
The performance and costs of native samae dam chickens (*Gallus gallus*) breeders of smallholder farmers in Thailand

Wiyabot, T. *

Department of Agricultural Technology, Faculty of Agricultural Technology and Industrial Technology, Nakhon Sawan Rajabhat University, Nakhon Sawan Province, Thailand. 60000.

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Abstract The results showed that production costs tended to decrease when male and female black macaque chickens were raised in the second cycle. The average fixed cost per total cost is approximately 16.48%, the average variable cost per total cost is 91.87%, and the total cash cost is 66.79%. The highest-priced item is chicken feed at 37.70% of the total cost. The feed cost per 1 kg of body weight gain averaged over two cycles; the male weight gain was 49.05 baht/kg. In females, 53.29 baht/kg. An analysis of income structure, economic profit, and average parent breeder production per total cost of smallholder farms revealed that parent breeder production can be profitable from the first round of production. The loss per production index is 20%, and the production efficiency index is 50–60%.

Keywords: Performance and cost, Samae Dam (*Gallus gallus*) Chicken

Introduction

There are many native chickens in rural villages, such as bantam chickens, yard chickens, guinea fowl, Betong chickens, and cocks. Native chickens are generally gamecock breeds. Hens have black feathers, black faces, and black shins and crests, but some species are grey and gold, and the crest is still a rocky crest, which is the nature of the gamecock. The reason why farmers are raising native chicken breeds of gamecocks is that these gamecocks are large and strong. They grow well, and the female carries fertilized eggs. Because gamecock breeders have continuously selected for outstanding characteristics for hundreds of years, the Department of Livestock Development has been researching breeding and setting native chickens since 1989, starting with gamecocks from 17 provinces in the eastern region. However, breeding is not focused solely on breeding but rather on growth. Additionally, fertile eggs can propagate quickly. For real Thai fighting cocks, there are 17 different plumage colours, such as whitetail yellow, black tail padauk, yellow Lao, Pradu Lao, Samae Dam, etc.

*Corresponding Author: Wiyabot, T.; Email: Thunwa.thun8@gmail.com or Thunwa.w@nsru.ac.th

(Department of Livestock Development, 2004). Most farmers do not have enough income to cover their expenses. These chickens have good taste, firm texture, and less fat. The price of native chickens is 20–30% higher than that of broiler chickens. It is a cheap source of protein for rural villagers. They are easy to find and the most convenient; there is no market problem, and the risk rate is minimal. They can be sold for extra income and as an alternative to an agricultural career, the Thai farmers, in line with the integrated agriculture system or the mixed farming system that Thai people know. Raising native chickens increases the quality of fattening chickens, adds additional value in the marketing development process, and generates extra income for the community, including marketing to the middle and upper markets. In the future, this project will also provide opportunities for farmers to integrate farming with local wisdom to create a career. The strength of the community economy helps achieve sustainable development for farmers and communities (Kochaporn *et al.*, 2013).

The researcher's field trip to obtain preliminary research data from July 3–5, 2020, revealed that the Uthai Thani Farmers Group in Uthai Thani Province believed that the production of indigenous Samae Dam chickens was a way to generate additional income. Given that indigenous Samae Dam hybrid chickens are characterized by soft flesh, black bodies, black legs, a long history of raising, and a reasonable price, a breed of indigenous Samae Dam hybrid chicken should be developed. It promotes community occupations suitable for the climate of Uthai Thani Province. It is classified as a tropical city, especially in the summer. The weather is scorching in the summer. In addition, there are droughts in winter. The lowest temperature is between 15 and 16 degrees Celsius between December and January (Figure 1).

Therefore, this research aimed to study the efficiency and cost of Samae Dam chicken breeds suitable for smallholder farms in Uthai Thani Province, Thailand.

Materials and methods

This study investigated the efficiency and cost of the production of Samae Dam chickens by smallholder farmers because these chickens are purebred. In addition, few farmers preserve the species. The native chickens of Samae Dam have a long history of raising, revealing distinctive characteristics, and are difficult breeds. However, the local Samae Dam chicken is reasonably priced. It is suitable as a career income for farmers and to conserve the species. Therefore, there should be proper education based on academic principles. The performance and cost of the production of Samae Dam chickens (*Gallus gallus*) were studied

to upgrade the small farm standard in Uthai Thani Province, Thailand, as Figure 1 and 2.



Figure 1. The research location of Thailand



Figure 2. The research location is in Uthai Thani province, Thailand

Trial planning

Efficiency test of Samae Dam breeder chickens of smallholder farmers in Uthai Thani Province, Thailand. One hundred male Samae Dam chickens and 100 female Samae Dam chickens for a total of 200 Samae Dam chickens from smallholder farms in Uthai Thani Province, Thailand. The chickens were tested and raised for eight months. The survey method used was observation. All Samae Dam (*Gallus gallus*) chickens were 0–8 months old. Data on daily feed intake, weight gain, average daily gain, feed conversion ratio, and mortality rate were collected from 10 small-scale farms in Uthai Thani, Thailand (2 cycles per farm), to calculate the cost–profit structure. The cost of food per body weight increased by 1 (Baht/kg), and the total cost consists of total fixed cost: TFC and total variable cost: TVC, $TC = TVC + TFC$, where TC = total costs, TVC = total variable costs, TFC = total fixed costs, and production revenue is the revenue generated by the manufacturer. Received from the sale of the product at market price (TR), which is calculated from the unit price (P) multiplied by the quantity sold or the amount sold (Q) as $TR = P \times Q$, the net profit is the income received. Total – Total costs, Net income is total earned revenue – Variable costs with valuation. Production loss index and the production efficiency index (Dusadee, 2013).

Data storage

The production efficiency of Samae Dam chickens from smallholder farmers in Uthai Thani Province, Thailand, was tested by recording weekly feed intake. To calculate feed intake, initial weighing was performed. At the end of the experiment, every week, weight gain (WG) was used to determine the average daily gain, feed conversion ratio (FCR), food cost per 1 weight gain (Baht/kg), and mortality rate each month throughout 0–8 months.

Calculating production costs

A study on the cost of the production of Samae Dam chickens by smallholder farmers in Uthai Thani Province, Thailand, was carried out. An analysis was done of the cost-quantitative profit structure from production. The analysis of the cost, profit, and production of Samae Dam breeder chickens is divided into three parts.

Production cost: Farmers raised chicks per production cycle. The total number of chicks, mortality rate, chicken production, and average chicken weight per head use the time of day to increase the total weight in kilograms, with the following costs:

Fixed costs included house depreciation, depreciation of farm equipment, house maintenance expenses, tools, and the cost of land use opportunity.

Variable costs included chicks, food, utilities, labour, medical supplies, and other materials. Most of the variable costs are cash costs (accounting costs), except for the household labour costs that farmers use, which farmers do not pay in cash. The significant variable costs consisted of food costs, chick costs, and household labour costs.

Total cost is the sum of fixed costs, variable costs, and cash costs. Total revenue is revenue from the sale of all products. The cash income is received from the sale of chicken, Baht, and gain from the sale of byproducts (chicken manure). Profit is the total revenue minus total cost of raising Samae Dam breeder chickens per production cycle, earning profits in cash (Kochaporn *et al.*, 2013).

Data analysis

Efficiency tests of Samae Dam chicken breeds of smallholder farmers in Uthai Thani Province, Thailand, were conducted with 100 females and 100 males of Samae Dam parents aged 0–8 months, for a total of 200 chickens. The significance of the intergroup difference was calculated through one-way

ANOVA with SPSS for Windows. (Tables 1 and 2). In addition, a univariate chi-square test was performed to investigate the relationships between different variables. The variables that were significant in the univariate analysis ($P \leq 0.05$) were included in the multivariate analysis as described by Suwit *et al.* (2013).

Results

The average feed intake, weight gain, average daily gain, feed conversion ratio, and mortality rate are presented in Table 1. The results for males revealed that the average feed intake, weight gain, average daily gain, feed conversion ratio, and mortality rate were 120 (g/h), 3,500 (g/h), 14.53 (g/h/d), 3.42, and 10.02 (%), respectively. For females, the values were 120 (g/h), 3,200 (g/h), 13.33 (g/h/d), 3.75, and 6.85 (%), respectively (Table 2). The average feed intake, weight gain, average daily gain, feed conversion ratio, and mortality rate did not differ between males and females. And each age of the parent-bred chickens (Table 3).

Table 1. Performance statistics of male Samae Dam (*Gallus gallus*) chickens aged 0-8 months

Variables	N	Mean	Sd	Median	Minimum	Maximum	CV%
Feed Intake(g/h)	100	120	11.5	122	95	130	36.51
Weight Gain (g/h)	100	3,500	77.71	3,500	3,200	3,750	16.31
Average Daily Gain (g/h/d)	100	14.53	13.11	14.45	12.05	18.32	18.72
Feed Conversion Ratio	100	3.42	1.57	4.00	3.20	4.55	11.79
Mortality Rate(%)	100	10.02	7.04	10.50	8.90	11.77	14.45

Note: Feed cost per kilogram is 14.5 baht/kg. Dong Khwang Subdistrict, Mueang District, Uthai Thani Province, 2020Feed ingredients (%25paddy, %25brown rice, and %50local chicken ready meals)

Table 2. Performance statistics for female Samae Dam (*Gallus gallus*) chickens aged 0 - 8 months

Variables	N	Mean	Sd	Median	Minimum	Maximum	CV%
Feed Intake (g/h)	100	120	15.11	120.75	94	135	34.11
Weight Gain (g/h)	100	3,200	56.78	3,300	3,200	3,500	17.81
Average Daily Gain (g/h/d)	100	13.33	4.74	12.15	12.15	18.10	16.15
Feed Conversion Ratio	100	3.75	2.38	3.65	3.06	4.45	12.97
Mortality Rate (%)	100	6.85	6.50	6.97	5.54	7.25	11.20

Note: Feed cost per kilogram is 14.5 baht/kg. Dong Khwang Subdistrict, Mueang District, Uthai Thani Province, 2020Feed ingredients (%25paddy, %25brown rice, and %50local chicken ready meals)

Table 3. Individual males and females have the same univariate variable

Variable	Age range (months)	Male	P-vale	Female	P-vale
Feed Intake (g/h)	3-0	30.00	0.32	30.00	0.45
	6-3	40.00		40.00	
	8-6	50.00		50.00	
Weight Gain (g/h)	3-0	1,100.00	0.20	1,000.00	0.07
	6-3	1,900.00		1,800.00	
	8-6	500.00		400.00	
Average Daily Gain (g/h/d)	3-0	12.50	0.12	11.50	0.66
	6-3	32.25		20.00	
	8-6	8.35		6.65	
Feed Conversion Ratio	3-0	2.45	0.09	2.70	0.11
	6-3	1.24		2.00	
	8-6	6.00		6.50	
Mortality Rate (%)	3-0	10.00	0.15	10.00	0.42
	6-3	0		0	
	8-6	20.00		18.00	

Production data from comparisons of different anthelmintics with no treatment were used in a cost analysis. The data were from a farm of Samae Dam (*Gallus gallus*) chickens in Uthai Thani Province, Thailand. The cost structure involved the purchase price of products and the labour cost of administration.

A cost–profit study of male and female chicken breeders at small farmer farms revealed that the cost of raising male and female chickens in the second cycle tended to decrease. The average fixed cost per total cost is approximately 16.48%, whereas the average variable cost is 91.87%. The real cash cost is 66.79%. The highest-priced item was chicken feed, at 37.70% of the total cost. The food cost per 1 kg body weight gain averaged over two cycles was 49.05 baht/kg for males. In addition, for females, it was 53.29 baht/kg, as shown in Table 4, for the analysis of the income structure and economic profit of parents' production. The average breeding per total cost of smallholder farms in Uthai Thani Province, Thailand, revealed that breeder production can be profitable from the first cycle of production, with a loss per production index of 20% and a production efficiency index of 50–60%, as shown in Table 5.

Table 4. The findings of a cost structure analysis of the average 2 cycles of parent breeder production per 8-month total cost of smallholder farms in Thailand's Uthai Thani Province (Average for both rounds of 100 animals on the same farm)

The cost structure of breeder production	Round 1		Round 2		Average 2 rounds/total cost	
	Male	Female	Male	Female	Male- Female	(%)
1 fixed cost	9,650	9,650	8,100	8,100	8,875	16.48
1.1 Depreciation of a house unit: baht	3,500	3,500	2,750	2,750	3,125	5.80
1.2 Depreciation of equipment ^a unit: baht	2,000	2,000	1,900	1,900	1,950	3.62
1.3 Depreciation of raising equipment ^a	1,750	1,750	1,400	1,400	1,575	2.92
unit: baht						
1.4 Maintenance expenses unit: baht						
1.4.1 House maintenance cost unit: baht	650	650	550	550	600	1.11
1.4.2 Tool maintenance cost unit: baht	600	600	500	500	550	1.02
1.5 Land use opportunity cost ^a unit: baht	1,150	1,150	1,000	1,000	1,075	1.99
2 variable costs	56,050	56,050	33,875	33,875	49,462.50	91.87
2.1 Chicks ^b unit: baht	15,000	15,000	-	-	7,500	13.93
2.2 Chicken feed cost unit: baht	20,300	20,300	20,300	20,300	20,300	37.70
2.3 Utility Unit: baht	500	500	400	400	450	0.83
2.4 Household labor cost ^a unit: baht	19,250	19,250	12,500	12,500	15,875	29.48
2.5 Medical supplies unit: Baht	750	750	500	500	625	1.16
2.6 Other material costs (priming chaff)	250	250	175	175	212.50	0.39
Total cost unit: baht	65,700	65,700	41,975	41,975	53,837.50	-
Total cash cost unit: baht	38,050	38,050	33,875	33,875	35,962.50	66.79
Feed cost per weight gain 1kg. (baht/Kg.)	49.59	54.37	48.52	52.21	49.05	53.29

Note: ^a non-cash expense, ^b price of purebred chicks 300 baht/head, feed cost per kg 14.5 baht/kg. Dong Khwang Subdistrict, Mueang District, Uthai Thani Province, 2020 Ingredients (%25 paddy, %25 brown rice, and %50 local chicken feed)

The production efficiency test of Samae Dam chickens from smallholder farmers in Uthai Thani Province, Thailand, revealed that raising male and female Samae Dam chickens had a lower production cost in the second round. The average fixed cost per total cost is approximately 16.48%, and the average variable cost is 91.87%. Thus, the actual cash cost is 66.79%. The highest cost is chicken feed, which accounts for 37.70% of the total cost. The cost of feed per 1 kg body weight, averaged over two cycles, was 49.05 baht/kg for males and 53.29 baht/kg for females. The chicken grows an average of 14 grams per head per day. Therefore, broiler feed is suitable for chickens with an average growth rate of 50 g/head/day, whereas layer chicken feed is suitable for chickens with an average growth rate of 15 g/head/day. Therefore, food suitable for black-tailed Padauk

chickens should be ready-made food for laying hens according to the different ages of the chickens.

Table 5. The findings of the revenue structure and economic profit analysis, as well as the average breeder production per total cost of smallholder farms in Thailand's Uthai Thani province (Average for both rounds of 100 animals on the same farm)

The cost structure of breeder production	Round 1		Round 2		Average	
	Male	Female	Male	Female	Male	Female
3. Income	151,250	151,250	150,900	150,900	151,075	151,075
3.1 Revenue from chicken sales unit: baht	150,000	150,000	150,000	150,000	150,000	150,000
3.2 By-product (chicken manure) ^a unit: baht	1,250	1,250	900	900	1,075	1,075
Total Revenue unit: baht	151,250	151,250	150,900	150,900	151,075	151,075
Income above cash costs	150,000	150,000	150,000	150,000	150,000	150,000
Profit (Loss) in Economics unit: baht	85,550	85,550	116,125	116,125	97,237.50	97,237.50
Profit (Loss) over cash cost unit: baht	111,950	111,950	127,575	127,575	114,037.50	114,037.50
Economic cost per kg. unit: baht	375.42	410.62	239.85	262.34	321.41	321.41
Cash cost/kg. unit: baht	217.42	237.81	193.57	211.71	214.70	214.70
Number of production (h)	50	50	50	50	50	50
average weight (kg/h) unit: baht	3.50	3.20	3.50	3.20	3.50	3.20
Total weight (kg)	175	160	175	160	175	160
Selling price/kg. unit: baht	850	850	850	850	850	850
Profit (Loss) /Kg. Unit: baht						
Profit (loss) in economics unit: baht	474.58	439.38	610.15	587.66	528.59	528.59
Profit (loss) above cash costs unit: baht	632.58	612.19	656.43	638.29	635.30	635.30
4. Samae Dam chicken production index						
4.1 Loss per production index (%)	20.12	18.75	21.05	19.25	20.45	19.17
4.2 Production efficiency index (%)	60.45	58.90	61.35	59.84	60.90	59.37

Note: ^a non-cash income, ^b pre-contest price, feed cost per kg 14.5 baht/kg. Dong Khwang Subdistrict, Mueang District, Uthai Thani Province, 2020, feed ingredients (%25paddy, %25brown rice, and %50local chicken feed)

Discussion

Smallholder farmers in the Uthai Thani area tested the productivity of Samae Dam chicken breeds

In addition to being cheaper than broiler feed, chickens also do not have to stress to excrete nutrients such as excess protein from the body (Pornphimon *et al.*, 2013) stated that Chiang Mai fattened black-tailed Pradu chickens with natural feed. They were served thick food with other locally sourced ingredients, and the chickens were moved to live in the garden. The average fattening time was 92 days; the average weight was 1.28 kg, the average growth rate (ADG) was 13.08 g/day, and the fattened chickens had an average meat conversion rate (FCR) of 4.38. For naturally raised chickens, ready-made food from other raw materials was used. The average growth rate (ADG) was 11.17 g per head per day. The efficiency of feed conversion to meat was 5.15. This may be because this study uses concentrated feed, which is a relatively high-quality feed for chickens. In addition, less feed from other raw materials (22.71 g/head/day) was used, but when the FCR was considered, it was found to be greater (lower) (Narong *et al.*, 2013). The FCR was 3.21 because the chickens were on a full-fledged laying hen diet in the study. Therefore, the feed efficiency of black-tailed Padauk chickens was better than that of concentrated feed combined with feed from other raw materials (Amnuay *et al.*, 2012). In seven cases during six months of fattening, with an average of 22.71 g/head/day, the cumulative amount was 279.27 g, combined with another raw material, with an average of 34.43 g/head/day, and the cumulative amount was 370.53 g (Pornphimon *et al.*, 2013). The fattening period of the blacktails averaged 98 days, with a finished feed intake amount of 15.08 g/head/day and a feed intake from other raw materials of 42.37 g/head/day (Narong *et al.*, 2013). And other natural materials of Chiang Mai black-tailed Padauk chickens, aged 0–13 weeks, or with an average fattening period of 92 days, with the quantity per head per day (Pornphimon *et al.*, 2013). The feed intake of chickens raised in the farm system was 53.3 g/head/day at 0–12 weeks of age. Since most of the feed used by the seven farmers is from local and natural ingredients (70–80%), only 22.71 g/head is concentrated/day (20–30% of total feed per feeding/head/day). In addition, seven farmers raise chickens freely in gardens, allowing the chickens to peck at worms, insects, and grass as additional food (Amnuay *et al.*, 2008). Atcharat *et al.* (2016) studied the growth rate of native chickens, and Onanong *et al.* (2002) studied the growth performance of native chickens raised by village farmers. They are managed and

fed naturally, with feed such as bran, broken rice, paddy, food residues leftover from consumption, grass, and vegetables. They found that the native chickens have a growth rate of 6.35 g/head/day at 6–12 weeks of age.

Cost-effectiveness analysis of Samae Dam Chicken Breeder production by small farmers in Thailand's Uthai Thani Province

A study of the cost of production of Samae Dam chickens of smallholder farmers in Uthai Thani Province, Thailand, for the analysis of income structure and economic profit of average parent breeder production per total cost of smallholder farms in Uthai Thani Province in Thailand revealed that breeder production can be profitable from the first cycle of production, with a loss index per production of 20% (Atcharat, 2016). All costs from raising local chickens use fixed costs totalling 346.42 baht per head per model, representing 66.35% of the total cost. Cash was divided into cash (266.66 baht) and noncash (79.76 baht). More importantly, costs or expenses from mothers of genus were 76.96% and 19.24%, respectively. A greater than average variable costs equal to 175.70 baht, representing 33.65% of total costs, which consists of cash and noncash parts, are 2.00 baht and 173.70 baht, respectively (Dusadee, 2013) for Chiang Mai 1 black-tailed hens reared naturally. The cost of producing chicks averaged 17.97 baht/head. The production cost of fattening chickens averaged 64.80 baht/kg. The yield consisted of chicks, fattening chickens, and chicken droppings. Farmers sold an average of 210 chicks/each and raised them as fattening chickens at 516/each (average rearing time of 92 days, average weight of 1.28 kg/case). a) Farmers have an average income of 4,176 (Wuttichai and Panupan, 2019). Farmers have average actual costs of 102.48 baht/kg (compared with other groups, due to high variable costs). The feed cost was 62.25%, the labour cost was 19.60 %, and the chick cost was 14.93%. The loss rate was as high as 19.15% of the imported chicks. A total of 12 farmers raised fattening chickens for sale. Farmers started raising young chickens with a three-month-old breed in November 2012. The chicken breed will start producing eggs at approximately 225 days of age if they are raised in a backyard. Therefore, breeders first started laying eggs in April 2013. Fatty chickens will be approximately 90–120 days old. The production cost is 87.63 +. 23. 23, 49 baht per pezzo. The selling price was 120 baht per piece, the cost of fattening chicken production (Suwit *et al.*, 2013). Profit and return for the production of Samae Dam chicken breeds of small farmers: the returns from naturally raising chickens are considered to produce

excellent yields, especially if a good and strong breeder yields chickens with good characteristics. It can be sold at a reasonable price, especially for distribution as a gamecock, a contest, or for other selection as a breeder. Pornphimon *et al.* (2013) reported that farmers who sell would have an average profit of 50,114 baht/person/year or 4,176.2 baht/month/person. Thus, farmers earn an average of 79,849.5 baht per head of Chiang Mai black-tailed Padauk chicken. The average production cost was reduced to 29,735.5 baht/case. The farmers made an average profit of 50,114 baht or 4,176.2 baht/month/person. Siriwan (2002) studied the cost and return of raising domestic chickens and reported that there was enormous capital and return on raising chickens of 1 generation. For one house, the total rearing time was 13 weeks, the total cost of live chickens was 607,166.79 baht, and the average price of live chickens per kg was 40.36 baht. The problem encountered from raising chickens in the house is the problem of rising cost of production and marketing. The results of the present study showed that chicken farming must consider farm management, production, and marketing costs, which are closely related. Phanom (2001) studied the potential of farmers in native chicken production in Uttaradit Province. Native chicken production has an average net income of 2,120.49 baht, with the highest net gain of 10,500 baht and the lowest of 100 baht. There is a lack of knowledge concerning the selection and breeding of native chickens, sanitation and disease prevention, and problems and obstacles in the production of native chickens. Naturally, raising local chickens requires space, and if the space is far from the living area or community, it is very suitable because chickens that are grown naturally. Want a wide area and are not disturbed by others' absence. Clan Breeders and Breeders, if there is no natural house-raised chicken if natural domestic chicken farming does not have at least two of the qualities above, it impedes production or yield. Because the production of natural domestic chickens is in market demand throughout the year, if they can be produced continuously, they will be able to generate income for the raisers both as an additional occupation and a secondary occupation (Dusadee, 2013; Kochaporn, *et al.* (2013). Two farmers raised chickens as their primary occupation, and the rest raised chickens as a supplementary occupation. The consideration of those who are interested in the proportions of raising and feeding is uncertain. Therefore, the appropriate ratios of concentrated feed should be studied. As well as fermented peas, grass, or other locally available food that the chickens can fully produce. Food nutrition analysis of other raw materials, such as fermented peas and mixed food, was performed. Or any other local raw materials that

farmers purchase to raise chickens, to reduce the cost of concentrated food, so farmers can choose suitable raw materials. The knowledge gained from this study is applied to each farmer, and the results may be different. Owing to limitations in the understanding of each farmer's management. Therefore, farmers must understand the nutritional value of raw materials for raising chickens. By introducing native chickens to natural release, chickens can find their own food. Thickening supplements are needed in the early stages of growth. The egg-laying step for hens involves feeding fermented food or mixing biological fermentation in feed and water for native chickens. Farmers should know the production process and proper use.

In the second round, the production of male and female black macaque chickens resulted in lower production costs. The average fixed cost per total cost is 16.48%, the average variable cost per total cost is 91.878%, and the total cash cost is 66.79%. Chicken feed is the most expensive, accounting for 37.70% of the overall cost. The cost of feed per kilogram of body weight gain averaged two cycles, with the male costing 49.05 baht/kg. Females cost 53.29 baht per kilogram. In terms of the revenue structure, economic profit, and average parent breeder production per total cost of smallholder farms, parent breeder production can be lucrative as early as the first round of production. The production efficiency index was 50–60%, whereas the loss per production index was 20%.

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Conflicts of interest

The authors declare no conflict of interest.

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