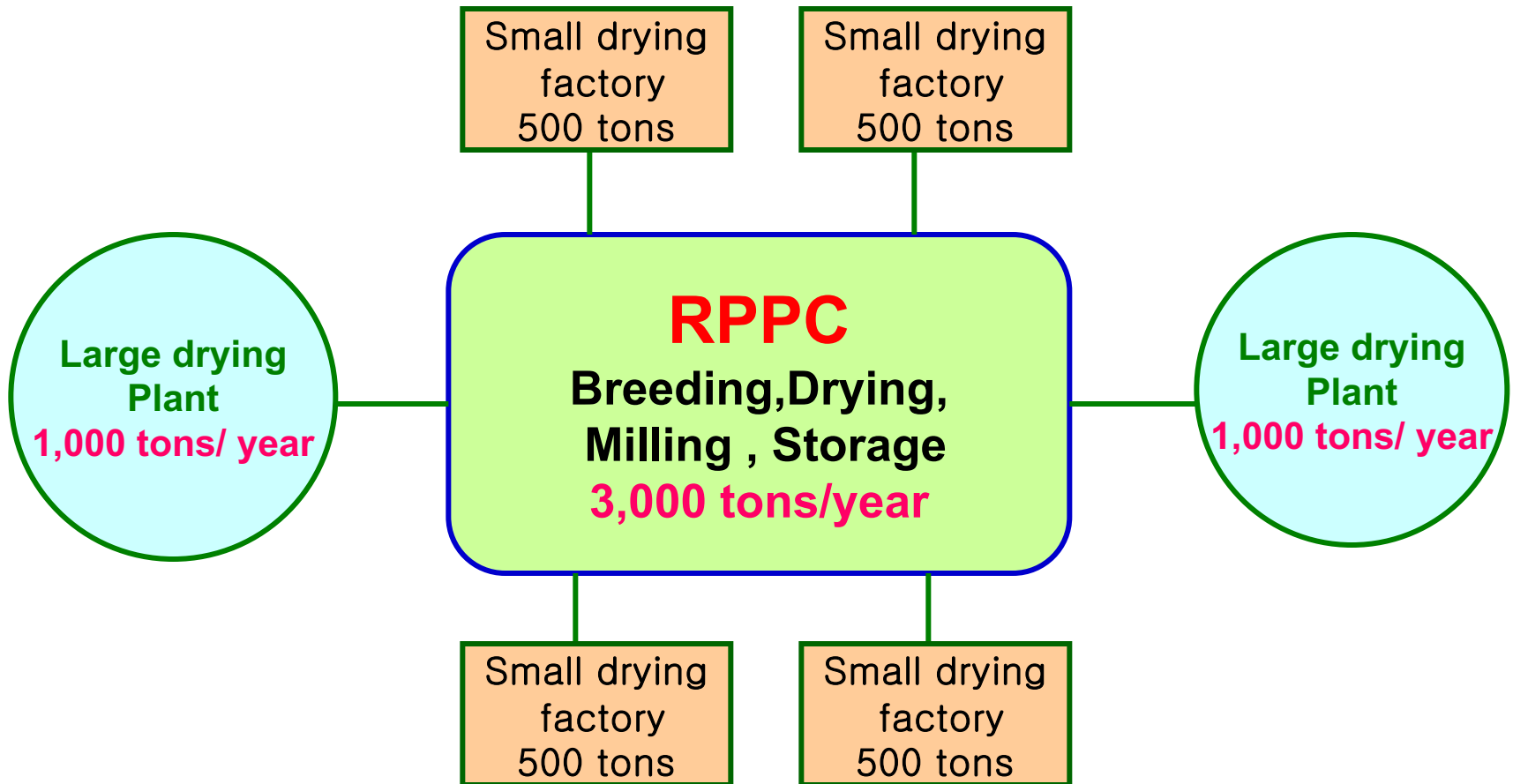
RPPC: Red Pepper Processing Complex

- Purchase fresh red pepper from farmer
- Produce high quality dried red pepper
- Establish red pepper powder standard

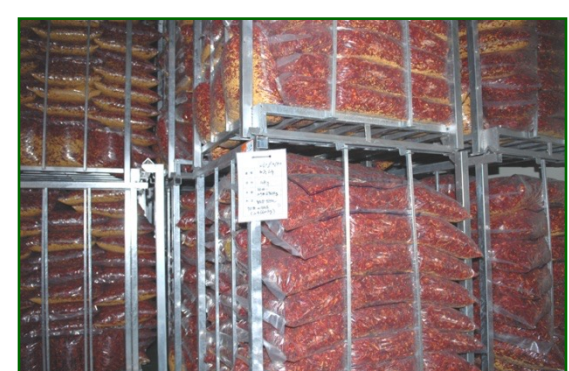
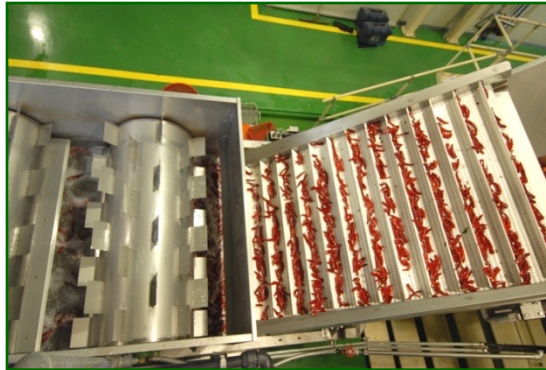


- Save drying cost and labor
- Evaluate red pepper product quality
- Establish foundation of farm income
- Develop high valuable export product
- Increase global competition

Red Pepper Processing Complex



Drying process of red pepper in Youngyang RPPC (2009. 9)



Drying process of red pepper in Youngyang RPPC (2009. 9)



Fig. Dried red pepper materials in Youngyang RPPC (2005. 9)



Table. Quality analysis for dried red pepper sample in YY RPPC ('05. 9. 20)

Sample (sampling time, pungency)	Moisture content (%)	ASTA color	Capsaicinoids (mg/100g)	Free sugar (%)	Total plate count (CFU/g)
8/19 16:30 normal	11.4±0.1	147.3±2.0	13.4±0.3	25.7±0.3	4.3×10 ³
8/21 17:40 normal	12.1±0.1	123.2±1.2	17.7±0.9	24.6±0.3	1.7×10 ³
8/26 9:30 mild	12.0±0.1	119.8±1.6	14.3±0.3	22.3±0.2	4.0×10 ³
8/28 12:10 normal	11.3±0.2	133.9±2.5	17.2±0.4	24.2±0.6	2.4×10 ³
8/29 12:00 mild	11.6±0.2	150.2±1.3	15.2±0.1	23.7±0.8	2.7×10 ³
8/29 22:50 mild	12.4±0.0	147.7±0.1	13.1±0.1	26.1±2.2	3.1×10 ³
9/2 10:37 normal	10.3±0.1	153.8±1.4	13.3±0.3	19.6±0.2	2.5×10 ³
9/2 15:56 mild	11.5±0.6	169.7±0.9	13.5±0.2	23.5±2.9	2.5×10 ³
9/3 20:08 mild	11.5±0.1	173.5±1.9	13.4±0.2	25.5±0.3	3.3×10 ³
9/4 9:21 mild	12.7±0.1	170.2±3.7	13.3±0.2	24.0±0.5	3.3×10 ³
9/5 9:15 mild	14.3±0.3	154.4±0.5	14.8±0.2	26.6±1.3	1.3×10 ⁴
Average	11.9±0.2	149.4±3.7	14.5±1.3	24.2±1.3	3.8×10³

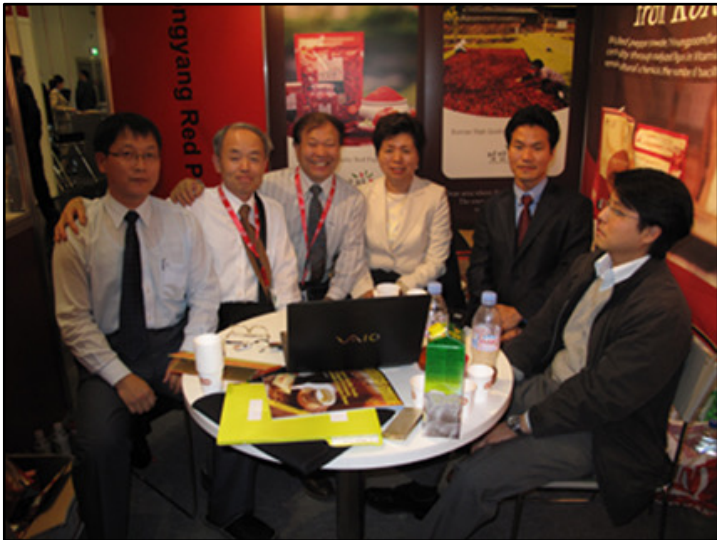
Advanced red pepper milling factory in Young Yang RPPC(2009. 9)



Advanced red pepper milling factory in Young Yang RPPC(2009. 9)



High quality Korean red pepper powder(2009 ANUGA, Germany)

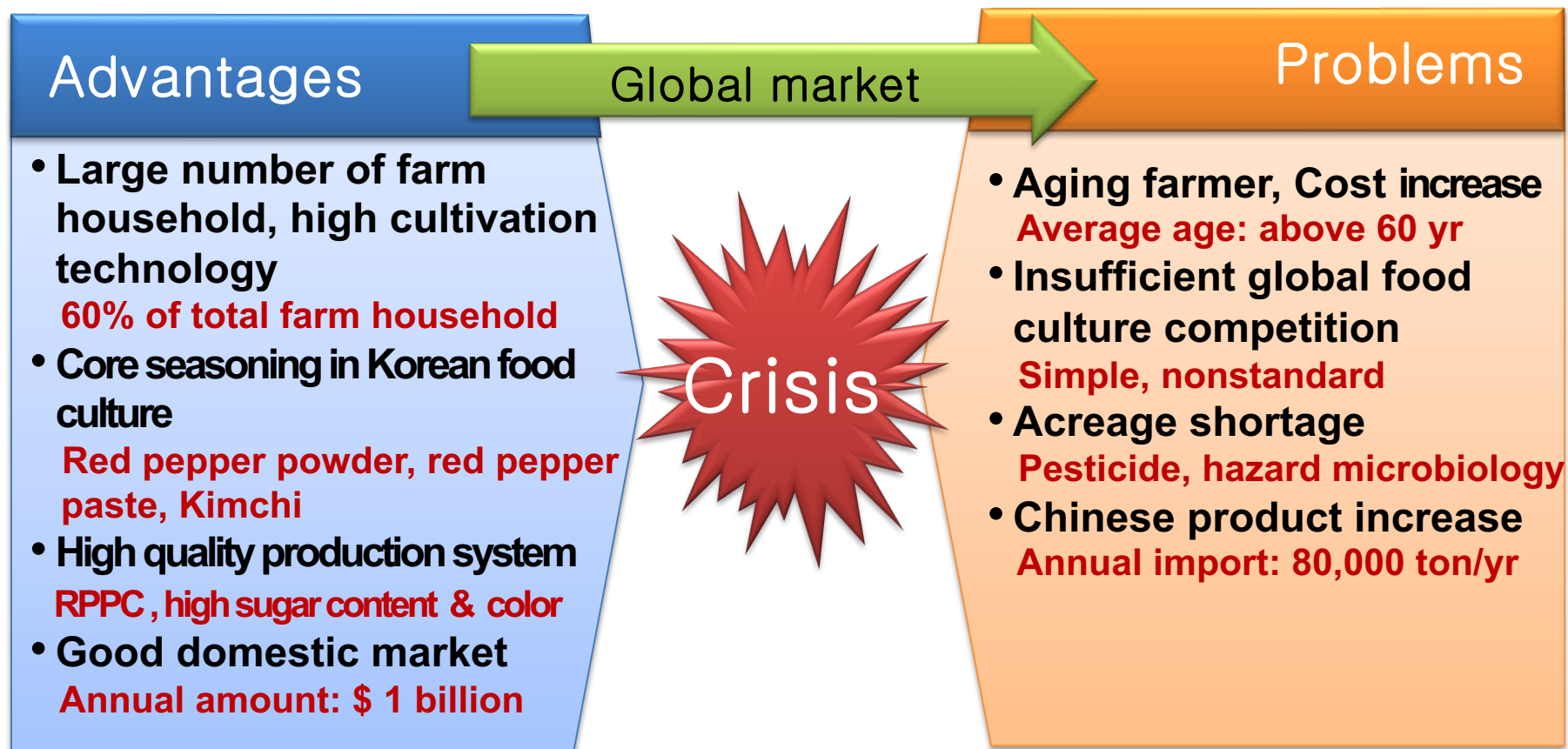


■ Standard for high quality red pepper powder

- ASTA color value: above 120
- Average particle size: 20(coarse), 40(fine) mesh
- Pungency(SHU): 2000(mild), 5000(normal), 10000(hot)
- Free sugar content: above 20%
- Seed mixing rate: 10%
- Sanitation: total plate count below 10^3 cfu/g
- Moisture content: below 11 %w.b.

Red Pepper Export Research Group (www.koreanredpepper.org)

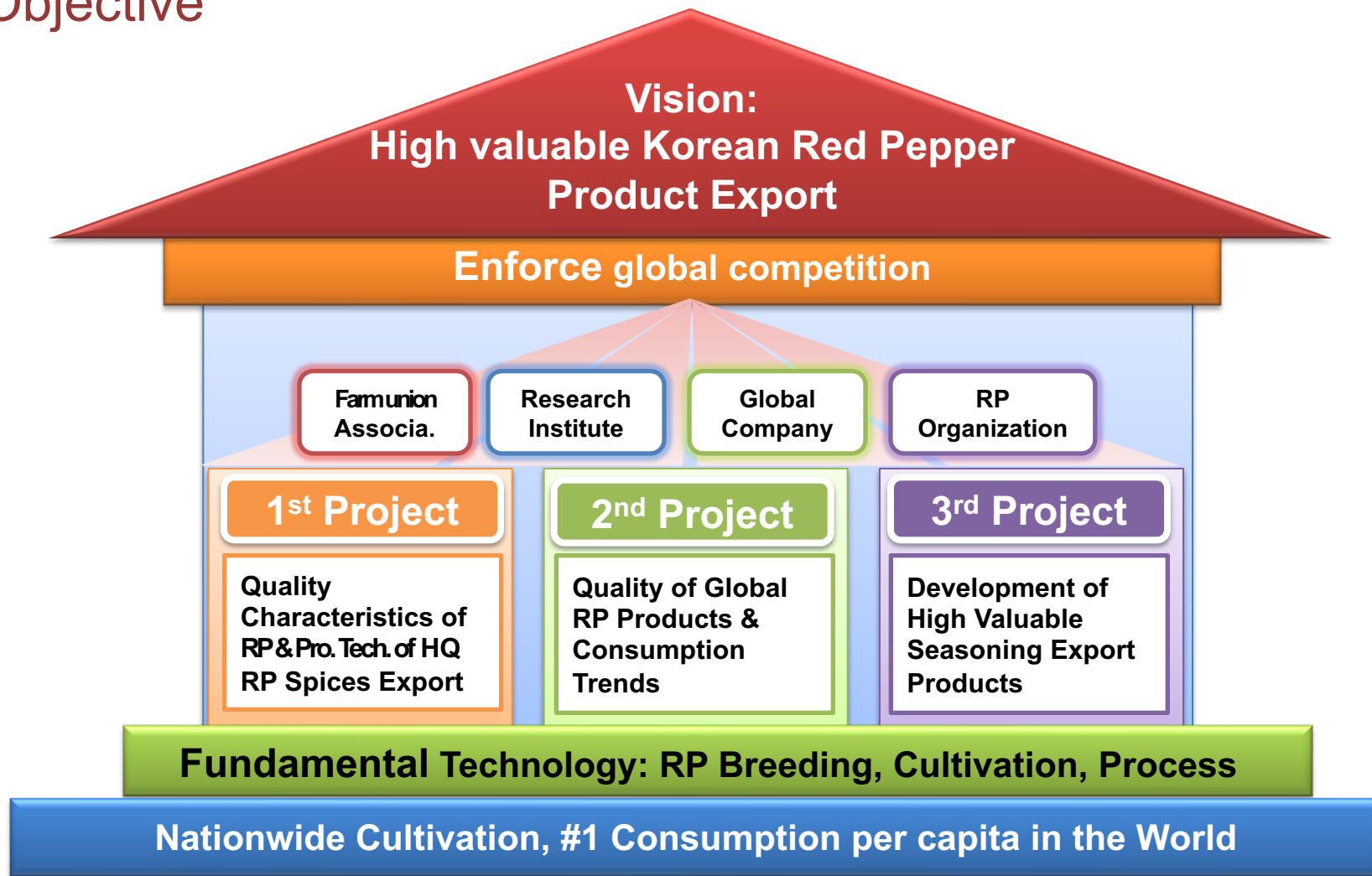
■ Problems of Korean red pepper industry

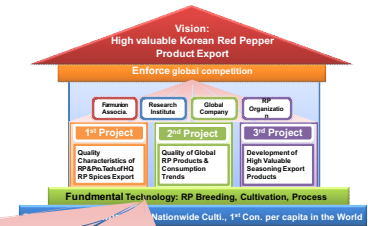


■ Necessity of Research



■ Objective





Final Research Goal

- ✓ Production of High Quality RP Spices
- ✓ Analysis of Global Products & Consumption Trends
- ✓ Development of High Valuable Export Products
- ✓ Increase of Global Top Brand Products

■ Research Content

– Quality Characteristics of Red Pepper and Production Technology of High Quality Red Pepper Spices Export

- Analysis of quality characteristics of various Korean red peppers
- Establishment of environment-friendly management system of pests and diseases of red pepper
- Development of production technology for exporting high quality red pepper spices in red pepper processing complex

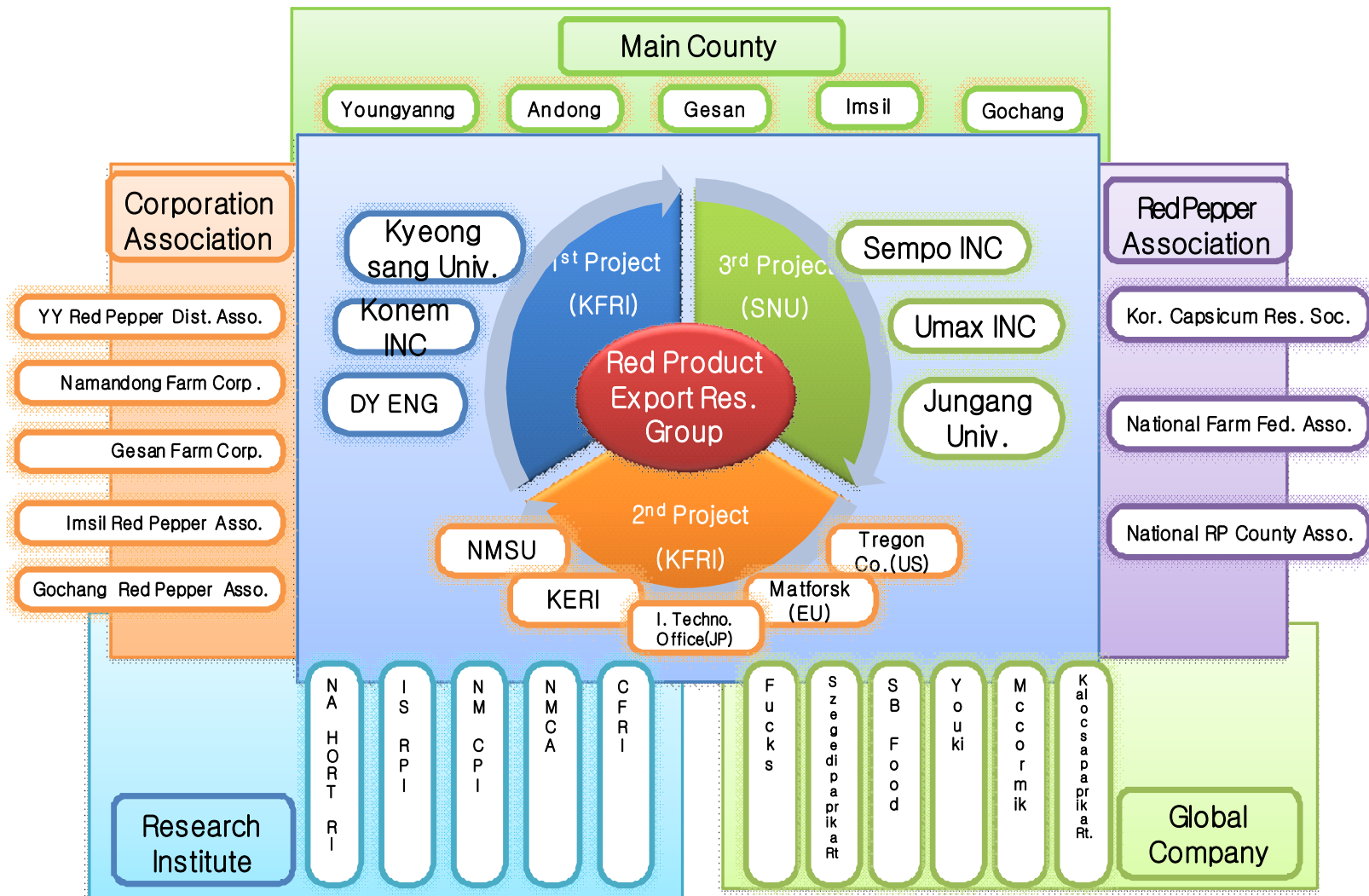
– Quality of Global Red Pepper Products and Consumption Trends

- Quality properties of red pepper products in global market and consumer preferences
- Analysis of global red pepper products and consumption trends

– Development of High Valuable Seasoning Export Products

- Development of high valuable seasoning export products
- Development of red pepper seasonings fit for Korean cuisines
- Development of packaging technology and package design for Korean red

Research Group



■ Prospect

- **Export high quality Korean red pepper product**
 - Estimated export(2014): 4,000 ton/yr, \$50 million
- **Activate domestic market of red pepper spices**
 - Estimated amount : \$500 million (present \$200 million)
- **Raise RPPC profits**
 - Increase net income 3 times
- **Enforce safety and quality of red pepper spices**
 - Increase customer reliability and consumption
- **Evaluate quality of Korean traditional food**
 - Improve quality of Kimchi and Gochujang
 - Encourage globalization of Korean cuisines

Korean Red Pepper Export Association(KoRPEA)

■ Established date

– November 26, 2009

■ Purpose

Develop high valuable export products and raise global competition of domestic red pepper industry by using domestic and foreign red pepper material with red pepper processing companies.

■ Location

– aT Center, Seoul

■ Main plan

- Survey global chile pepper market and material
- Activate domestic red pepper export
- Cooperate with foreign chile pepper associations
- Recommend red pepper developing policy
- Globalize domestic red pepper quality and standard

■ Member

– Domestic red pepper processing and export companies



Foundation of Korean Red Pepper Export Association('09. 11. 26)

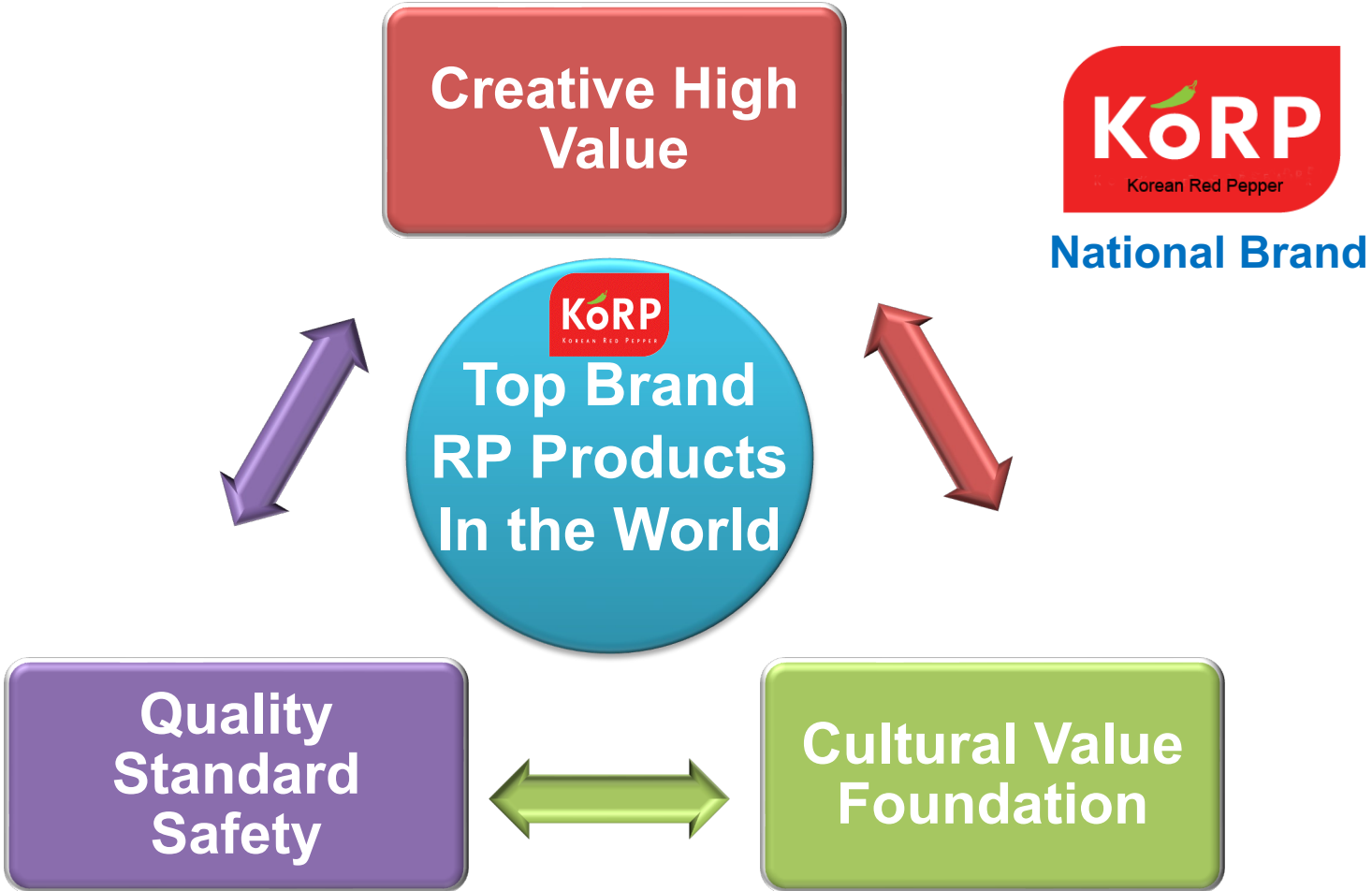


Korean Red Pepper Export and Import Area

Area



Strategy of Top Brand Korea Red Pepper



Estimated Korean consumption of red pepper powder in United States

- Korean population in US: 2,500,000
- Consumption per capita: 2 lb/yr
- Total Demand: 5 million lbs, 2,250 tons
- Retail price: \$7 /lb
- Estimated amount: \$35 million



Korea day parade in Los Angeles(2007, 9)

Lotte Plaza, 13069 Wisteria Dr. German town, MD(2010. 1)





Development of Value-Added Seasoning Products with Korean Chile Peppers (*Capsicum annuum* L.) for Grilled Beef and Their Sensory Evaluation



2010. 9. 12

Dr. K. M. Yoo & Dr. I.K. Hwang

Seoul National Univ. Food & Nutrition Dep.

The purposes of this study was to develop value-added seasonings products with Korean advanced chile peppers (*Capsicum annuum* L.), and investigate their physicochemical characteristics based on sensory evaluation. Ninety-seven chile pepper-related products were collected from American local favorites and analyzed based on their compositions. Korean advanced chile peppers seasoning was developed through various combination. Seasoning sample's contents was prepared with sensory evaluation on participation in USA.



Figure 1. Examples of the developed chile pepper seasoning products for grilled beef



Material characteristics

Table 1. The contents of total microbial, moisture contents, total carotenoids, vitamin C, ASTA value and capsaicinoids of Yeongyang's chile pepper powders

	Total microbial (log CFU/g)	Moisture content (%)	Total carotenoids (mg/100g)	Vitamin C (mg/100g)	ASTA color value	Capsaicinoids (mg/100g)
Chili pepper	3.36	12.43	223.46	290.33	149.37	4.06

Yeongyang's chile pepper powders were prepared for developing Korean chile pepper seasoning products, and measured in the content of total microbial (3.36 log CFU/g), moisture content (12.43%), total carotenoids (223.46 mg/100 g), vitamin C (290.33 mg/100 g), ASTA color value (149.37), and capsaicinoids (4.06 mg/100 g).



Sensory participants characteristics

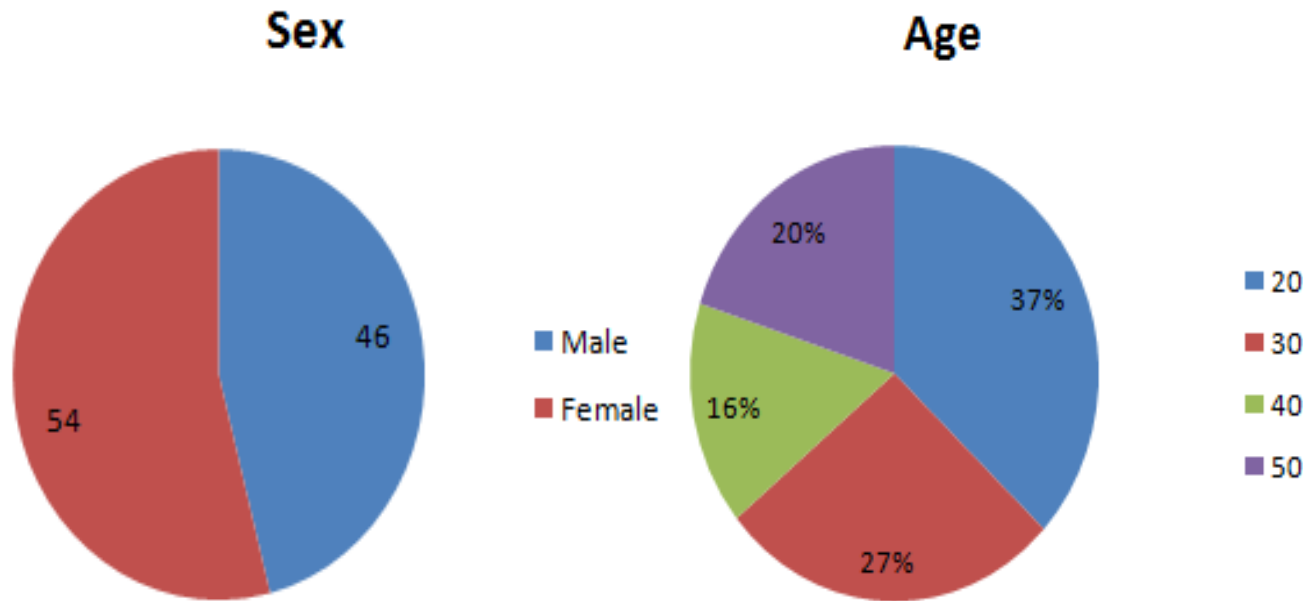


Figure 2. Characteristics of sex and age on participants of sensory evaluation in USA



Sensory comparison

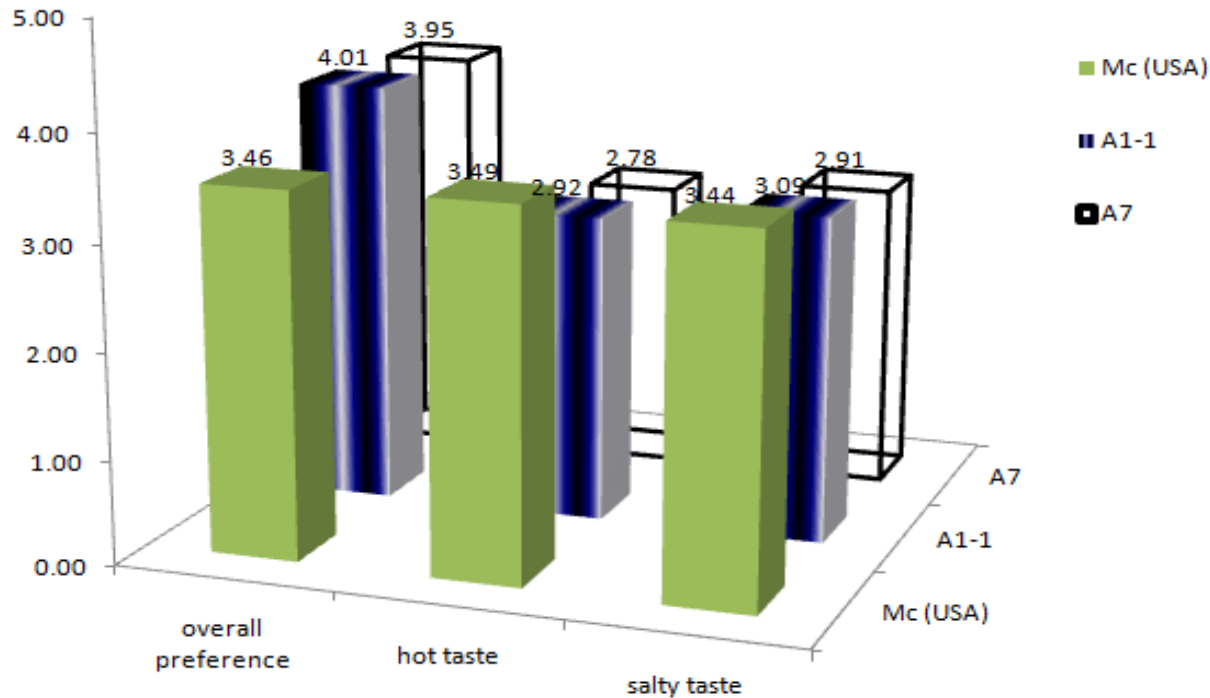


Figure 3. Comparison of overall preference of the developed chile pepper seasoning products to American favorites samples on grilled beef in USA

Korean chile pepper seasoning products for grilled beef showed higher overall acceptability, compared to American local favorite seasonings (McCormick). This result might show the possibility in replacement of mixed seasoning products from foreign countries (USA and Europe).

Table 2. Ingredients and formulations of the developed value-added chile seasoning products for grilled beef

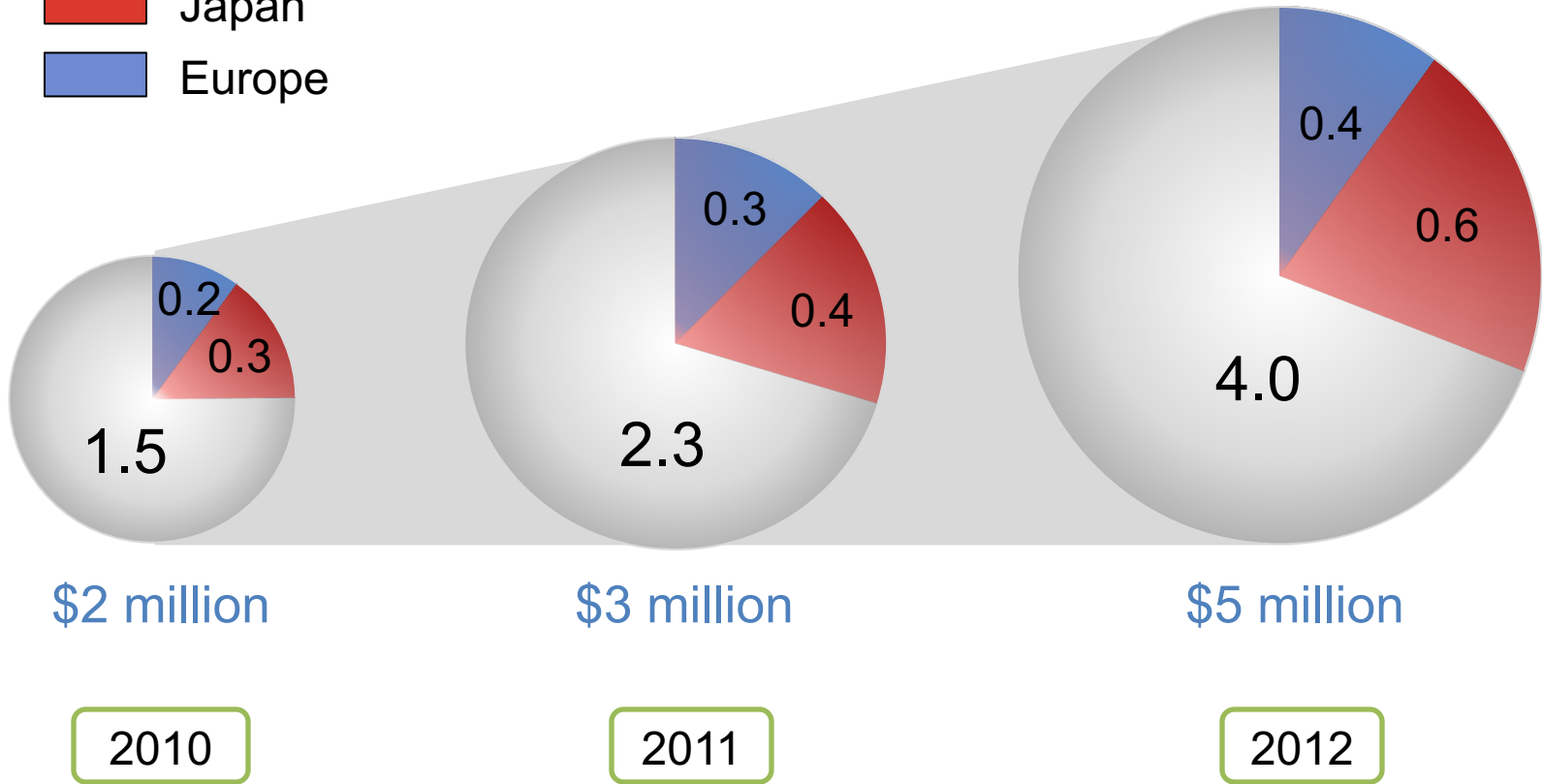
Ingredients	Seasoning Samples (weight (g))			
	A1-1	A6	A7	A8
Chile pepper	105	150	105	105
Oregano	45	45	45	45
Parsley	45	45	45	45
Thyme	45	45	45	45
Black pepper	30	30	30	30
Salt	60	60	60	60
Dried mushroom	45	45	45	45
Curry	30	30	30	30
Citron	15	15	15	15
Paprika	30	-	30	30
Sweet pumpkin	30	-	-	30
Garlic	45	-	-	-
Green pepper	-	15	-	-
Brown sugar	-	-	-	45

Completed Korean chile pepper seasoning products contained red pepper (20%), various herbs (26.1%), salt (11.4%), dried mushroom (8.5%), garlic (8.5%), black pepper, curry, paprika, sweet pumpkin (5.7%), and citron (2.8%), respectively.

Prospect of Korean Red Pepper Spices Export by RPERG

- USA
- Japan
- Europe

Unit: million dollars



Korean red pepper is the center of our food culture and the hope of our farmers.

We hope that all of people in the world enjoy and love it.



Korean red pepper to the world

Thank you so much!