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Impact of TPP and the Countermeasures by Japanese Agricultural Corporation: Empirical Analysis Based on A National Survey

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Japan has been active to promote the TPP and gradually serve as a leading country, and the effect of TPP on domestic agriculture is attracting much attention. This study focused on this topic from the perspective of agricultural corporations based on a national questionnaire survey by the authors. The questions included the managers' perceptions on the general effect of TPP and its impact on the corporation management, and the effective countermeasures. One–way ANOVA models were applied to identify the determinants of perceptions, and the countermeasures to address the impact of TPP. Further discussions were conducted to explore the different perceptions and countermeasures among various levels of significant factors. The significant determinants consisted of corporate form, age of the corporate representative, total sales, stage in corporation development, status, and concerns of agricultural export. The countermeasures were significantly determined by various intentions or preferences within different corporate forms, export status and concerns, in form of parabolic curves with age, sales, profitability, alongside the fluctuations in stages of corporation development.

Key words: Agriculture, Corporation, Countermeasure, Japan, TPP

INTRODUCTION

The TPP, trans–pacific partnership agreement, is an important international multilateral economic negotiation organization, with the purpose of economic liberation in Pacific region (Yamasaki, 2017). It was originated from the trans–pacific strategic economic partnership agreement (TPSEP), which was firstly signed in 2005 by four member countries of the Asia–Pacific economic cooperation (APEC), i.e., New Zealand, Singapore, Chile, and Brunei. It consisted of multilateral free trade agreements (FTAs) that were under consideration since 2002. Formerly known as the free trade area of the Asia–pacific (FTAAP), they aimed to promote trade liberalization in the Asia–Pacific region. Besides international trade, TPP regulates sensitive issues such as labor and environment, intellectual property rights, and state–owned enterprises.

In November 2009, the US officially announced its participation in and essentially began to dominate the TPP negotiations. Since then, the TPSEP was renamed as Trans–Pacific partnership (TPP). Following the join of Australia, Peru, Malaysia, Vietnam, and the other countries, TPP kept expanding its international influence. On July 23, 2013, Japan formally joined the TPP negotiation. On February 4, 2016, the TPP was officially signed by representatives from 12 member countries in Auckland, New Zealand. TPP agreements need to be approved by national legislatures (the congresses and parliaments). On November 10, 2016, the House of Representatives of Japan adopted the TPP agreement. On December 9, with the approval by majority of the Senate, the approval process of TPP in the Japanese Diet was completed (Fujita *et al.*, 2018). However, due to the large domestic divergences in the US, coupled with the opposition of both Democratic and Republican presidential candidates, the TPP agreement faced numerous obstacles to be approved by the Congress. On November 11, 2016, the U.S. Senate announced that the TPP plan was officially suspended. On January 20, 2017, the new US President Donald Trump announced the withdrawal from TPP on the inauguration day. On January 23, 2017, he signed an executive order at the White House, marking the formal withdrawal procedure of the US from TPP. Meanwhile, the Trump administration began to explore bilateral trade opportunities with US Allies and other countries (Suzuki, 2017; Fukui, 2019).

The Japanese government expects that the TPP can increase GDP by 0.66% with 570 trillion yen of gross value (Suzuki, 2017). TPP is hence taken as a pillar of economic growth strategy, especially the largest option for agriculture (Ohizumi, 2014). On November 11, 2017, Japanese Economic Renaissance Minister held a joint press conference with the industry and trade minister of Vietnam in Da Nang, Vietnam. They announced that except for the US, the 11 countries will sign a new free trade agreement of comprehensive progressive trans–pacific partnership (CPTPP) (Fujita *et al.*, 2018). On March 8, 2018, the signing ceremony of CPTPP was held in Santiago, Chile, and the agreement entered into force since December 30, 2018 (MAFF, 2020). In this way, although the attitude of the US experienced fluctuations and eventually withdrawal, Japan has been positive to the TPP and gradually came to a leading role.

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The TPP requires to abolish the tariff protection in all fields, and hence affects the disadvantaged industries of participating countries. Japan's main agricultural products have been protected by high tariffs. Once the tariffs are removed and the free trade market of agricultural products is completely opened, its agriculture will inevitably suffer heavy losses. The latest estimation of the losses was 110 billion Yen (MAFF, 2020). To reduce the losses, the Japanese government tried to delay or reduce the agricultural tariff cancellation in the TPP negotiations. On the other hand, the government formulated special budget and plan to stabilize agricultural production, introduce information technology to reduce production costs and improve quality, and actively develop overseas markets for agricultural products. The corporations are encouraged to access agricultural management. By 2018, the number of corporations involved in farmland and farm management was 3286, increased by 6.7 times since 2009 when started the liberalized lease system of farmland. The corporations comprised stock company (63.6%), limited company (12.3%), and NPO (24.1%) (MAFF, 2020). They are increasingly becoming the backbone to integrate advanced production factors, promote R&D and managerial innovations, and export the agricultural products.

Many scholars have carried out concerning studies on the TPP and its impact on Japanese agriculture. Ito (2016) analyzed the potential of Japonica rice production overseas for Japan market and the trend domestic rice production, under the inter–governmental agreement of TPP. Mishima (2016) analyzed the impact on rice farming, dairy farming, livestock farming, upland crops, vegetables, and fruits. Sakuyama (2016) examined the roles of pre–determined negotiation rules drawn up by Japan's agricultural liberalization commitments of the TPP agreement. Shimizu (2016) calculated the tariff removal rate within all the 2328 agricultural, forestry and fishery products, and the 586 goods of the 5 staple products. Shimizu (2018) estimated the impacts of different tariff level, say, those retained on the staple items (rice, wheat, dairy products, and sugar), lower or even free on beef, pork, and most processed goods. Taniguchi and Hattori (2018) discussed the effect of TPP on the main products excluding rice, and the problem of agriculture structure. Chomei and Nanseki (2019) reviewed the effect of TPP on Japanese agriculture in general and on individual staple products, using the data issued by Ministry of agriculture, forestry, and fisheries (MAFF).

Different from most prior studies, this study analyzed the effect of TPP on agricultural management using the result of the national questionnaire survey to agricultural corporations. The perceptions of the respondents were collected in 2016, before withdrawal of the US from the TPP. Thought it may be slightly different from the present situation, it revealed the micro level basis of Japan's enthusiastic commitment to joining TPP just before the diet's approval. This study measured the managers' perceptions of the impact of TPP on Japanese agriculture, and the significant determinants from the perspective of corporation attributes, managerial properties, and agricultural export.

SURVEY AND DATA

The questionnaires survey supporting this study was conducted by the authors from August to October of 2016. The names of the agricultural corporations, as respondents, were selected from various publications, reports, and the homepage of Japan Agricultural Corporation Association (https://hojin.or.jp/). Then, their addresses were collected by staffs of this project with search engine of Internet. Among the 2468 corporations requested to fill in the mailed questionnaire, 558 valid answers were obtained to make an effective reply rate of 22.6% (Chomei and Nanseki, 2019).

As shown in the appendix, the questionnaire can be grouped into attributes of the respondents, the respondents' evaluation on impact of TPP and their countermeasures. Based on the data collected through the survey, one–way analysis of variance (ANOVA) was adopted to identify the significant determinants of the respondents' perceptions and countermeasures. Further discussion was conducted on the perceptions and countermeasures affected by variation of the significant determinants (Fig. 1).

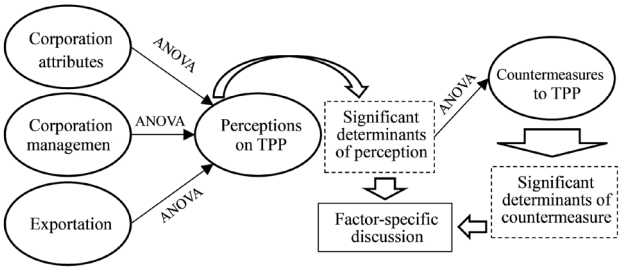

Fig. 1. Questionnaire structure and data analysis process in this study.

Attributes of the respondents

Table 1 showcases the questions, together with the sample size, choice type, corresponding number in the appended questionnaire, and responded proportion of each option.

The attributes are further grouped into three categories. First category included the corporation attributes. (1) Corporate form consisted of three categories. Limited company, accounted for 45.8%, refers to those founded before May 1, 2006 and legally allowed to retain, though thereafter it has been excepted from new enterprises by the Company Act. Stock company, accounted for 35.7%, can be listed publicly, and the shareholders have limited liability for the debt. Agricultural producers' cooperative corporation, accounted for 17.1%, is farmers' mutual aid organization to share agricultural facilities, carrying out agricultural production, and it is established according to the Agricultural Cooperative Act. (2) Corporation being judicially qualified to own farmland, accounted for 80% of the surveyed corporations. Referred as agricultural production corporation

Table 1. Respondent attributes and the corresponding question numbers in the appended questionnaire

1. Corporate form (n=544, single choice, Q1): Limited company (45.8%), stock company (35.7%), agricultural producers' cooperative corporation (17.1%), others (1.5%)
2. Corporation is judicially qualified to own farmland (n=545, single choice, Q2): Yes (80.0%), No (20.0%)
3. Age of the corporate representative (n=519, single choice, Q3): Less than 30 (0.2%), 30–40 (9.1%), 40–50 (15.6%), 50–60 (24.5%), 60–70 (41.4%), more than 70 (9.2%)
4. Education of the corporate representative (n=558, multiple choice, Q4): High school (49.6%), vocational school (8.8%), institute of agricultural management (12.0%), junior college (6.3%), university (27.4%), graduate school (3.9%), others (e.g., private schools and training programs, 3.2%) Agriculture–related (51.6%), not agriculture–related (53.4%), at school or drop–out (6.3%)[a]
5. Total sales in latest accounts (million Yen, n=540, single choice, Q5): Less than 30 (11.9%), 30–50 (14.1%), 50–100 (20.4%), 100–300 (31.1%), 300–500 (9.1%), 500–1000 (6.5%), 1000–1500 (2.6%), 1500–2000 (1.1%), more than 2000 (3.3%)
6. Total profit margin in latest accounts (n=527, single choice, Q6): Deficit (16.3%), break–even –0% (8.5%), 1–5% (34.7%), 5–10% (20.7%), 10–15% (9.3%), 15–20% (7.6%), more than 20% (2.8%)
7. Stage in the corporation development (n=538, single choice, Q7): Starting (8.4%), growing (33.5%), mature (19.1%), recession (6.7%), 2nd starting (15.8%), 2nd growing (12.3%), 2nd mature (1.3%), 2nd recession (2.0%), others (2.8%)
8. Crop and agricultural product of the corporation (n=558, multiple choice, Q8): Rice (36.6%), wheat (11.6%), beans and coarse cereals (16.7%), open ground vegetable (28.3%), house vegetable (22.6%), flower and foliage plant (7.2%), fruiter (10.2%), mushroom (3.9%), dairy cow (4.3%), beef cattle (4.7%), poultry meat and eggs (6.8%), swine (5.9%)
9. Export of agricultural and processed products (n=514, single choice, Q9): Doing directly (3.7%), doing indirectly (11.7%), under consideration (23.2%), no planning (60.5%)
10. Concerns on exporting agricultural and processed products (n=541, multiple choice, Q10): Yen exchange rate (29.8%), popularity of Japanese food (24.2%), domestic market movements (14.8%), overseas market movements (32.3%), export is not concerned (25.7%), others (5.5%)

a: sum of all the relevance to agriculture and at school status of education levels.
Source: survey conducted by the authors

before 2015, it can possess and transact farmland like a farmer, have made dramatic growth, from 2740 in 1970 to 19213 by 2019 (MAFF, 2020), covering almost all agricultural sectors. (3) Age of the corporate representative, the options varied from less than 30 to more than 70, and most of corporations had a representative aged in 60–70, with the ratio of 41.4%. (4) Education background of the corporate representative, the largest option was high school (49.6%), following by university (27.4%), institute of agricultural management (12.0%), vocational school (8.8%), junior college (6.3%), and graduate school (3.9%). For each option, the respondents were required to answer whether their education related to agriculture, being at school or drop–out.

Second category related to corporate management. (5) Total sales in latest accounts, which was grouped in 9 levels from less than 30 million Yen to more than 2 billion Yen, with the largest percentage of 31.1% in 100–300 million Yen. (6) Total profit margin in latest accounts varied from deficit to more than 20%, and the largest percentage of 34.7% occurred on those with the margin of 15%. (7) Stage in the corporation development was optional in the first and the second rounds of starting, growing, mature, and recession, and the first round of growing had the largest ratio of 33.5%. (8) Crops and agricultural products of the corporation, rice (36.6%) was most adopted, following by open ground vegetable (28.3%), house vegetable (22.6%), beans and coarse cereals (16.7%), wheat (11.6%), fruiter (10.2%), flower and foliage plant (7.2%), poultry meat and eggs (6.8%), swine (5.9%), beef cattle (4.7%), dairy cow (4.3%), mushroom (3.9%).

Third category involved status and concerns of exportation. (9) Export of agricultural and processed products was surveyed from doing directly (3.7%), doing indirectly (11.7%), under consideration (23.2%), and no planning (60.5%). (10) Concerns in exporting agricultural and processed products, including Yen exchange rate (29.8%), popularity of Japanese food (24.2%), domestic market movements (14.8%), and overseas market movements (32.3%).

Perceptions and countermeasures to the TPP

As shown in Table 2, three questions were designed to capture the responses. (1) Overall evaluation of TPP, 12.8% and 19.6% of the responses esteemed TPP will lead to big crisis or crisis, 9.1% and 12.1% of them evaluated the participation of TPP as a "big chance" or "chance", while the rest 46.3% esteemed TPP as neither a chance nor a crisis. (2) TPP's impact on corporation management, 1.7% and 2.9% of the 522 valid responses chose the extreme options of bankruptcy and fast growth. Excluding the 43.3% responses with no clear judgement, bad impact and that in slight level were cho-

Table 2. Respondents' perception towards the TPP participation of Japan and the corresponding question numbers in the appended questionnaire

1. Overall evaluation of TPP (n=525, single choice, Q11): (1) Big crisis (12.8%), (2) crisis (19.6%), (3) neutral (46.3%), (4) chance (12.2%), (5) big chance (9.1%)
2. TPP's impact on your corporation management (n=522, single choice, Q12): (1) Bankruptcy (1.7%), (2) bad impact (18.8%), (3) slightly bad impact (18.4%), (4) neutral (43.3%), (5) slightly good impact (7.9%), (6) good impact (7.1%), (7) fast growth (2.9%)
3. Your corporation's effective countermeasure to the TPP (n=545, multiple choice, Q13): (1) Scale enlargement (31.0%), (2) business diversification (24.4%), (3) corporate collaboration and management integration (16.9%), (4) access to new domestic market (13.6%), (5) access to overseas market (21.5%), (6) cost reduction (37.8%), (7) introduction of new technology (23.1%), (8) improvement and upgrading of production management (35.8%), (9) cost reduction of materials and machinery (25.0%), (10) personnel expenses and wage restraint (7.5%), (11) commodity differentiation (43.5%)

Source: survey conducted by the authors

sen by 18.8% and 18.4% of the respondents, while good impact and that in slight level were supported by 7.1% and 7.9% of them, respectively. (3) Corporation's effective measures to TPP, the largest ratio of 43.5% was commodity differentiation, following by cost reduction (37.8%), improvement and upgrading of production management (35.8%), and scale enlargement (31.0%).

To sum up, optimistic respondents were slightly less than those pessimistic in general. However, further analysis by Chomei and Nanseki (2019) revealed that in corporations with advantages in managerial strategy and information management, the respondents were obviously more optimistic to TPP. Their countermeasures emphasized on production innovation to enrich the variety of agricultural products with reduced costs. Thus, although the TPP may lead to losses to agriculture, the corporations can address the challenges with modern internal organization structure, supporting public policies, and the countermeasures to resolve the competitive pressure.

RESULT AND DISCUSSION

Determinants of the perception to the TPP

ANOVA is a widely used statistical tool to test the significance of the level–specific mean of dependent variables due to the variation of one factor (Quirk *et al*., 2013), having been used in empirical studies including Johnson *et al*. (2016), Richard (2020). As illustrated in Fig. 1, using SPSS 23.0 for Windows, the ANOVA was applied to identify the significant determinants of respondents' perception and countermeasures towards the effect of TPP. Table 3 summarizes the significant factors to the adoption of the two perceptions, among different levels of the respondent attributes in the left column.

Table 3. ANOVA result on significant factors of the perceptions on TPP participation of Japan

Factor: respondent attribute	Overall evaluation of TPP		TPP's impact on corporation management	
	F[c]	Sig.	F[c]	Sig.
1. Corporate form	**8.458**	0.000	**8.822**	0.000
2. Corporation is qualified to own farmland	1.220	0.270	2.703	0.101
3. Age of the corporate representative	**5.508**	0.000	**3.873**	0.002
4. Education of the corporate representative[a]	0.773	0.463	0.432	0.650
5. Total sales in latest accounts	**2.741**	0.006	**2.956**	0.003
6. Total profit margin in latest accounts	1.424	0.203	1.281	0.264
7. Stage in corporation development	**3.734**	0.000	**3.779**	0.000
8–1. Sales of open ground vegetable[b]	**2.512**	0.024	**2.346**	0.034
8–2. Sales of house vegetable[b]	2.020	0.069	2.487	0.027
8–3. Sales of flower and foliage plant[b]	1.175	0.162	2.816	0.041
9. Export of agricultural and processed products	**14.166**	0.000	**11.829**	0.000
10–1. Concern on Yen exchange rate	3.712	0.055	0.527	0.468
10–2. Concern on popularity of Japanese food	4.037	0.045	2.972	0.085
10–3. Concern on domestic market movements	5.009	0.026	2.324	0.128
10–4. Concern on overseas market movements	**13.866**	0.000	**21.077**	0.000

a: result of the high school, and the other educational backgrounds are similarly insignificant. b: data are grouped in 9 level as shown in Table 1, and the insignificant products are omitted. c: The bold F values indicate significant factors at 0.01.

Software: SPSS 23.0 for window

Each factor was measured as imposing similar significance to the two dependent variables. In each analysis, the dependent variables were overall evaluation of TPP and its impact on corporation management as shown in Table 2, while the variables listed above in Table 1 were set as the factor in turn. Corporate form, age of the corporate representative, total sales in latest accounts were significant, while whether the corporation is judicially qualified to own farmland, education background of the corporate representative, total profit margin in latest accounts were insignificant at 0.01. The other factors significant at 0.01 included stage in corporation development, export of agricultural and processed products. Within the sales of crops and agricultural products, open ground vegetable was significant at 0.01, house vegetable, flowers and foliage plant were significant at 0.05. Within the four concerns on exporting agricultural and processed products, only that on the overseas market movements was significant at 0.01 (Table 3).

Determinants of countermeasures to the TPP

The ANOVA models were constructed to identify the significant determinants of the countermeasures to TPP. The results are summarized in Table 4, where M_1 through M_{11} stand for the 11 countermeasures, from scale enlargement to commodity differentiation.

Corporate form was significant to scale enlargement (M_1), business diversification (M_2), access to overseas market (M_5), cost reduction of materials and machinery (M_9); while being a corporation qualified to own farmland was significant only to corporate collaboration and management integration (M_3). Total sales in latest accounts were significant to access to new domestic market (M_4), improvement and upgrading of production management (M_8); while only cost reduction (M_6) was significantly determined by total profit margin in latest accounts. Stage in corporation development was significant to scale enlargement (M_1), introduction of new technology (M_7), commodity differentiation (M_{11}).

Table 4. ANOVA result on significant factors of the perceptions on TPP participation of Japan

Factor[a]	Corporation's effective countermeasure to the TPP[b]										
	M_1	M_2	M_3	M_4	M_5	M_6	M_7	M_8	M_9	M_{10}	M_{11}
Corporate form	**3.58*****	**3.76*****	1.62	0.43	**4.06*****	0.39	0.03	0.05	**2.92*****	1.44	2.12*
Corporation is qualified to own farmland	0.00	0.22	**7.29*****	0.32	0.02	0.38	2.48	0.05	0.02	3.81**	0.27
Age of the corporate representative	2.82**	1.24	1.66	2.17*	**3.94*****	0.63	0.77	1.80	1.88*	1.09	0.36
Vocational school	1.53	0.99	1.80	0.38	0.55	2.78*	3.06*	1.15	0.42	1.66	0.03
Junior college	**7.01*****	0.03	1.70	3.52*	1.11	0.32	0.01	1.27	0.11	0.00	1.27
Graduate school	0.35	0.50	0.62	2.97*	0.66	0.05	0.48	0.10	3.41*	0.00	0.38
Total sales in latest accounts	0.54	0.62	1.93**	**2.35*****	1.45	1.32	0.85	**2.88*****	0.23	0.69	1.59
Total profit margin in latest accounts	0.42	0.15	1.61	0.62	1.42	**2.37*****	0.70	1.02	0.85	0.40	0.34
Stage in corporation development	**6.76*****	2.42**	0.47	1.86*	2.31**	0.61	**3.27*****	1.62	1.36	1.14	**3.08*****
Sales of rice	2.08	0.45	1.90	0.43	2.19*	**4.34*****	**3.99*****	2.29*	2.54*	0.33	0.59
Sales of wheat	0.53	0.59	**4.59*****	1.19	0.76	0.03	0.72	0.11	0.68	0.90	0.26
Sales of beans and coarse cereals	1.93	2.62*	2.47*	0.33	0.34	0.43	0.34	0.45	0.82	0.36	0.79
Sales of open ground vegetable	0.90	1.02	1.42	0.58	2.29**	0.88	1.27	0.75	0.75	0.44	0.42
Sales of house vegetable	0.50	1.18	0.57	2.12*	1.47	0.69	0.29	1.90*	2.34**	0.49	0.72
Sales of fruiter	1.55	2.81**	0.42	0.69	2.61**	2.83**	2.02**	1.36	2.99**	**6.20*****	0.90
Sales of beef cattle	1.16	1.41	2.23*	0.35	0.51	1.00	0.57	1.05	1.72	0.41	0.79
Sales of swine	0.65	1.86	0.63	0.47	0.75	1.47	0.83	**3.46*****	0.55	0.18	0.99
Export of agricultural and processed products	**4.42*****	1.87	3.29**	3.07**	**51.79*****	0.27	2.28*	0.30	0.59	0.19	**3.85*****
Concern on Yen exchange rate	**20.69*****	2.16	2.75*	**10.43*****	**43.92*****	0.94	**7.82*****	**7.56*****	2.90*	0.99	6.49**
Concern on popularity of Japanese food	**14.44*****	**9.41*****	0.53	**11.89*****	**14.13*****	1.73	4.08**	0.14	1.00	1.36	4.41**
Concern on domestic market movements	2.60	3.35*	2.01	**20.05*****	**7.16*****	2.79*	4.48**	**13.03*****	**7.98*****	0.18	3.28*
Concern on overseas market movements	**12.54*****	2.44	**9.08*****	1.62	**104.95*****	0.79	4.05**	5.24**	1.81	1.19	**24.82*****

a: Factors without significant effect are omitted. b: M_1 through M_{11} stand for the countermeasures, i.e., scale enlargement (M_1), business diversification (M_2), corporate collaboration and management integration (M_3), access to new domestic market (M_4), access to overseas market (M_5), cost reduction (M_6), introduction of new technology (M_7), improvement and upgrading of production management (M_8), cost reduction of materials and machinery (M_9), personnel expenses and wage restraint (M_{10}), commodity differentiation (M_{11}). The numerals are the F values of ANOVA, while ***, ** and * indicate significance at 0.01, 0.05, and 0.10, respectively. The bold values are significant at 0.01.

Software: SPSS 23.0 for window

The countermeasures determined by export of agricultural and processed products included scale enlargement (M_1), access to overseas market (M_5), and commodity differentiation (M_{11}). When considering exporting, each of the four concerns was significant to the countermeasures. Concern on Yen exchange rate determined scale enlargement (M_1), new domestic market (M_4), access to overseas market (M_5), introduction of new technology (M_7), and improvement and upgrading of production management (M_8). Concern on popularity of Japanese food was significant to scale enlargement (M_1), business diversification (M_2), new domestic market (M_4), and access to overseas market (M_5). The four countermeasures determined by concern on domestic market movements included new domestic market (M_4), access to overseas market (M_5), improvement and upgrading of production management (M_8), and cost reduction of materials and machinery (M_9). The countermeasures determined by concern on overseas market movements consisted of scale enlargement (M_1), corporate collaboration and management integration (M_3), access to overseas market (M_5), and commodity differentiation (M_{11}).

The demographic information of the corporate representative and sales of crops and agricultural products were measured as less determining to the TPP countermeasures. Setting the significant level at 0.01, age of the corporate representative only determined access to overseas market (M_5). Within the educational institutions, only junior college was significant to scale enlargement (M_1). In terms of sales, the significant crops and agricultural products involved only rice to cost reduction (M_6) and introduction of new technology (M_7), wheat to corporate collaboration and management integration (M_3), fruiter to personnel expenses and wage restraint (M_{10}), and swine to improvement and upgrading of production management (M_8). All the ANOVA results on countermeasures are summarized in Table 4.

FURTHER DISCUSSION

Perception on different levels of the significant factors

For the two perceptions, each level was presented by a corresponding value as shown above in Table 2. Regarding the overall evaluation of TPP, numerals of 1 through 5 were used to stand for the five levels from big crisis to big chance. For perception on TPP's impact on corporation management, numerals of 1 through 7 indicated the seven levels from bankruptcy to fast growth. Thus, the average value of the numbered levels showcases the respondents' perceptions, and higher values indicate more positive assessment. Table 5 summarized the TPP perceptions of respondents, on different levels of the significant factors measured in Table 3, with paired values of both perceptions varying in the same directions.

Among the three corporate forms, stock company

Table 5. TPP perceptions of respondents on different levels of the significant factors

1. Corporate form (mean=2.85, 3.70) [a]: Limited company (2.78, 3.61), stock company (3.13, 4.03), agricultural producers' cooperative corporation (2.47, 3.24), others (2.75, 3.50)
2. Age of the corporate representative (mean=2.85, 3.70): Less than 30 (5.00, 7.00), 30–40 (3.23, 4.07), 40–50 (3.19, 3.96), 50–60 (2.87, 3.70), 60–70 (2.64, 3.52), more than 70 (2.79, 3.57)
3. Total sales in latest accounts (million Yen, mean=2.84, 3.69): Less than 30 (2.79, 3.56), 30–50 (2.80, 3.59), 50–100 (2.85, 3.67), 100–300 (2.80, 3.74), 300–500 (2.71, 3.57), 500–1000 (3.24, 3.91), 1000–1500 (3.57, 4.71), 1500–2000 (1.40, 1.80), more than 2000 (3.00, 3.82)
4. Stage in corporation development (mean=2.85, 3.70): Starting (3.14, 3.93), growing (3.08, 3.96), mature (2.51, 3.40), recession (2.50, 3.28), 2nd starting (2.71, 3.44), 2nd growing (2.98, 3.97), 2nd mature (2.50, 2.83), 2nd recession (2.00, 2.00), others (2.71, 3.71)
5. Sales of open ground vegetable (million Yen, mean=2.98, 3.81): Less than 30 (2.80, 3.64), 30–50 (3.50, 4.07), 50–100 (2.82, 3.47), 100–300 (3.41, 4.59), 300–500 (4.00, 4.67), 500–1000 (3.50, 4.00), 1000–1500 (4.00, 5.00)
6. Sales of house vegetable (million Yen, mean=2.90, 3.80): Less than 30 (2.78, 3.62), 30–50 (2.69, 3.62), 50–100 (2.73, 3.73), 100–300 (3.50, 4.55), 300–500 (3.67, 4.67), 500–1000 (3.00, 4.00), 1000–1500 (2.00, 2.00)
7. Sales of flower and foliage plant (million Yen, mean=3.00, 3.70): Less than 30 (2.80, 3.27), 30–50 (2.75, 3.25), 50–100 (3.67, 4.67), 100–300 (2.89, 3.89), 300–500 (3.33, 4.00)
8. Export of agricultural and processed products (mean=2.85, 3.69): Doing directly (3.79, 4.63), doing indirectly (3.21, 4.16), under consideration (3.15, 3.97), no planning (2.59, 3.42)
9. Concerns in exporting agricultural and processed products (mean=2.85, 3.70) [b]: Yen exchange rate (2.99: 2.79, 3.76: 3.67), popularity of Japanese food (3.02: 2.80, 3.86: 3.64), domestic market movements (3.10: 2.81, 3.90: 3.66), overseas market movements (3.10: 2.73, 4.05: 3.52)

a: The two numerals in each bracket are average values of perceptions on overall evaluation of TPP, and its impact on corporation management. Number of respondents for each question and option can be found in Table 1. b: Colon is used to separate the average values of "Yes" and "No".

Source: survey conducted by the authors

was most positive about the impact of TPP, following by limited company, and then agricultural producers' cooperative corporation. Age of the corporate representative was roughly negative to the perception on TPP impacts, that is, the younger the more optimistic, and gradually decreased with the increase of age group.

Respondents from corporations with total sales in latest accounts of 1–1.5 billion gave the highest estimation to the impact of the TPP, following by the groups of 500–1000 million, more than 2.0 billion, and the other groups evaluated the overall impact of TPP less than the median value of 3 in this 1–to–5 system. Similar trend was observed in the TPP' impact on company management. The highest evaluation was also given by annual sales of 1000–1500 million yen, while the evaluations from the other groups were less than the median value of 4.0 in this 1–to–7 system (Fig. 2).

In terms of the corporation development stage, highest evaluation on over impact of the TPP was made by respondents from those in staring stage, following by the growing stage, and the evaluations of the other groups were smaller than the median value of 3.0. In contrast, as to the assessment of the TPP' impact on corporation management, although average value of all the eight groups did not reach the median point of 4, those in the second growing stage were most optimistic (Fig. 3). The two figures illustrated that in each group of the sales or stages, the average value of TPP's impact on company development is larger than that on overall evaluation, indicating that that corporations are more self–confident, than the national economy, to deal with the challenges brought by TPP.

In terms of the sales of open ground vegetable, it related to the perception values negatively by large, as the largest values occurred on the group of 1.500–2.0 billion Yen, while those less than 30 had the smallest values on both perceptions. Though less significant as shown above in Table 3, similar trends were found in the sales of house vegetable, sales of flower and foliage plant (Table 5). Analyzing from export of agricultural and processed products, the evaluation values were the largest by those doing directly, following by doing indirectly, under consideration, and no planning. Within the concerns in export of agricultural and processed products, the largest differences were detected between concerned and not concerned on the movements of overseas market. For the overall evaluation of TPP and its impact on corporation management, the differences were 0.37 (i.e., 3.10 minus 2.73) and 0.53 (i.e., 4.05 minus 3.52),

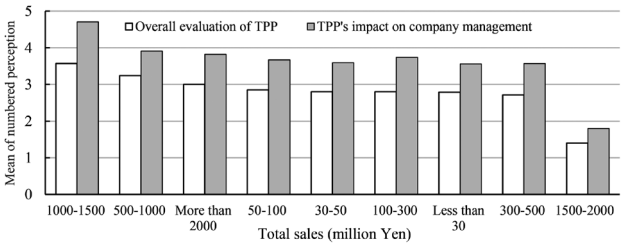

Fig. 2. Perception on TPP from different total sales in latest accounts. Vertical axis are average values of the numbered perceptions.
Note: For overall evaluation, 1–5 stand for the 5 levels from big crisis to big chance. For impact on corporation management, 1–7 indicate the 7 levels from bankruptcy to fast growth.

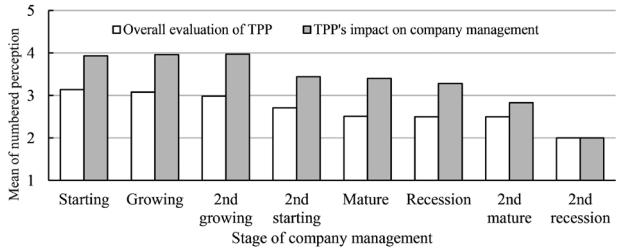

Fig. 3. Perception on TPP from different stages in corporation development. Vertical axis are average values of the numbered perceptions.
Note: For overall evaluation, 1–5 stand for the 5 levels from big crisis to big chance. For impact on corporation management, 1–7 indicate the 7 levels from bankruptcy to fast growth.

respectively.

Countermeasures on different levels of the significant factors

Impact of corporation attributes

We summarized and sorted the countermeasures to TPP as shown in columns, by the average adoption rates among different corporate forms as shown in lines. As shown in Table 6, the largest standardized deviation was detected on the four countermeasures significant at 0.01 in Table 4, i.e., business diversification (M_2), scale enlargement (M_1), access to overseas market (M_5), and cost reduction of materials and machinery (M_9). Business diversification (M_2) was most adopted by 29.7% of the limited companies, scale enlargement (M_1) and

Table 6. Adoption of the countermeasures by different corporate forms

Countermeasure		$\mathbf{M_2}$	$\mathbf{M_1}$	$\mathbf{M_5}$	$\mathbf{M_9}$	M_{11}	M_3	M_{10}	M_6	M_8	M_4	M_7
Average	Ⅰ	**29.7**	28.5	18.5	26.5	43.4	14.5	7.6	35.7	35.7	12.4	22.9
adoption	Ⅱ	23.7	**38.1**	**29.4**	18.6	46.4	21.6	5.2	38.7	36.6	14.4	23.7
rate (%)	Ⅲ	12.9	21.5	14.0	**33.3**	35.5	14.0	11.8	41.9	34.4	14.0	22.6
Std. D		8.5	8.4	7.9	7.4	5.6	4.3	3.4	3.1	1.1	1.0	0.6

Note: Type Ⅰ, Ⅱ and Ⅲ refer to limited company, stock company, agricultural producers' cooperative corporation, respectively. Number of respondents for each type can be found in Table 1.

access to overseas market (M_5) were most adopted by 38.1% and 29.4% of the stock companies, while cost reduction of materials and machinery (M_9) was most adopted by 33.3% of the agricultural producers' cooperative corporations.

For corporations qualified to own farmland, the average adoption ratio of corporate collaboration and management integration (M_3) was 19%, having the largest difference of 10.7% with those being not qualified (Table 7). Thus, this proofed the significance at 0.01 between this factor and the countermeasure.

Age of the corporate representative affected the access to overseas market (M_5), ratio of which was the largest in the age range of 40–50 year and diminishing to both sides of ranges (Fig. 4). In general, corporation managers of this age range have rich management experience and more innovative and enterprising spirit. They tend to realize the importance of actively integrating into the international market, in the context of globalization to deal with the challenges of TPP.

Impact of corporation management

Total sales in latest accounts were significant mainly to two countermeasures. The highest adoption ratio of access to new domestic market (M_4) occurred in 500–1000 million Yen group, following by corporations with total sales of 1000–1500 million Yen group. As to the improvement and upgrading of production management (M_8), the adoption ratio was highest in 1000–1500 million Yen group, following by groups of 1000–1500 million Yen. In general, with the increase of the total sales, adoption ratios of both countermeasures changed according to a parabolic curve (Fig. 5).

Similar relationship was fitted between total profit margin and cost reduction (M_6), the highest adoption ratio was found in 10–15% group and diminishing to the other groups on both sides (Fig. 6). It may indicate that corporations with median profit margin, say, 10–15%, have the motivation and financial resources to promote technological and managerial innovations, scale enlargement, for reduced costs.

The adoption ratios of scale enlargement (M_1), introduction of new technology (M_7) and commodity differentiation (M_{11}), fluctuated with the same trend by large, during the different stages in corporation development. They started to rise in the starting stage, and then decline after the end of the growing stage. After reaching a low point in the recession stage, they began to rise in the second starting stage and hence the next cycle of fluctuations (Fig. 7). Kurakazu (2016) analyzed the latest trend of the large–scale management over 100 ha and

Fig. 4. Access to overseas market (M_5) by age of the corporate representative.

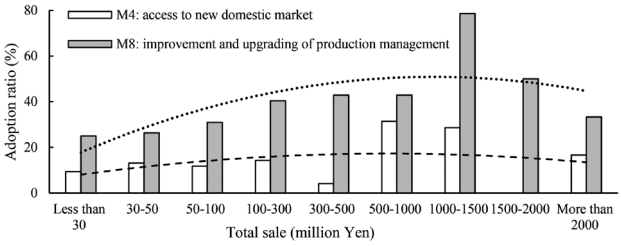

Fig. 5. Countermeasure adoption of access to new domestic market (M_4), improvement and upgrading of production management (M_8) by total sales in latest accounts.

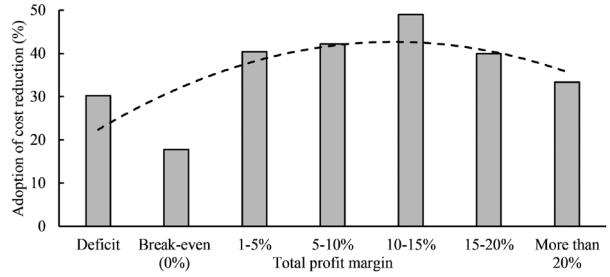

Fig. 6. Countermeasure adoption of cost reduction (M_6) by the total profitability in latest accounts.

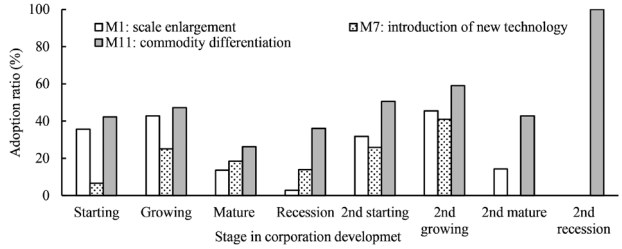

Fig. 7. Countermeasure adoption of scale enlargement (M_1), introduction of new technology (M_7), and commodity differentiation (M_{11}) by stage in corporation development.

Table 7. Adoption of the countermeasures by corporations qualified to own farmland

Countermeasure	**M_3**	M_7	M_{10}	M_6	M_{11}	M_4	M_8	M_2	M_5	M_9	M_1
Qualified	19.0	24.5	6.4	37.2	44.0	14.0	36.0	24.5	21.3	25.0	31.0
Non–qualified	8.3	17.4	11.9	40.4	41.3	11.9	34.9	23.9	22.0	24.8	31.2
Abs. difference	10.7	7.1	5.5	3.2	2.7	2.1	1.1	0.6	0.7	0.2	0.2

Note: Bold values are significant at 0.01.

the adoption of advanced technology, emphasized that the increased market scale promotes the adoption of agricultural ICTs. Suzuki K. and Suzuki N. (2019) argued that various craftsmen are demonstrating their ingenuity, to challenge the management differentiation, i.e., the sixth industrialization, and export to foreign countries for new value creation and the development of overseas market. This study added finding that the new companies tend to deal with the challenges through larger scale, while the company in the second round of management are apt to adopt new technology and diversified commodities.

Sales of rice affected cost reduction (M_6) and introduction of new technology (M_7), adoption ratios peaked in groups of 100–300 million Yen and 30–50 million Yen, respectively. In contrast, sales of wheat affected corporate collaboration and management integration (M_3), adoption ratios peaked in groups of 50–100 million Yen. For both crops, sales less than 30 million Yen had the lowest adoption of all the three countermeasures (Fig. 8). Shibata (2020) argued that confronting the volatile international food market, Japanese agricultural policy should aim to improve productivity by combining management and adopting new technologies of various sectors centered on rice cultivation, rather than expanding the managerial scale. This survey proofed that oversized management may be inattentive to these countermeasures. Japan heavily relay on imported wheat, with a self–sufficiency of less than 15%. Targeting at the grain and processed products, TPP aims to reduce the import premium and the tariffs, thus corporate collaboration and integration are needed to deal with the increased wheat importation (Mishima, 2016).

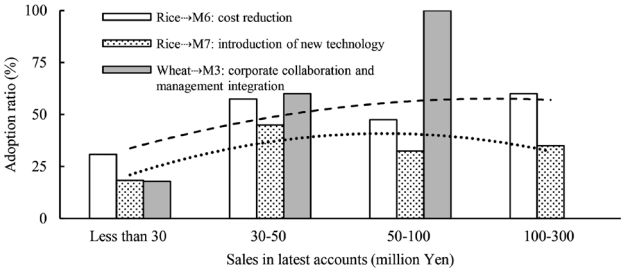

Fig. 8. Adoption of cost reduction (M_6, n=204), introduction of new technology (M_7, n=204) in rice production; corporate collaboration and management integration (M_3, n=65) in wheat production by sales in latest accounts.

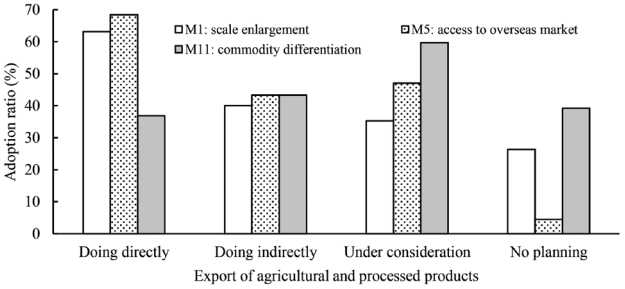

Fig. 9. Countermeasure adoption of scale enlargement (M_1), access to overseas market (M_5), and commodity differentiation (M_{11}) by exportation status of agricultural and processed products.

Impact of exportation

Within the four countermeasures significantly determined by export of agricultural and processed products, scale enlargement (M_1) and introduction of new technology (M_7) were most adopted by those exporting directly, while the highest adoption ratio of commodity differentiation (M_{11}) occurred in corporations considering exporting agricultural products (Fig. 9). Shogenji (2019) found that differing from the developed countries on new continents and the EU, Japan's agriculture depends largely on the imported food and feed, and its trade policy reflects two viewpoints of food security and the multi–functional roles of agriculture. This survey further observed that the agricultural corporations have high aspiration to access the overseas market (M_5), especially 68.4% of those doing exportation directly recognized the importance of integrating into the international market, following by 47.1% of those under consideration, and 43.3% of those doing directly.

Among the countermeasures, as shown in columns, significantly affected by the concerns in exporting agricultural and processed products, more than 44% of the interviewed corporations concerning Yen exchange rate apt to adopt scale enlargement (M_1) and improvement and upgrading of production management (M_8), following by access to overseas market (M_5), introduction of new technology (M_7) and access to new domestic market (M_4). Similarly, adoption ratios and sequence of the countermeasures determined by the other three concerns were also summarized in Table 8.

Table 8. Countermeasure adoption ratios by concern in considering export

Concern	M_1	M_2	M_3	M_4	M_5	M_6	M_7	M_8	M_9	M_{10}	M_{11}
C_1	**44.72**	28.57	21.12	**20.50**	**38.51**	40.99	**31.06**	**44.72**	29.81	9.32	51.55
C_2	**44.27**	**34.35**	19.08	**22.14**	**32.82**	42.75	29.77	37.40	28.24	9.92	51.15
C_3	38.75	32.50	22.50	**28.75**	**32.50**	46.25	32.50	**53.75**	**37.50**	8.75	52.50
C_4	**41.14**	28.57	**24.00**	16.00	**45.14**	40.57	28.57	42.86	28.57	6.86	**58.29**

Note: C_1 through C_4 refer to Yen exchange rate, popularity of Japanese food, domestic market movements, overseas market movements, respectively. Bold values are significant at 0.01.

MAIN CONCLUSIONS

With high economic expectation, Japanese government has been positive to TPP and gradually managed to play a leading role. Being an important area of TPP agreement, agriculture is affected by TPP after its substantial operation. This study analyzed the effect of TPP on Japanese agricultural management, from the perspective of agricultural corporations through a national questionnaire survey.

The result indicated that more than 40% of the respondents had no clear perception on the impact of TPP, in general aspects and to their corporations. In the rest respondents, positive perceptions were slightly less than the negative ones. The widely supported TPP countermeasures included commodity differentiation, cost reduction, improvement and upgrading of production management, and scale enlargement. One–way ANOVA revealed that perceptions on TPP and the countermeasures were mainly determined by corporate form, age of the corporate representative, total sales, stage in corporation development, export, and concerns of agricultural export. According to the further discussions on the impact of significant factors, stock corporation was most optimistic, corporate representative's age, total sales, stage in corporation development negatively related to the positivity. Exporting related to higher positiveness, while concern on overseas market made the largest differences on the perceptions. With respect to the determinants of countermeasures, various intentions and preferences were revealed between different corporate forms and export status and concerns; parabolic curves were fitted on age, sales, profitability; alongside the fluctuations among stages in corporation development.

AUTHOR CONTRIBUTION

All listed authors have contributed to this manuscript. Dongpo Li carried out the detailed study design, statistical analysis and drafted the manuscript. Teruaki Nanseki built up the research frame and carried out the basic study design, as well as advised the interpretation of statistical analysis and edited the manuscript. Yosuke Chomei assisted in the study design, advised the data interpretation, and edited the manuscript. All authors assisted in editing of the manuscript and approved the final version.

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APPENDIX: EXCERPT OF THE QUESTIONNAIRE

♦Questions on the corporation attributes

Q1. Please circle the option that applies to your corporate form.
(1) Limited company, (2) Stock company, (3) Agricultural producers' cooperative corporation, (4) Others (in detail:)

Q2. Is your corporation qualified to own farmland (agricultural production corporation) according to the Farmland Act of Japan? Please circle the option that applies.
(1) Yes, (2) No

Q3. Please circle the option that applies to the age of your corporate representative.
(1) Less than 30, (2) 30–40, (3) 40–50, (4) 50–60, (5) 60–70, (6) More than 70

Q4. Please circle all the options that apply to the education information of your corporate representative.

	Graduated		At school or dropped–out
	Agriculture	Non–agriculture	
(Example of filling–in)	○		
1. High school			
2. Vocational school			
3. Institute of agricultural management			
4. Junior college			
5. University			
6. Graduate school			
7. Others (private school, training program, etc.)			

♦Questions on the corporation management

Q5. Please circle the total sales in latest accounts that applies to your corporation (in million Yen).
(1) Less than 30, (2) 30–50, (3) 50–100, (4) 100–300, (5) 300–500, (6) 500–1000, (7) 1000–1500, (8) 1500–2000, (9) More than 2000

Q6. Please circle the profit margin in latest accounts that applies to your corporation.
(1) Deficit, (2) Break–even (0%), (3) 1–5%, (4) 5–10%, (5) 10–15%, (6) 15–20%, (7) More than 20%

Q7. From the standpoint of a manager, what stage is your corporation now? Please circle the option that applies.
(1) Starting, (2) Growing, (3) Mature, (4) Recession, (5) 2nd starting, (6) 2nd growing, (7) 2nd mature, (8) 2nd recession, (9) Others

Q8. Please fill in the sales of crop and agricultural product in latest accounts; and circle the intended scale adjustment of your corporation.

Crop and agricultural product	Sales in latest accounts (10000 Yen)	Scale adjustment intended		
		Reducing	Constant	Increasing
(Example of filling–in)	15000		○	
1. Rice				
2. Wheat				
3. Beans and coarse cereals				
4. Open ground vegetable				
5. House vegetable				
6. Flower and foliage plant				
7. Fruiter				
8. Mushroom				
9. Dairy cow				
10. Beef cattle				
11. Poultry				
12. Swine				
13. Others (in detail)				

♦Questions on the exportation of agricultural and processed products

Q9. Please circle the option that applies to the exportation status of agricultural and processed products in your corporation.

(1) Doing directly, (2) Doing indirectly, (3) Under consideration, (4) No planning

In case of doing directly, please circle the option that applies to the planed scale of your corporation.

(1) Increase, (2) Retain, (3) Decrease, (4) Increase the indirect exportation

In case of doing indirectly, please circle the option that applies to the planed scale of your corporation.

(1) Increase, (2) Retain, (3) Decrease, (4) Increase the direct exportation

Q10. When exporting agricultural and processed products, what are your main concerns? Please circle the options that apply.

(1) Yen exchange rate, (2) Popularity of Japanese food, (3) Domestic market movements, (4) Overseas market movements, (5) Export is not concerned, (6) Others

♦Questions on the perceptions and countermeasures to the TPP

Q11. As to Japan's participation of the TPP, what is the overall evaluation of your corporation? Please circle the option that applies.

(1) Big crisis, (2) Crisis, (3) Neither a crisis nor a chance, (4) Chance, (5) Big chance

Q12. As to Japan's participation of the TPP, what is the impact on the management your corporation? Please circle the option that applies.

(1) Bankruptcy, (2) Bad impact, (3) Slightly bad impact, (4) Neither bad nor good, (5) Slightly good impact, (6) Good impact, (7) Fast growth

Q13. To address Japan's participation of the TPP, what are the effective countermeasures of your corporation? Please circle the options that apply.

(1) Scale enlargement, (2) Business diversification, (3) Corporate collaboration and management integration, (4) Access to new domestic market, (5) Access to overseas market, (6) Cost reduction, (7) Introduction of new technology, (8) Improvement and upgrading of production management, (9) Cost reduction of materials and machinery, (10) Personnel expenses and wage restraint, (11) Commodity differentiation