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The impact of government incentives on financial viability of selected aquaculture species in Malaysia

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Abstract

Aquaculture businesses in Malaysia require careful and comprehensive financial analysis to be successful. Comprehensive financial analysis has three key components, namely financial position, profitability and liquidity/cash flow. This research focuses on using pro forma income statements to analyze financial positions and to evaluate the effect of government incentives on sustainability of Malaysian aquaculture farms. This paper is divided into two sections; the first section discusses and provides the finding and comparability of the financial analysis on freshwater and brackish water producers. In the first section, the discussion was based on financial viability criteria, namely net present value (NPV), internal rate of return (IRR) and benefit cost ratio (BCR)) for base study. The evaluation process was carried out using four different phases; base study and government incentives simulations, Pioneer Status (PS), Investment Tax Allowance (ITA), and Accelerated Capital Allowance (ACA) for effectiveness of government incentives and roles in increase of profitability and production. The results showed that in all brackish water farms, NPV after the ACA incentive showed a higher and positive value comparable to individual PS and ITA. The effect of Government Incentive on Penaeus vannamei and Grouper showed that IRR and NPV on ACA (based on PS) is 2% and 9%, respectively higher than ACA (based on ITA). Meanwhile, in Barramundi farming ACA (based on ITA) was 8% higher than ACA (based on PS). The results on freshwater showed that ACA (based on ITA) on Tilapia and Catfish was 8% and 6% higher than ACA (based on PS). This paper concludes that the aquaculture operators should choose to accept PS with ACA on *Penaeus vannamei* and Grouper and choose ACA based on ITA on Barramundi, Tilapia and Catfish in order to maximize private profitability.

Introduction

Global aquaculture production (excluding plants) increased from 32.4 million tons in 2000 to 63.6 million tons in 2011, while the contribution of aquaculture to global food fish consumption rose from 33.8 percent to 48.6 percent in the same period. It is estimated that aquaculture will meet more than 50 percent of global food fish consumption by 2012 (FAO, 2013). The value of aquaculture production to human nutrition and incomes is much greater than gross national production. The bulk of production is generated by small-scale activities, with exceedingly high levels of participation not only in catching and farming, but also in processing and marketing. Inland fisheries are often critical to local food security (FAO, 2011and FAO, 2006). Such sustainable development (in the agriculture, forestry and fisheries sectors) conserves land, water, plant and animal genetic resources, is environmentally non-degrading, technically appropriate, economically viable and socially acceptable (FAO, 2011). Aquaculture is one of the fastest growing food production sectors related to other agricultural food production sector in the world (FAO, 2011). The improvement of the ponds in late 1980s, where engineering problems (facilities, equipment, processes, and systems needed to grow and harvest aquatic animals) were minimized signaled a new phase in shrimp farming (FIGIS, 2006). In 1993, there were 1,877 ha of brackish water ponds in the Malaysia. The production of farm cultured penaeid shrimps increased, from 60 MT in 1984 to 3,057 MT in 1991. The production fell slightly in 1992 to 2,963 MT, but increased subsequent in two years. Production in 2012 stood at 41,000 MT of whole shrimp. There is a steady growth in shrimp production over the last 10 years from 2000 to 2010 (Rasoul et al., 2013). According to Holthuis (1980), prawns include approximately 33 genera with approximately 2,500 species, of which less than 300 species are of economic interest throughout the world. More than 20 species of prawns are found in Malaysia, including the

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black tiger prawn, the king prawn, the white prawn, the sharp-rostrum prawn, and the yellow prawn (Ministry of Fisheries Malaysia, 2003). World fish consumption is approximately 15% (Normal) during 1980-2009 but in Malaysia, based on FAO references in 2009 is closed to 19%. Among the methods used is the use of beneficial microorganisms, integrated pest management and recycling of agricultural waste materials such as straws to make compost.

It was deemed necessary to have a forum where a comprehensive discussion focused on the experiences of Malaysia farming that have already been farming *Penaeus vannamei* and their respective assessments of risks and benefits (FAO, 2010). Economic measurement is the way to prove any cultivation project is viable or not by identify all the resources and government incentives by supporting farms to increase profitability. Financial assessment is the common way to prove the viability of any aquaculture project by identifying all the resources, benefits and government incentives in supporting farms to reduce costs of production and to increase profitability. The proposed government incentives related to applicable aquaculture are: a) Pioneer status; where a company enjoys a partial exemption from income tax. It pays tax on 30% of statuary income for five years, commencing from its production day (defined as the day of first sale of the aquaculture produce), b) An investment tax allowance (ITA); A farm granted ITA is eligible for an allowance of 70% of its qualifying capital expenditure incurred within five years from the date on which the first qualifying capital expenditure is incurred, and c) Accelerated Capital Allowance (ACA); the ACA on the capital expenditure is to be utilized within three years, i.e. an initial allowance of 60% for the first year and an annual allowance of 20% for the next two years. The assessment based on profit also coincided with Seyed *et al.* (2013) where they stated that profit is the major factor in investigating economic enterprises (Nawazish *et al.*, 2013). Accordingly, this study aims to evaluate the financial viability of brackish water and fresh water farming with government incentives and take advantage of the various tax incentives available for enhancing aquaculture farms' profits. Good knowledge of the fiscal incentives will provide the aquaculture businesses with ideas to effectively plan their business and investment strategies.

Material and Methods

Study area and data collection

The data and information were gathered from recorded primary data (survey/interview) which presents brackish water and fresh water producers in 2012. The data on farm budget, input requirements and cost of production were elicited from the respondents during field survey and other information was acquired from databases and agricultural agency reports. Data was gathered from a 5 % sample of fish farmers in Malaysia. The data set on commercial farms was referred to as project survey data involving Penaeus vannamei prawn, grouper fish, Barramundi fish, tilapia fish and catfish. The data were collected from a farm survey in selected states of Malaysia. The secondary data were gathered from the Ministry of Agriculture and Agro-Based Industry Malaysia, the Department of Fisheries Malaysia (DOF), the Department of Statistics (DOS), farm records and other relevant documents.

The number of sampled producers was 246, including brackish water and fresh water producers' information in Malaysia. Five main species include; Penaeus vannamei, grouper, Barramundi, tilapia and catfish were studied in this research. The selected states were Perak, Pahang, Johor, Selangor, Pinang, Sabah, and Sarawak. The study was assisted by the Department of Fisheries (DOF), and the corporations of shrimp farming were highly approved.

Data analysis

The data on farm budget, economic life, input requirements and cost of production were elicited from the respondents during field survey and other information were acquired from databases and agricultural agency reports. The data were analyzed using the Microsoft Excel computer spreadsheet software. The profitability indicators were net present value (NPV), internal rate of return (IRR), benefit-cost ratios (BCR) and payback period (PBP). Most frequently method in the financial analysis used was NPV. This is because NPV indicates the present values of the costs and revenue attained from the investment activity (Seyed *et al*., 2013). NPV is the present value of net cash inflows that generated by a project. Net cash inflow equals total inflow during a period less the expenses of generating the cash inflow. The formula for NPV is as follows:

$$NPV = \sum_{t=0}^{n} \frac{CF_t}{(1+i)^t}$$

CFt = Cash flow in year t and and i = Discounting factor

The IRR is a (discounting factor) that brings the NPV to zero. In other words, IRR is the highest interest rate that the project can support. The minimum attractive rate of return or MARR is the interest rate that represents the minimum profit that an investor

wants to gain when an investment is made. The IRR should be greater than MARR for an investment to be financially feasible. The formula of IRR is shown below:

$$0 = P0 + P1/(1+R) + P2/(1+R)2 + P3/(1+R)3 + \ldots + Pn/(1+R)\,n$$

Where P0, P1, . . . Pn equals the cash flows in periods 1, 2, . . . n, respectively; and
IRR (R = IRR) equals the project's internal rate of return.

CF is the net cash flow at time period t; R is the internal rate of return. Benefit Cost Ratio (BCR) is another parameter measures the economic viability of an agriculture project. The BCR is defined as "the total discounted benefits divided by the total discounted costs". If the value of BCR is greater than 1, hence they have a positive net benefits and otherwise. The higher the ratio means the greater the benefits relative to the costs. The formula of BCR is as follows:

$$BCR = \text{Total Discounted Benefits} / \text{Total Discounted Costs}$$

Government incentives analysis

Is including a) Pioneer Status (PS); A Pioneer Status company enjoys a partial exemption from income tax. It pays tax on 30% for five years, commencing from its production day (defined as "the day of first sale of the agriculture produce"), b) Investment Tax Allowance (ITA); A company granted ITA is eligible for an allowance of 70% on its qualifying capital expenditure incurred within 5 years from the date on which the first qualifying capital expenditure is incurred and c) Accelerated Capital Allowance (ACA); The ACA on the capital expenditure is to be utilized within 3 years, i.e. an initial allowance of 60% in the first year and an annual allowance of 40% during 2 years.

Results and Discussion

The number of sampled brackish water producer was 226 in all states. Table 1 presents brackish water producers' profiles in Malaysia. All the producers sampled were male. The age distribution of the producers was 19.03 percent between 20 and 29, 23.45 percent between 30 and 39, 31.41 percent between 40 and 49, 15.48 percent between 50 and 59 and 10.61 percent above 60 years. The mean age was about 42.5 years which standard deviation was 13.42, and the maximum age was 65 and the minimum was 20 years. In terms of educational background, 33.62 percent of the producers had only primary school, 40.26 percent had only secondary school and 26.10 percent were postgraduates. As for number of labors, 36.72 percent had less than 3, 25.66 percent between 3 and 6, 16.37 percent between 7 and 10 and 21.23 percent were above 10. The mean number of labor was about 2.06 which standard deviation was 14.33, while the maximum number was 10 and the

Table 1. Demographic characteristics of brackish water producers in Malaysia

Item	Group	Frequency	Percent
Age	20-29	43	19.03
	30-39	53	23.45
	40-49	71	31.41
	50-59	35	15.48
	60-65	24	10.61
	Mean=42.5, Min=20		100
	SD = 13.42, Max=65		
Gender	Male	226	100
Level of education	Primary	69	33.62
	Secondary	85	40.26
	Post-graduate	19	26.10
			100
Starting Capital	Self-finance	226	
Type of brackish water species	Government Support	-	59.73
	Penaeus vannamei	135	16.81
	Grouper fish	38	23.45
	Barramundi fish	53	100
Area of Farms	Perak	102	
	Pahang	3	
	Johor	70	
	Selangor	26	
	Pinang	9	
	Sabah and Sarawak	16	
Number of Labors Hired	Less Than 3	83	36.72
	3-6	58	25.66
	7-10	37	16.37
	More than 10	48	21.23
	Mean= 2.06, Min=1		100
	SD = 14.33, Max=10		
Experience Working (Years)	Less than 10	44	19.47
	10-20	53	23.45
	21-31	76	33.62
	32-42	29	12.83
	More than 42	24	10.61
	Mean = 24.80, Min = 3		100
	SD = 12.3, Max = 60		

Table 2. Demographic characteristics of fresh water producers in Malaysia

Item	Group	Frequency	Percent
Age	20-29	2	25
	30-39	-	-
	40-49	4	50
	50-59	2	25
	Mean= 39.5, Min=20		100
	SD= 11.69, Max=59		
Gender	Male	8	100
Level of education	Primary	3	37.5
	Secondary	4	50
	Post-graduate	1	12.5
			100
Starting Capital	Self-finance	8	100
	Government Support	-	-
Type of freshwater species	Tilapia	2	25
	Catfish	6	75
			100
Area of Farms	Perak	1	12.5
	Pahang	1	12.5
	Johor	2	25
	Selangor	2	25
	Pinang	1	12.5
	Sabah and Sarawak	1	12.5
			100
Number of Labors Hired	Less Than 3	2	25
	3-6	1	12.5
	7-10	3	37.5
	More than 10	2	25
			100
Experience Working (Years)	Less than 10	2	25
	10-20	1	12.5
	21-31	-	0
	32-42	4	50
	More than 42	1	12.5
			100

Table 3. Profit and lost statement of brackish water farms in Malaysia, 2012

	Penaeus vannamei	*Grouper*	*Barramundi*
NPV	569,965.965	277,589.293	66,304.426
IRR	36%	51%	24%
MCR	419,610	117,815	419,610
B/C	2.358	3.356	1.158
PI	6.307	1.935	1.17663
Break even production	11.57	3.74	10.354

Source: From survey, 2012.

Table 4. Profit and lost statement of fresh water farms in Malaysia, 2012

	Tilapia	*Catfish*
NPV	4,564.70	34.38
IRR	11%	10%
MCR	86,55	29,937
B/C	1.05	1.001
PI	1.58	2.069
Break even production	17.88	7.513

Source: From survey, 2012.

Table 5. The effect of government incentive on *Penaeus vannamei* farming in Malaysia, 2012

	Base Study	PS	ITA	ACA (based on PS)	ACA (based on ITA)
NPV	569,965.96	778,056.95	685,011.18	834,578.69	811,217
IRR	36 %	44 %	41 %	48 %	46 %
MCR	97,700	419,610.27	97,700	390,054	117,700
B/C	6.83	2.854	8.01	9.54	8.08
PI	42.23	42.435	42.33	42.53	42.53
Break-even Point	31,129.19	31,239.19	31,139.19	31,289.19	31,129.19
Pay Back Period	2.71	2.23	2.19	2.16	2.17

Note: PS; Pioneer status, ITA; Investment Tax Allowance, ACA; Accelerated Capital Allowance and tax rate is 25%.

Table 6. The effect of government incentive on *grouper* fish farming in Malaysia, 2012

	Base Study	PS	ITA	ACA (based on PS)	ACA (based on ITA)
NPV	277,589.29	327,150.33	321,324.72	382,102.46	286,703
IRR	51%	58%	57%	64%	53%
MCR	117,814.86	97,700	97,700	117,814.86	117,814.86
BCR	3.10	4.15	4. 09	34	3.23

Note: PS; Pioneer status, ITA; Investment Tax Allowance, ACA; Accelerated Capital Allowance and tax rate is 25% and MCR is used to calculate BCR.

minimum was 1. And for the experience working in brackish water production, 19.47 percent was less than 10 years, 23.45 percent between 10 and 20 years, 33.62 percent between 21 and 31, 12.83 between 32 and 42, and 10.61 percent were more than 42 years. The number of sampled fresh water producers was eight located in the selected states. Table 2 presents fresh water producers' profiles in Malaysia. All the producers sampled were male. The age distribution of the producers was 25 percent between 20 and 29, 50 percent between 40 and 49, and 25 percent between 50 and 59. The mean age was about 39.5 years which standard deviation was 11.69, while the maximum age was 59 and the minimum was 20 years respectively. In terms of educational background, 37.5 percent of the producers had a primary school, 50 percent had a secondary and 12.5 percent were postgraduates. As for number of labors, 25 percent had less than 3, 12.5 percent between 3 and 6, 37.5 percent between 7 and 10, and 25 percent above 10. And for the experience working in fresh water production, 25 percent was less than 10 years, 12.5 percent between 10 and 20 years, 50 percent between 32 and 42, and 12.5 percent for more than 42 years.

The Net Present Value (NPV) at 10% discount rate is positive for the sum of 10 years (economic life) cash flows' present value, and thus, the brackish water and fresh water aquaculture projects are acceptable. The study computed NPV, IRR and BCR indices and based on the base study results, it was concluded that the project should be accepted (Table 3 and 4). The brackish water farms IRR is estimated at 36% for Penaeus vannamei, 51% for Grouper and 24 % for Barramundi. As we can see IRR was greater than the discount factor, so we can conclude that the brackish water species aquaculture is viable (Table 3). Similarly the benefit cost ratio (BCR) is greater than one and is estimated at 2.35 for *Penaeus vannamei*, 3.35 for *Grouper* and 1.15 for *Barramundi* based on the ratio of present value benefits and initial cost. The computed IRR in the fresh water farm is presented in Table 4. Internal rate of return with 10% discount factor was estimated at 11 % on Tilapia, and 10 % on Catfish. The IRR is greater than the discount factor, so we can summarize that the project in fresh water aquaculture is also acceptable, but if the cut off rate for accepting or rejecting is greater than 20% then both fresh water projects would be rejected. In this category, the benefit cost ratio (BCR) was estimated at 1.05 on Tilapia, and 1.001 on catfish based on the present value on and initial investment and several investment benefits.

Following IRR, BCR also recorded slight profitability and the acceptance of these projects should be based on further sensitivity analysis to scrutinize the versatility of these projects. If a slight increase of feed cost the index turns less than 1, the project should be rejected. However, the financial criteria seldom contradict each other. If one indicator rejects a project others will also results in the same direction.

Sustainability of brackish water and fresh water aquaculture

Sustainable aquaculture production in Malaysia is one of the government's most important objectives as a means of increasing food security and regional development. Tables 5 indicate a clear understanding of the current status of aquaculture in Malaysia and describe different aspects of government incentives that shall be considered for suitable and viable aquaculture development. The study evaluated *Penaeus vannamei*, Grouper and Barramundi fishes which are on native brackish water species, Tilapia and Catfish which are of native fresh water species are using financial viability criteria (net present value (NPV), internal rate of return (IRR) and benefit cost ratio (BCR). The evaluation process was carried out using four different phases' namely base study and government incentives simulations (Pioneer status (PS), Investment Tax Allowance (ITA) and Accelerated Capital Allowance (ACA).

The indicators showed a better result for the

Table 7. The effect of government incentive on *barramundi* fish farming in Malaysia, 2012

	Base Study	PS	ITA	ACA (based on PS)	ACA (based on ITA)
NPV	66,304.42	95,593.69	107,088.37	109,946.42	150,730.36
IRR	24%	25.94%	32.62%	32%	40%
MCR	87,095.83	87,095.833	87,095.83	87,095.83	87,095.83
B/C	1.761	2.10	2.22	2.26	2.73
PI	10.39	10.39	10.39	6.21	6.21
Break-even Point	20,678.44	20,678.47	20,678.51	20,678.56	20,678.56
Pay Back Period	3.80	3.20	2.95	3.017	2.66

Note: PS; Pioneer status, ITA; Investment Tax Allowance, ACA; Accelerated Capital Allowance and tax rate is 25%.

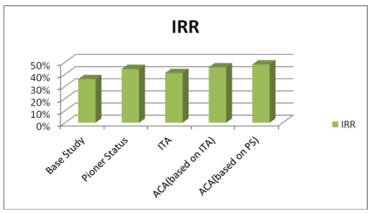

Figure 1. The percentage of IRR with government incentives on *Penaeus vannamei* farming in Malaysia, 2012

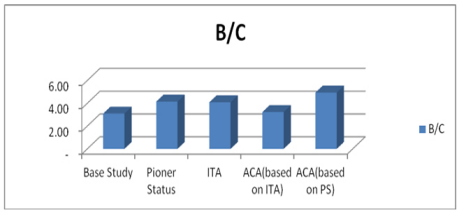

Figure 2. The benefit cost ratio with government incentives on *Grouper* farming in Malaysia, 2012

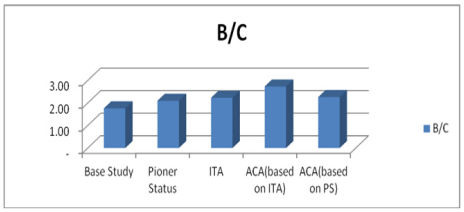

Figure 3. The benefit cost ratio with government incentives on *Barramundi* farming in Malaysia, 2012

PS and ITA incentive with ACA for brackish water operators during the 10 year project evaluations on aquaculture farms in Malaysia. In all brackish water farms, NPV after the ACA incentive showed a higher and positive value compare to individual PS and ITA. Table 5 indicates that Penaeus vannamei farms showed that IRR (44%) (Figure 1) and the NPV (778,056.96) for the PS is greater than that of the ITA and PS was continued by ACA. Then, the project will be continued with ACA based ITA to compare between three main factors, including NPV, IRR and Benefit Cost Ration (BCR).. The IRR for the PS with ACA is 48%, which is higher than the ACA based ITA of 41% and individual PS (44%). This shows the project worth has improved and after accepting incentives the project becomes more viable. Results on Grouper farms indicated that IRR (58%), (Figure 2) and NPV (327,150.33) for the PS was greater than that of ITA (IR = 57%, NPV = 321,325), and PS was continuing on the next government incentives which

Table 8. The effect of government incentives on tilapia fish farming in Malaysia, 2012

	Base study	PS	ITA	ACA (based on PS)	ACA (based on ITA)
NPV	4,564.70	38,605.40	79,018.42	94,327.45	469,199.82
IRR	11%	15%	20%	21%	29%
MCR	158,240	158,240	87,095.83	158,240	158,240
BCR	1.028	1.243	1.907	1.996	3.965

Note: PS; Pioneer status, ITA; Investment Tax Allowance, ACA; Accelerated Capital Allowance and tax rate is 25% and MCR is used to calculate BCR.

Table 9. The effect of government incentives on cat fish farming in Malaysia, 2012

	Base study	PS	ITA	ACA (based on PS)	ACA (based on ITA)
NPV	34.38	6,107.23	10,528.44	12,222.64	22,716.69
IRR	10%	14%	17%	17%	23%
MCR	29,936.91	29,936.916	29,936.91	158,240	158,240
BCR	1.001	1.13	1.30	1.27	1.34

Note: PS; Pioneer status, ITA; Investment Tax Allowance, ACA; Accelerated Capital Allowance and tax rate is 25% and MCR is used to calculate BCR

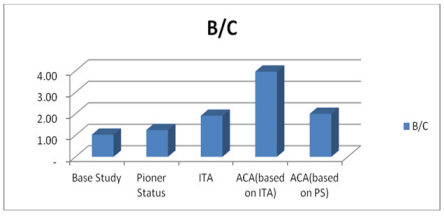

Figure 4. The benefit cost ratio with government incentives on Tilapia farming in Malaysia, 2012

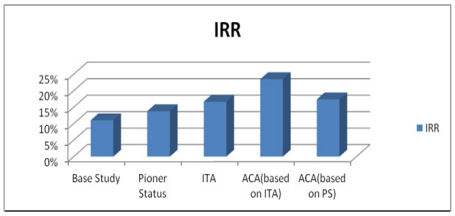

Figure 5. The Percentage of IRR with government incentives on Catfish farming in Malaysia, 2012

is ACA. The IRR with ACA was 64% which is higher than PS (58%) and ITA based on ACA (53%) (Table 6). The results in Table 7, indicates that IRR (33 %) and NPV (107,088.38) for ITA was greater than PS (NPV = 95,594 and IRR= 30%) on Barramundi farms, ITA and PS were selected to continue on the next government incentives. Results showed that ACA based on ITA (NPV = 150,730, IRR = 40%) was more acceptable than ACA based on PS (NPV = 109,946, IRR = 32%) (Figure 3)

Table 8 indicates that Tilapia farms showed that IRR (20%) and the NPV (79,018.43) for the ITA was greater than that of the PS. The IRR for the ITA with ACA was 29%, which is higher than the ITA of 20%, individual PS (15%) and ACA based on PS (21%) (Figure 4). Results on Catfish farms indicated that IRR (17%) and NPV (10,528.45) for the ITA was greater than that of PS, ITA and PS were selected to continue on the next government incentives which was ACA. The IRR with ACA based on ITA was 23%, which was higher than PS with ACA (17%) (Table 9, Figure 5). In addition, all species for the BCR, the ACA has a slightly higher BCR than individual ITA and PS. This may be due to lower cost needed in ACA since

the non-cash charges is higher, and thus it will tend to produce a higher BCR as the cash inflow of the project is higher. In addition, the 10% rate also recorded a BCR of the ACA higher than the base study. For the rate of 10% (standard rate), the NPV in ACA has a higher amount than the sole incentive. This indicates that the acceptance of ACA on aquaculture project will give higher profit to the aquaculture farms.

Conclusion

The study compared the effects of government incentives on the private profitability of brackish water and fresh water farms. Several indicators were used as project evaluation indicators. In order to enhance sustainability, the government provides incentives for agriculture and agro-based industries to increase food production for food security purposes in Malaysia. The three most popular incentives in an agriculture project were discussed and evaluated. Farmers cannot apply for both incentives, they must choose between pioneer status (PS) and investment tax allowance (ITA). Since, NPV is higher in PS than ITA, the shrimp and grouper operators should choose pioneer status (PS) instead of ITA. Then, after incorporating the ACA incentive, the NPV was even higher. This paper concludes that the PS with ACA should be accepted by shrimp and grouper farms whereas ITA with ACA should be accepted by Barramundi farms. Results on brackish water farms and ITA with ACA should be accepted by fresh water farms whereas PS with ACA. By considering those approaches, a higher profit would be awarded to the respective operators, and hence, the higher private profit will enhance sustainability. In other words, brackish water and fresh water farmers should apply for the right combinations of incentives to sustain the brackish water and fresh water aquaculture production. However, the analyses are only applicable to tax paying operators because the incentives are all in the form of tax rebate.

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