

Empirical Research on Food Supply Chain Management: A background of Mozambican agriculture and case studies in Japanese agriculture



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A busy outdoor market scene, likely a grain market, with several people handling large sacks of grain. In the foreground, a man in a purple shirt and blue pants is bent over, using a small wooden bowl to scoop yellow grain from a large pile on the ground. To his left, another man in a purple shirt and yellow pants is holding a large sack. In the background, there are stacks of white sacks and other people working. The ground is covered with a large pile of yellow grain. A red arrow graphic points to the left, and a white box with a black border contains the text "Introduction".

Introduction



1.1 Contextualization

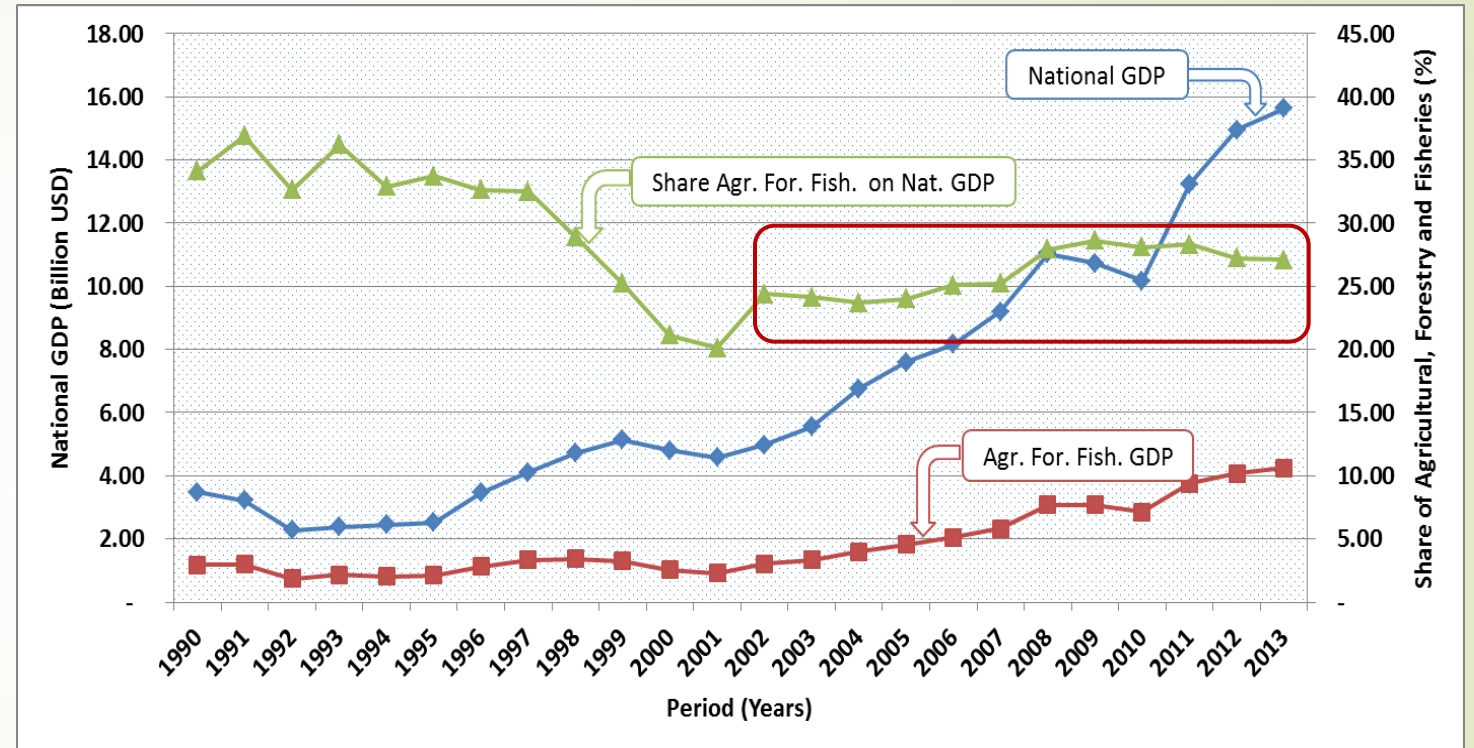
The Mozambican agrarian sector:

Is a pillar of the national economy;

✚ It has been contributing persistently between 22% and 30% to the GDP, in the last 10 years;

✚ Annual growth in the range of 5 to 11%;

✚ Employs 80% of the total employed labor force.



Source: FAOSTAT (2016)



1.2 Problem and justification

In Mozambique:

Recent studies in agri-food industry often focus on issues related to:

- ✚ Farmer's limited production, processing and access to the market;
- ✚ Wholesalers and retailers usually, are identified as powerful and able to extract more income at the expense of farmers;

There are rare studies that:

- ✚ Aim to expose the existent market potential and opportunities that can be explored, through the enhancement of “*demand pull*” and “*collaborative relationships*” strategies on behalf of the farmers;

Actual subsistence status of the Mozambican agriculture

Food insecurity, loss of business opportunities and dependency on importation



1.2 Problem and justification

In Japan:

- ✚ The FSCM is expected to be more integrated and able to be acknowledged for its functionality, either at local or national level;

These expected facts may justify the choice of conducting research in Japanese agriculture at two levels:

- ✚ **National level:** in order to understand the Japanese FSCM structure, as a whole;
- ✚ **Three case studies and consumer survey:** expected to permit a mapping of the field, identification, description and analysis of the critical variables, and;
 - ✚ Provide a deep understanding of the level of integration among the producers, wholesalers/ retailers and consumers;



1.3 Objectives



Characterize the Mozambican agriculture system, farmers' access to market rates and status of the food supply sufficiency



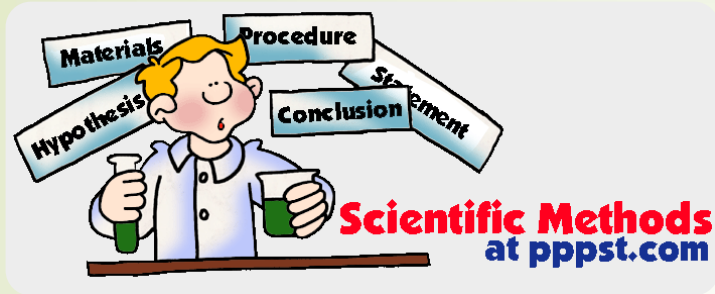
Describe the Japanese household farm management and economy and food marketing costs and income



Explore the applicability of FSCP's and SCO's principles through three case studies and consumer focus survey



Cross information and discuss the applicability of Japanese FSCM strategies in Mozambican agri-industry



2. Methodology

The outline of the research methodology

1. Characteristics of the Mozambican agriculture, **farmers' capacity to access the market and national food supply capacity (descriptive statistics)**

3. Three case studies on market oriented farming system, two chain collaborators of small farmers (**semi-structured questionnaire**) and consumer survey (**structured questionnaire**)

2. Characteristics of the Japanese agriculture structure, **household farm management and marketing costs and income (descriptive statistics)**

4. **Analysis on applicability of the Japanese FSCM strategies on Mozambican agricultural context**

A photograph of a man wearing a dark cap and a light-colored shirt, standing in a cornfield. He is holding a corn cob and looking at it intently. The background is filled with tall corn plants.

3. Structure and characteristics of the Mozambican agriculture and food system

Characteristics of the Mozambican agriculture

By 2014:

- ✚ 4.28 million of farms, from which:
 - ✚ 4.23 (98.92%) were small;
 - ✚ 45,320 (1.06%) medium and;
 - ✚ 626 (0.016%) were large.

Farm (ha)	Rain fed	Irrigated
Small	Area < 10	Area < 5
Medium	10 < Area < 50	5 < Area < 10
Large	Area > 50	Area > 10

Access to inputs, facilities and services for SMF's

Data shows that:

Access to extension services, use of chemical fertilizers, chemical pesticides, access to irrigation facilities and formal credit **are available to not more than 10% of the total number of SMF.**

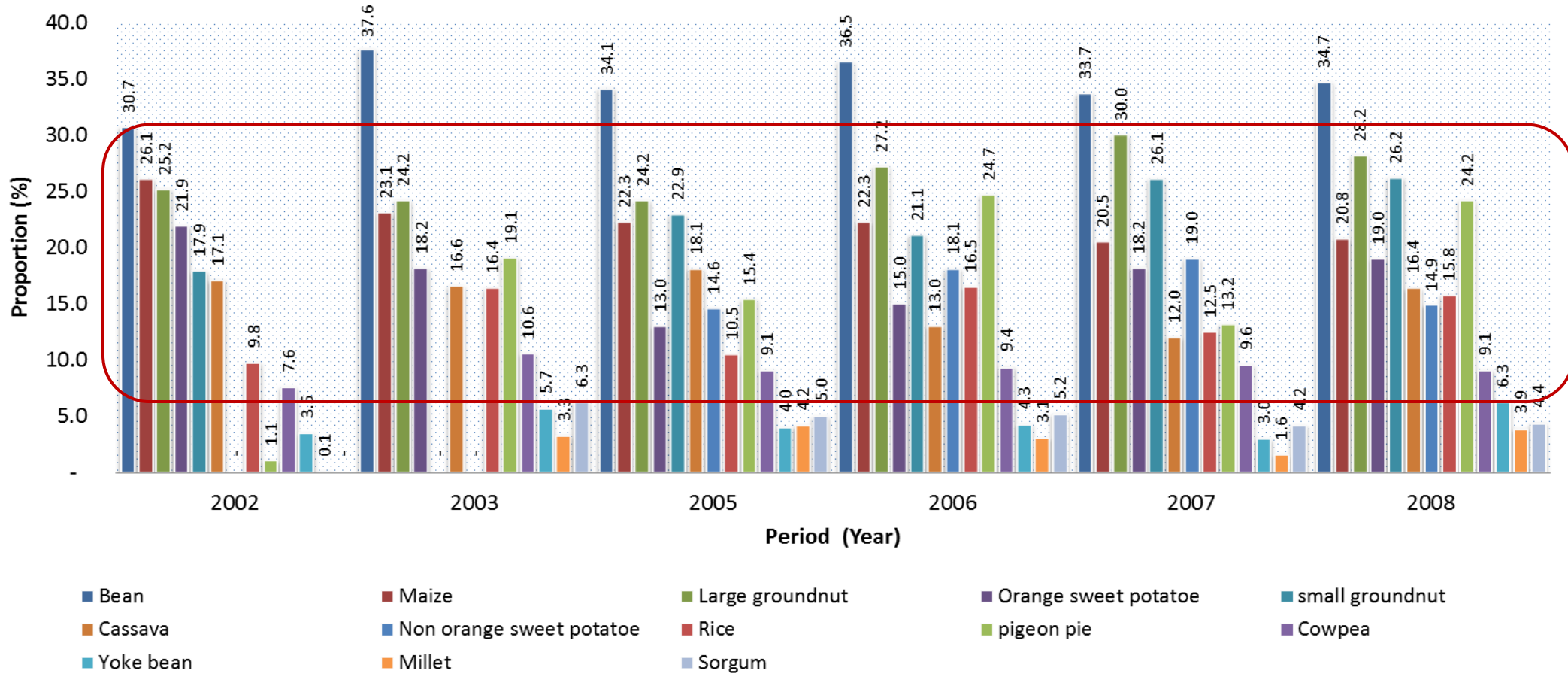


Description	2005	2006	2007	2008	2012	2014
Had access to extension services	14.8	12.0	10.1	8.3	6.6	8.3
Used chemical fertilizers	3.9	4.7	4.1	4.1	2.8	4.6
Used chemical pesticides	5.6	5.5	4.2	3.8	5.7	4.7
Used organic fertilizers	2.9	3.1	4.8	4.4	2.4	3.0
Used animal force	9.5	12.8	12.0	11.3	7.0	9.5
Used irrigation facilities	6.0	8.4	9.9	8.8	8.1	n.a.
Had access to credit	3.5	2.9	4.7	2.6	2.0	1.1
Hired permanent labor	1.8	2.2	2.6	2.9	2.1	1.9
Hired temporary labor	17.6	23.8	20.8	18.7	16.0	14.7
Belongs to an agricultural association	6.4	6.5	8.2	7.2	4.5	3.6
Had access to Market prices	40.3	36.3	35.1	34.1	49.0	48.4

Source: MASA (2015)

15 November 2017

Proportions of SMF's with access to Market for basic crops



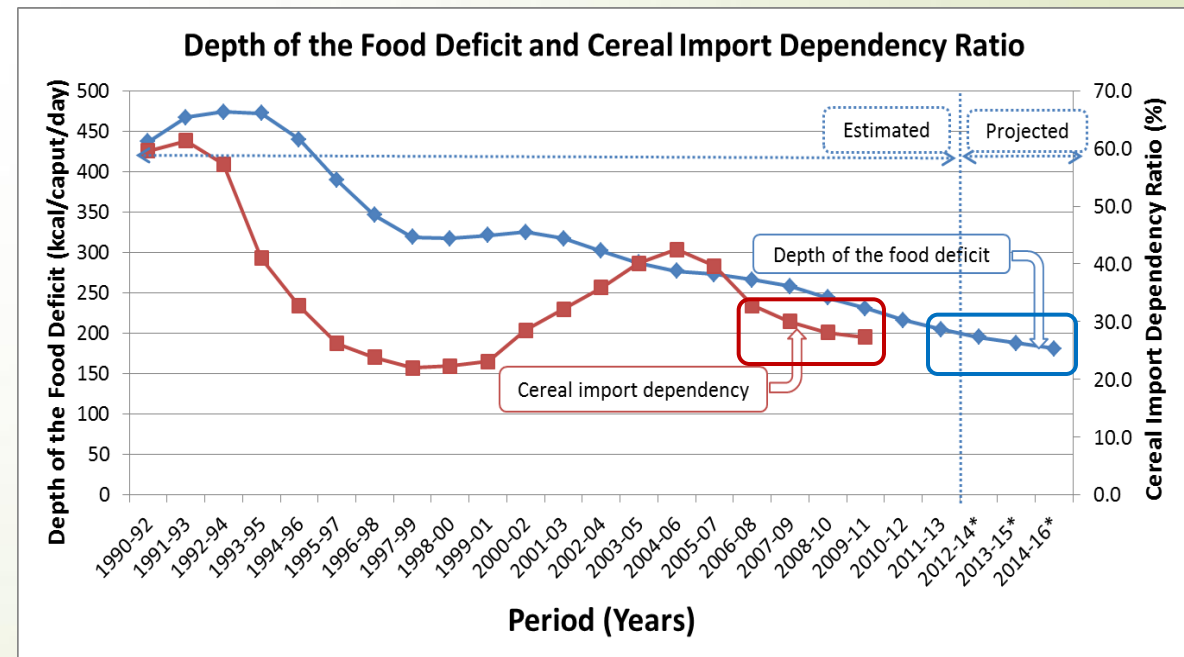
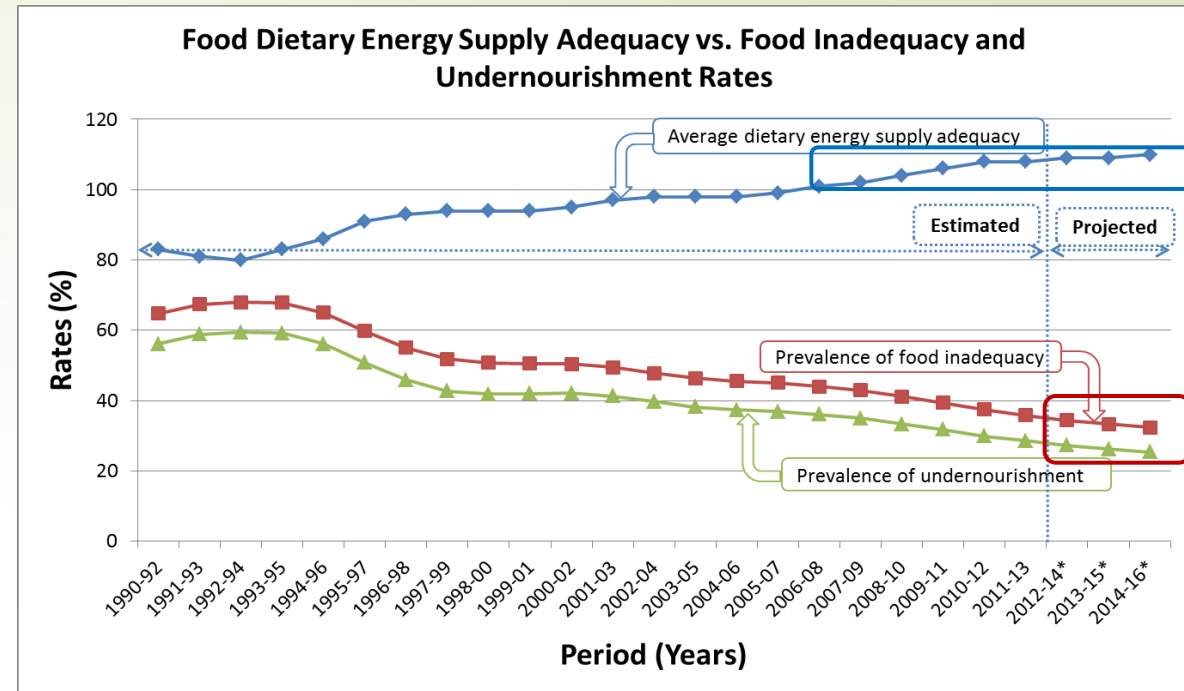
For the period under analysis:

- The proportions of SMF's that have access to the market fluctuate significantly;
- For the majority of crops, it did not go over 30%.

Food supply capacity, accessibility and importation rates

The average of **food supply capacity seems to be more than 100% by now**. However:

- There is still prevalence of food inadequacy and undernourishment (around 30 to 40%);
- The country's food deficit is close to 200kcal/capita/day;
- It forces the Government to import staple food (Eg: actual rates of cereal imports is estimated in 27%);



This findings from Mozambican agriculture suggests that:

- ✚ There is food or at least there is capacity to produce food inside the country;
 - ✚ But it does not get to the consumers, or if it gets, the consumers do not have enough purchasing capacity;
- ✚ The fact of SMF's limited access to the markets might partially justify these problems of food insecurity;
 - ✚ But this findings suggest that the Mozambican food industry may have a fragmented FSC (inefficient integration between production and distribution), rather than farmers' limited production capacity and market access themselves (***differing from what the actual researches tend to highlight***).



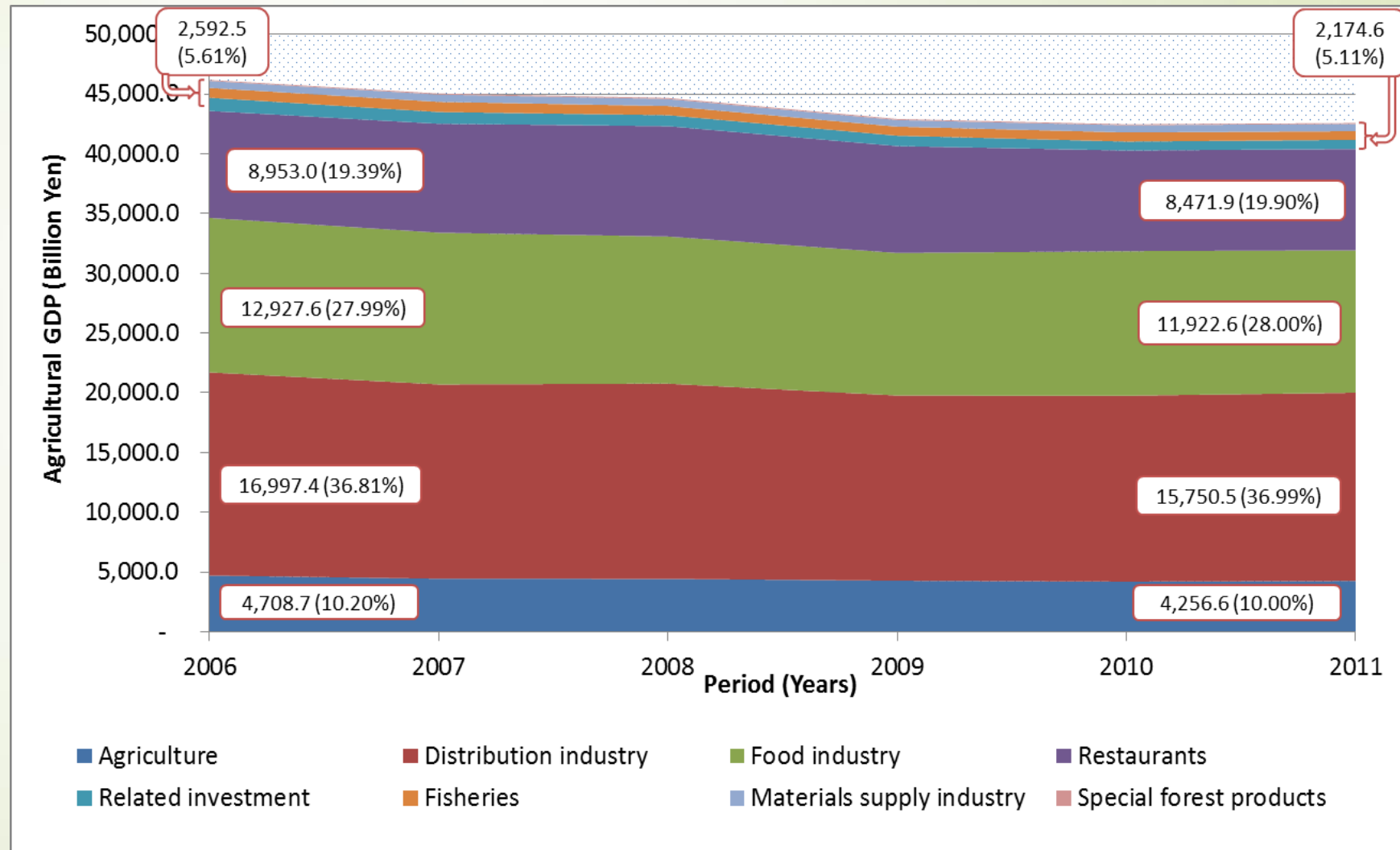
4. Structure and characteristics of the Japanese agriculture and food system

The current Structure of the Japanese agriculture and food system

Japanese GDP: 473,904.80 billion Yen (2011);
 Agriculture and related industry: 42,576.20 billion Yen (8.98%).

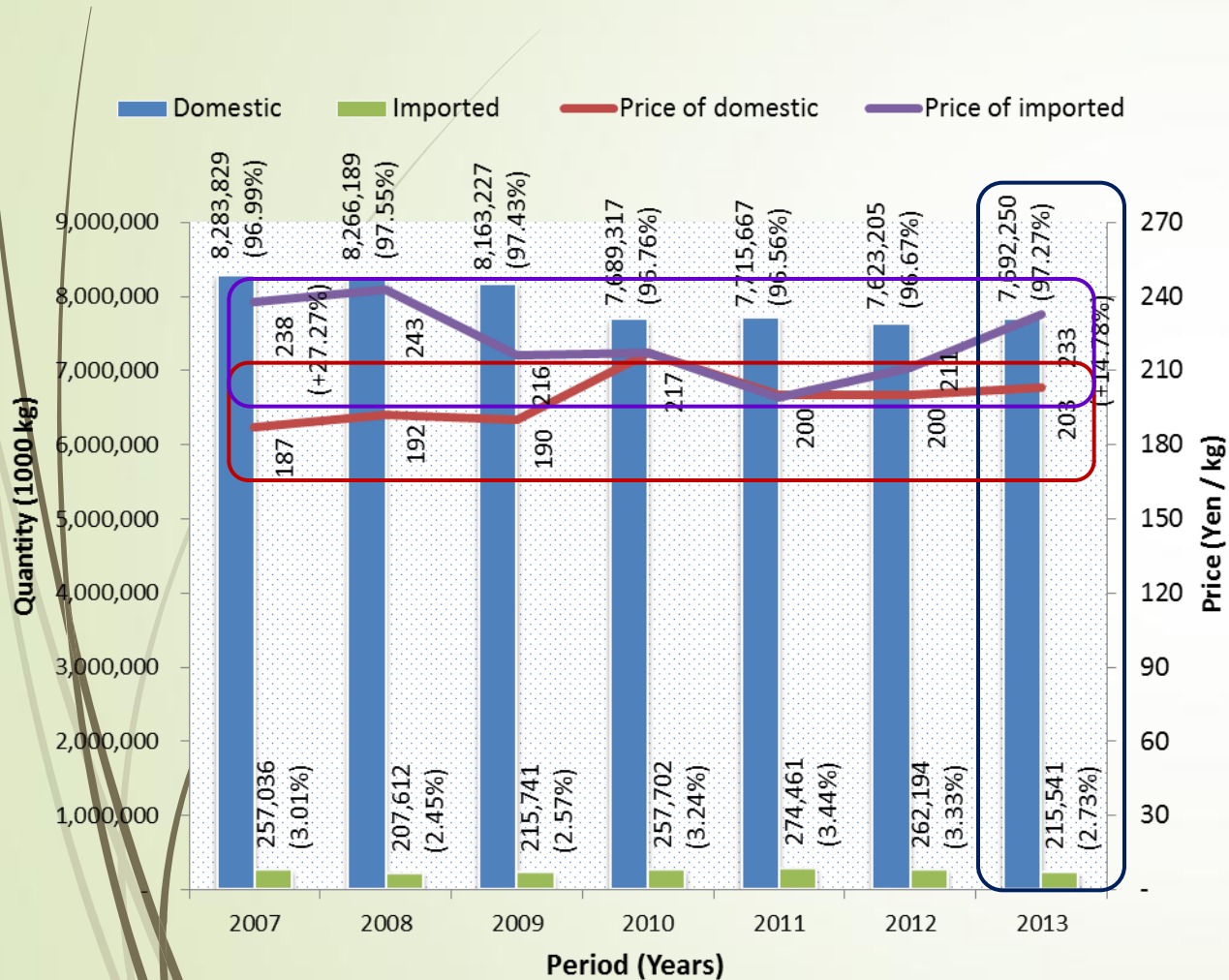
Structure:

Distribution: 36.99%;
 Manufacturing: 29.42%;
 Restaurants: 19.9%;
 Crop production: 10.0%



Marketing costs: the case of vegetables

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- Japan appears to be self sufficient in vegetables, close to 97% in major cities;
- The stability of vegetables' price seems to be the result of the national policies based on subsidies at all levels of the chain and support on collaboration;
- The price of domestic vegetables is lower than for the imported ones;

This findings from Japanese agriculture suggests that:

- ✚ The Japanese agri-industry is drove by manufacturing and distribution industry;
- ✚ Possesses policies to stabilize internal production, prices and support on collaboration at all levels

A group of people are in a field of green plants, likely conducting a survey or study. In the foreground, a woman with long brown hair, wearing a white shirt, is talking to an older man in a light blue jacket and hat. To the right, a man in a white shirt is writing in a notebook. In the background, another person in an orange shirt and hat is walking away, and a man in a dark blue shirt and cap is also visible. The field is filled with rows of green plants, and there are buildings and utility poles in the distance.

5. Case Studies and consumer focus survey

5.1 Natural citrus farm and supply chain: the case of Mika san

Name	MIKA Matsutani
Age	44 Years old
Education	Undergraduate level
Location	Ikata Town
Type of farming	Full time organic farming
Household members	2 female
Household members as labor force	2 female (Owner and Mother)
Hired labor force	0
Other source of income	Not. Given
Land (owed / rented / total)	Owed: 2.83 ha
Year started	Not Given

Interview Date: 2015/09/12



15 November
2017

Natural citrus production efficiency (estimates, F.Y. 2015)

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Item	Activity /product description	Quantity (Units)	Cost (Yen/Unit)	Total Cost (Yen)	Cost Composition (%)
Production factor					
Employee labor	pruning	10 (eventual workers)	10,000	100,000	6.16
Fertilizer	oil cake	200 (bags)	1,350	270,000	16.64
Weed Management	fuel	12 months	2,600	31,200	1.92
Total production cost				401,200	24.73
Management					
Maintenance	machine oil	3 (unknown)	400	1,200	0.07
Machinery	repair			100,000	6.16
Electricity				5,000	0.31
Communication				80,000	4.93
Total management cost				186,200	11.48
Marketing					
	fruit bagging			30,000	1.85
	transportation			1,000,000	61.64
	MOA Fee			5,000	0.31
Total marketing cost				1,030,000	63.79
Total Cost [1]				1,622,400	100
Gross Income [2]				4,291,150	
Income ([2] - [1])				2,668,750	
Cost Benefit Ratio ([2] / [1])				2.64	

Natural citrus supply chain in Mika san's farm

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Production

Retailing

Production process / product description (forward) and consumer needs (backward) information flow

Farmer

Citrus Farming

Assembling Labeling

Retailer

Local Selling , Western Japan (MOA Shop): **10 – 20%**

Direct Consumer Selling, mainly North Japan (fax and telephone ordering & mail delivery): **80 – 90%**

Direct sell, seems to:

- ✚ Permit to absorb the margins that should eventually benefit the wholesalers and retailers;
- ✚ Have helped on creating a competitive advantage in terms of price (**see table**);
- ✚ Have permitted to explore the “**place effect**” (hence there is no citrus production in the north Japan)
- ✚ Produce highly appreciated products (**organic**) in Japan

Mika san's price vs national level price, F.Y., 2015

Price: Yen/kg

Citrus type	Mika san	Producer	Retailer	
			Tokyo	Osaka
Mikan	360	n.a.	585	545
Iyokan	280	n.a.	453	471

5.2 Jay Wing Farm and supply chain: the case of Maki san

Name	MAKI Hidenori
Age	64 Years old
Education	Technical College of Agriculture
Location	Toon City
Type of farming	Full time conventional farming
Household members	3
Household members as labor force	3 (Owner, Wife and daughter)
Hired labor force	20 (9 permanent, 5 from retired and 6 part-time workers)
Other source of income	Full time farmer
Land (owed / rented / total)	1 ha / 54 ha / 55 ha
Year started	1993

Interview Date: 2015/12/16 and 2016/01/20



Jay Wing Farm production efficiency (estimates, F.Y. 2015)

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Item	Quantity (Units)	Cost (Yen/Unit)	Total Cost (Yen)	Cost Composition (%)
Common (administrative and production) factors				
Employee Labor	12 months	1,270,000	15,240,000	20.60
Fuel			3,880,710	5.25
Total undistinguished cost			19,120,710	25.84
Production factor				
Seed / Seedlings			3,122,000	4.22
Fertilizer			2,508,668	3.39
Pesticide			1,787,413	2.42
Land rent			2,393,591	3.26
Total production cost			9,811,672	13.24
Management				
Building maintenance			25,841,652	34.93
Electricity / water fee			3,880,710	5.25
Communication			878,348	1.19
Machinery / trucks maintenance			2,454,361	3.32
Insurance			769,020	1.04
Total Management Cost			33,824,091	45.72
Marketing				
Transportation			6,730,061	9.10
Grading a classification			3,302,528	4.46
Warehousing			1,195,602	1.62
Total Marketing Cost			11,228,191	15.18
Total Cost			73,984,664	100

Jay Wing Farm production efficiency (estimates, F.Y. 2015), cont...

Item	Value (Yen)
Total Cost [a]	73,984,664
Gross Income [b]	157,866,291
Income ([b] – [a])	83,881,627
Cost Benefit Ratio ([b] / [a])	2.13

Jay Wing Farm supply chain

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Production

Retailing

Production process / product description (forward) and consumer needs (backward) information flow

Farmer

Farming

Processing
Packaging
Labeling

Maki san's price vs national level price, F.Y., 2015

Price: Yen/kg

Rice type	Maki san	Producer	
		non-glutinous	glutinous
Uchi and Mochi	300	322	325.8
Red/ Black and Green	600	n.a.	n.a.

Wholesaler / Retailer

(40 – 50 customers along the country, the sequence reveals the level of importance of the buyer to the farmer)

1. Processing Companies (Kikkoman & SB Shokuhin): **50.0%**

2. Restaurant, Super-market and Rice Store: **25.0%**

3. Direct sell to consumer: **10.0%**

4. Hotel (Tokyo & Osaka): **8.0%**

5. JA Ehime: **5.0%**

6. University Cooperatives: **1.0%**

7. Hudon / pasteur Restaurant: **1.0%**

Multiple customers and strategies:

✚ The high price of red, black and green type rice, might be providing a competitive advantage;

✚ As They are sold at double price, when compared with uchi and mochi (**see table**);

5.3 Shinjo Agricultural Corporation and supply chain: the case of Watanabe san

Name	WATANABE Kunihiro
Age	63 Years old
Education	High School
Location	Seiyo City
Type of farming	Full time conventional farming
Household members	2 male and 2 female
Household members as labor force	2 male and 2 female
Hired labor force	4 male and 5 female
Other source of income	Full time farmer
Land (owed / rented / total)	Rented: 50ha
Year started	2003 (got the corporate rights)

Interview Date: 2016/03/08



15 November
2017

Shinjo Agricultural Corporation production efficiency (F.Y. 2013)

Amount (Yen)	Crops				Processed food					Total (Yen)	Cost composition
	Rice	Wheat	Soybean	Citrus	Vegetables	Tofu	Food	Biscuits	Soba		
Agr. Gross Income	12,947,369	4,714,766	8,247,735	1,402,492	1,630,407	21,061,702	730,405	1,560,216	1,141,198	53,436,290	
Production and marketing cost	12,520,801	7,308,225	7,639,145	897,025	1,144,334	10,858,413	846,927	932,199	-	42,147,069	73.68%
Administrative cost	2,493,484	2,187,115	2,243,732	564,161	488,681	6,255,215	465,763	126,448	-	14,824,599	25.92%
Other expenses	93,190	53,100	53,100	-	-	21,240	10,620	-	-	231,250	0.40%
Total agri. cost	15,107,475	9,548,440	9,935,977	1,461,186	1,633,015	17,134,868	1,323,310	1,058,647	-	57,202,918	100%
Agr. income	(2,160,106)	(4,833,674)	(1,688,242)	(58,694)	(2,608)	3,926,834	(592,905)	501,569	1,141,198	(3,766,628)	
Subsidies, premiums and other income	2,704,500	1,018,659	959,673	17,210	22	103,722	22	-	-	4,803,808	
Total Gross Income	15,651,869	5,733,425	9,207,408	1,419,702	1,630,429	21,165,424	730,427	1,560,216	1,141,198	58,240,098	
Total income	544,394	(3,815,015)	(728,569)	(41,484)	(2,586)	4,030,556	(592,883)	501,569	1,141,198	1,037,180	
Total cost [1]										57,202,918	
Total Gross Income [2]										58,240,098	
Total income ([2] - [1])										1,037,180	
Cost benefit ratio ([2] / [1])										1.02	

Shinjo Agricultural Corporation supply chain

Production

Retailing

Production process / product description (forward) and consumer needs (backward) information flow

Farmer

Farming

Processing
Packaging
Labeling

Watanabe san's price vs national level price, F.Y., 2015

Price: Yen/kg

Crop	Watanabe san	Producer		Retail	
		(no-glutinous)	(glutinous)	Tokyo	Osaka
Rice	440	322	325.8	457	406.4
Wheat flour	400	-	-	238	248
Soybean	540	-	-	n.a.	n.a.
Tofu	55	-	-	n.a.	n.a.

Wheat

JA-Higashi-Uwa (Uwa-Cho, local buyer): 80%

Direct sell (local farmers market): 20%

Rice

Direct Sell (Hotels, Restaurants: Matsuyama City): 100%

Grapes

Direct Sell (local farmers market): 100%

Processed soybean (Tofu)

Direct Sell: Hotels, Restaurants and Schools (4)

Seiyo City, Uwa-Cho: 60%

Matsuyama City: 30%

Processed soybean (Tofu)

Yawatahama City and Ozu City: 10%

Direct sells/ Multiple customers and strategies:

- ✚ He also absorb the margins that should benefit the wholesalers and retailers;
- ✚ The farmer's rice price in 2015 was literally lower than in Tokyo, therefore much higher than in Osaka area;
- ✚ The retailer wheat flour price was much lower in both metropolitan areas than the farmer's one (**table**);
- ✚ **These facts, either for wheat, or for rice may be reinforcing the farmer's capacity to increase the income.**

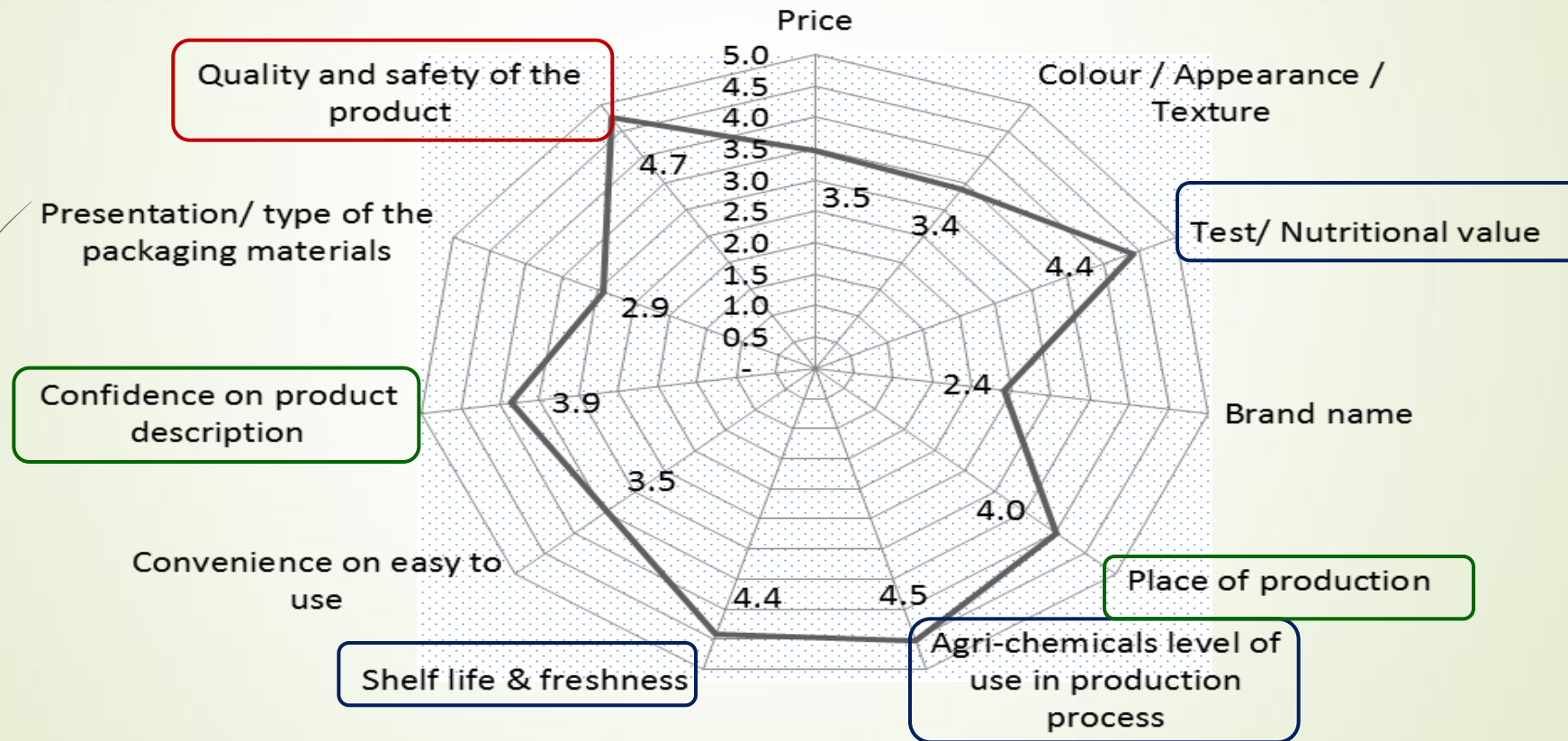


5.4 Consumer preferences and behavior: the case of MOA natural farmers' vegetables

To which extent the consumer's needs are synchronized with the farmers' service level?



Consumer characteristics and preferences



Consumer behavior

Results of the Ordinal Logistic Regression Model

	Variable	Estimate	Std. Error	Sig.
Dependent/ Threshold	Quality and safety of the product = 3	9.495ns	6.307	0.132
	Quality and safety of the product = 4	14.990**	7.377	0.042
Independent	Price	-1.791*	0.972	0.065
	Color / Appearance / Texture	2.134**	1.020	0.036
	Test/ Nutritional value	1.298ns	0.951	0.172
	Brand name	-1.303*	0.730	0.074
	Place of production	-1.205ns	0.904	0.183
	Agri-chemicals level of use in production process	1.952ns	1.273	0.125
	Shelf life & freshness	0.502ns	1.215	0.679
	Convenience on easy to use	-0.901ns	0.842	0.285
	Confidence on product description	2.251**	1.105	0.042
	Presentation/ type of the packaging materials	0.962ns	0.723	0.183

**P≤0.05; *P≤0.1 & ns = not significant
Pseudo R Square (Nagelkerke): 0.693

5.5 Summary of the Japanese FSC Practices and Orientations: based on the three case studies

The Farmer:

- ✚ Generally integrates production, assembling and processing in their business or is aligned to a processing company;
- ✚ Seems to have self-awareness regarding the quality standards, functions of the food intended to be produced and preferred by the end consumer;
- ✚ Also knows how to get the best of the food product, given its biological properties, environmental conditions and known production techniques.

Small farmers seem to emphasize (the case of MIKA san):

- + **customer relationship, consumer focus and information sharing;**
- + **Customization** as the core of the business;
- + **Commitment:** respect the relationship and/ or agreement, either formal or informal;
- + **Trust:** is based on **knowledge** about up to where the relationship can be taken;
- + The building of trust turns on **predictability** of the relationship and reduces the **risks**.

Medium and large farmers seem to emphasize (the case of MAKI san and WATANABE san):

- + **Strategic partnerships** through long-term **production-contract** for major customers and **ownership integration;**
- + **Customer relationship, consumer focus and information sharing;**
- + **Commitment, trust and preserved common values** are also performed.

Consumers

- ✚ **The consumers and the producers** seem to be synchronized in terms of product and service required;

6. Conclusions and policy implications

Analysis from the three sections suggests implementation of three main strategies, towards the development of farmers' management and supply capacity skills to Mozambican agriculture context :

- ✚ **Strategy 1 (from Jay Wing Farm perspective):** suggest FSC led by large farmers or processing companies, as they tend to understand better the dynamics of the market, and easily can adapt their production capacities to the customer/ consumer demand;

Conclusions and policy implications (Cont...)

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- ✚ **Strategy 2 (from MOA farmers perspective):** suggest FSC led by the wholesaler/ retailer, as they tend to understand better the consumer needs, and are in better position to send back signals to the farmers, about how, when and which product they should produce;
- ✚ **Strategy 3 (from Shinjo Agricultural Corp. perspective):** suggests FSC led by the farmers' markets, where all farmers are given opportunity to sell their products at retailer's price (might acquire more possibilities to increase income), and becomes more or less likely to understand better the consumers' needs.



どうもありがとうございました

Thank you very much for your attention.