Development of BASE Agricultural Business Board Game

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Abstract

The authors have developed business board game called "BASE Agriculture Game (AGR)." Agriculture is a large sector of the Thailand economy, and there is a need to educate farmers and other people in the agricultural business to become more innovative. The basics of this board game were as follows: First, the cattle are selected. Then the players purchase land and fix their assets and procure more cattle. Players provide Corn is as food for their cattle. Finally, the players raise the cattle until they are enough to be sold through bidding. Throughout the experience of playing the game, participants can gain basic knowledge of the agricultural business. Besides, they also learn the essentials of market mechanisms and accounting.

Keywords: Agriculture, Animal Husbandry, Board Game, Business Game, Cattle Farming, Live stock

1. Introduction

The global food crisis has become more critical and prominent in recent years. Close to one billion people in the world do not have enough food to eat. Therefore, many organizations, industries, and governments have begun shifting attention to innovations in the agriculture sector. Agriculture is a broad topic consisting of cultivation, farming of animals, plants, crops, fungi for food, and fiber as well as the production of biofuels, herbs and other products used to enhance human life. The agriculture business is vitally important to the world economy. Thai agricultural products are found all over the world. The portion of the Thai farm sector still occupies 8.93% of GDP in 2016 (World Bank, 2017). To increase agricultural revenue by a more efficient process, sense of business is necessary for people in the sector. Nevertheless, the majority of people are not familiar with the agriculture as a business. The actors decided to create an agriculture industry business game both for university students and people working in the agricultural sector.under the brand of "BASE business board games." We decided to develop a new game as one of the BASE Business Board Games put initially together by Hamada and his group. (Hamada, Hiji, & Kaneko, 2014, Kaneko, Hamada & Hiji, 2016)

2. Literature Review

The use of an agriculture game first occurred with the increased threat of global warming in the early 2000s, and the need to create sustainable farming and business models. Martin et al. (2007) focused on Polish agriculture and the micro model game for farmers using chicken breeding as an example. Dionnet, Kuper, Hammani, and Dionnet (2008)

introduced the Moroccan role-playing game for farmers. This game had a lot of margins to improve and let them consider the usefulness of joint irrigation.

In the United States, O'rourke (2001) surveyed to find out how many agribusiness simulations were used in American Universities. Out of 80 agribusiness courses, he discovered that simulation was being used in 34 classes. However, most of them were computer simulations rather than actual games. Moreover, this survey didn't make clear if any of the simulations related to the agriculture business. Regarding the livestock business or animal husbandry, Koontz, Peel, Trapp, and Ward (1994) introduce computer game called "The packer feeder game," but is classic computer-based game. Moreover, it is a work in over two decades ago. Thus, we can conclude a board game to learn agriculture business is rare existence.

3. The outlook for BASE Agricultural Business Board Game (BASE-AGR)

3.1 Scenario

In BASE agriculture board game (AGR) the players take the role of cattle farmers. They buy green land, fence, and silos. Also, they purchase cattle through auction, feed corn to them, raise them and then sell the cattle in a competitive environment. Also, they have the choice to grow dairy cows. Every player has to manage their money and inventories like cattle, log, silo, stall, and food, to survive. The team that retains the most assets is the winner.

3.2 Concept: Beefiness Ecownomics

We named our concept as "Beefiness Ecownomics"; which stands for learning economics by cattle farming.

3.3 Teaching Purposes

We can summarize the concept of “Beefiness Ecownomics" as following five factors, which is same as our teaching purposes to let students understand them.

1. To understand the basic economic concepts of the agriculture business. The players will have a good picture of the farming business in their mind after completing the game.
2. To understand the length of time involved in raising cattle. It becomes evident in the game by the amount of corn that cattle consume, and a time needed to get the cattle ready for sale.
3. To understand that there is timing involved when deciding whether or not to buy specific items. The game teaches the price fluctuation of corn from month to month.
4. To understand economic fluctuations. In the real world, prices for corn and the selling price of beef cattle always fluctuates.
5. To understand the strict rules of accounting principles. By completing the accounting sheet without any mistakes, (a single mistake will make the entire account sheet wrong; leading to severe problems), the players will understand the basic idea of accounting.

3.4 Facts of AGR

Table 1 shows default settings for AGR. IN case we need, we can amend.

Table 1

Major Specs of AGR

Facts	Data
Concept	Beefiness Ecownomics
Designer(s)	Tsubaki Group, BASE project, 2016
Form	Interactive Play
Type	Tabletop Games
Category	Eurogames (German-style Board Games)
Number of Teams	1-3 (15 people/table)
Age Range	10+
Setup Time	Approximately 2-10 minutes
Playing Time	1-3 hours
Random Chance	Low
Skills required	Strategy, Management
Optional	Calculator, Laptop Computer

4. Items and Components of the AGR

4.1 Overview

Fig.1 is an overview of the board game. In this picture, there are four farmers on the table. Each table consists of four teams (farmers), and each farmer has two to three students requiring close communication.

Fig.1 AGR Overview

4.2 Parts of the farmer board

Fig.2. Overview of the farmer board of AGR

Let's review the components of this game in detail.t

1. **Beef Cattle (Pink Tray):** This is a cow that the player acquired from an auction in the "Bidding Phase." The player will raise the cow (it lives in a stall). One beef cattle need 1/4 space of the stall to live. The player then sells it when it becomes mature. The cost (buying price) of beef cattle depends on the player's bidding result. The revenue (selling price) from selling beef cattle depends on the market price. Cattle can be sold when they grow up more than three months old (this will consume three or more corn tokens). One corn token needs to be used every month. Beef cattle are represented by the red token in Figure 2.
2. **Dairy Cattle (Blue Tray):** This is a mature cow that the player buys for selling milk. The player can buy dairy cattle in the "Buying Phase" of each month. The cost (buying price) of dairy cattle is 1,000 each. It can produce one tank of milk per month; which can be sold for 470 each. It also needs to consume one corn token every month. One dairy cattle need 1/4 space of the stall to live. Dairy cattle are represented by the blue tokens in Figure 2.
3. **Corn:** Corn is a token which is used to feed both the beef and dairy cattle. The player can buy corn during the "Buying Phase" of each month. The price of corn depends on the market offered price. Corn token needs to be stored in the silo. One corn token takes up 1/20 of the space of the silo.
4. **Log:** Logs are used to build the stalls and silos. The player can buy logs during the "Buying Phase" of each month. The price of one log is 100.
5. **Stall:** This is the living place for both the beef cattle and dairy cattle. Players can buy stalls during the "Buying Phase" of each month. The price is 150 each. One stall has a capacity of four cows (Beef and Dairy cattle). Beef and dairy cattle can live together in the stall. It needs to be surrounded by logs.
6. **Silo:** It is the storage space for the corn. The player can buy silos during the "Buying Phase" of each month. The price is 50 each. The maximum capacity of one silo is 20 corns per silo. Players must surround the stall and silo. Otherwise, cattle might escape.
7. **Price Card:** There are 12 Price cards; each card representing one month of the year. The price to sell beef cattle and the cost of corn will be decided by card every month. The player must open a card from January to December respectively.
8. **Farmer Board:** This is where the players will build their farms each team will get only one board.
9. **Accounting Tables:** Each team must record their business on an Accounting Tables: Table A (Cash Flow), Table C (Depreciation), Table D (Income statement), and Table E (Balance sheet). (Examples of these accounting tables are shown in figures 6, 7, 8, and 9).
10. **Bidding paper:** The sheet used for recording the bidding price for beef cattle by each team.

5. Process of AGR

5.1 Set-up

Each team prepares one company board and four sheets of accounting tables, consisting of Table A (Cash Flow Table), Table C (Depreciation), Table D (Income Statement), Table E (Balance Sheet) and one piece of bidding paper (Fig.3).

5.2 Initiation

At the beginning of the game, each team has 5,000 in capital stock. Initially, each group must buy a total of 7 logs (4 logs for a stall and 3 logs for a silo - next to the stall), and then set up the stall and silo by using logs.

5.3 Monthly Operation

There are 12 months (Jan-Dec) with four 4 phases in each month: Feed, Sell, Buy, and Bid. At the start of each month, the player will pick a price card from the deck to see the price of beef cattle in the sales phase and the cost of the corn in the buying phase. We called this cycle "FSBB cycle" (Fig. 3), begins. Because of time limitation, the game is played out for only one year.

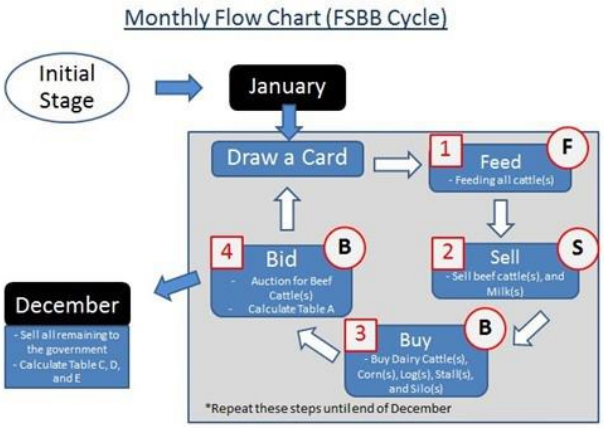

Fig.3. Monthly Role of AGR (FSBB Cycle)

5.3.1 Card drawing

Teacher draws one card. It defines the market price of Beef cow and price of corn (Figure 4).

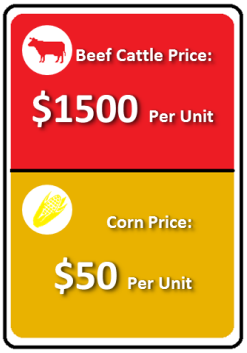

Fig.4. Samples of Market Price Cards

5.3.2 Feeding

Cattle eat one unit of corn. The beef cow becomes possible to sell when it eats four corns to grow up by four months. Student must prepared enough corns by previous months.

5.3.3 Sales

If a player has one daily cattle, one-tank milk can sell. The price is a 470/one tank. In case a player has enough-feed beef cattle, it can sell at the rate that market price card shows.

5.3.4 Buying

Every team can buy corn, dairy cattle, logs, stalls, and silos. Table 2 shows those item's price. Bidding decides procurement of beef cattle by following rules.

- The maximum amount of beef cattle that you can bid depends on the space left in the stall.
- A player cannot bid for beef cattle if there is no vacancy in the stall. If the player wishes to offer for more cattle, they must procure new stall.
- There is no need to bid for the maximum amount of beef cattle in a market. Table 3 shows the initial bidding price per one beef cattle. For example, if there are only two bids in Market 4, the bidder can buy at a price he/she attempts.
- Each Team discusses bidding price and submits a bidding paper to their staff.
- A team with the highest price gets the cattle for that particular market.
- In the case of a tie bid, the bidding will be reopened between the tied players. The new bidding floor starts at the same price.

Table 2

Prices of Items

Item	Price
Beef Cattle	Price defined By Bidding
Dairy Cattle	1000
Corn	Price the market card shows
Log	100
Stall	150
Silo	50

Table 3

Default Number of the bidding market

Market	Available quantity	Initial bidding price of beef cattle
Market 1	1	200
Market 2	2	300
Market 3	3	400
Market 4	4	500

5.3.5 Final sales

The real economy never finishes. But in this game, we have to finish at the end of year 1. "World-end" let students sell their beef cows without careful consideration. To avoid dumping sales, they are required to sell all remaining beef cattle, dairy cattle, and corn to the government with the provided price list (Table 4).

Table 4

Price list from the government, which is used in the final stage

Item	Price/unit
Beef Cattle	
with no Corn	300
with one corn	500
with 3 or more corns	1200
Dairy Cattle	800
Corn	80

5.4 Accounting

5.4.1 General Rules

At the end of the year, including the final stage, each company must finish their accounting table by following steps.

1. Reconfirm all revenue.
2. Recalculate all expenses and check the cash flow integrity.
3. After computing and checking correctly for income and expenditure, the players have to complete their other sheets, Depreciation, P/L, and B/S).
4. At the end of the year, students must complete their Cash Flow Management Sheets. After student complete the Cash Flow Management Sheets, they fill in their Depreciation cost Calculation sheets.
5. Finally, they complete the Profit and Loss Statement and Balance Sheet.

5.4.2 Handwriting

Every step of filling in the Accounting Sheets should be handwritten. Writing, not typing is a tradition of BASE business games, and its purpose is to let student realize strictness of accounting rule throughout making miscalculations.

5.4.3 Forms

AGR has four accounting sheets and student proceeds in the following order: All of these accounting sheets will help the student understand the fundamentals of accounting.

- Cash Flow Management Sheets (Fig.6.Table A); Table A represents a daily operation, with the horizontal and vertical proof ensuring its integrity. Students record the correct numbers and prices at the end of the year.
- Depreciation cost Calculation Sheet (Fig. 7. Table C); Table C is a simple depreciation table that shows that the stalls, silos, and logs depreciate 10% per year.
- Profit and Loss Statement (Fig.8.Table D): After completing tables A and C, students then complete Table D (Income Statement) to show the income or deficits. Balance Sheet (Fig.9.Table E): Based on the numbers on Table A, C, D, students calculate the status of the asset, liability, and equity, and learn the fundamental principle of accounting.

In this game, there is no Table B. In BASE business games, we always use same code on same table to avoid student's confusion.

BASE.AGR.A.SAMPLE	Desk	Color	Year	Full Name, ID, Nickname	1) John Cema 56XXXXXXXX (John)
	1	R	1		2) Jim Cema 56XXXXXXXX (Jim)
					3) Jame Cema 56XXXXXXXX (Jame)

BASE

		Previous	Initial	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Final	Total	
Sales Revenue																		
Beef	(AA)	x					1x2900			7x2400			7x2300					
		x					2900			16800			18400				38100	(AA)
Milk	(AB)	x			[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]	[1]			
470/Dairy Cattle/Month		x		0	470	470	470	470	470	470	470	470	470	470	470		5170	(AB)
Sale in Final	(AC)	x	x	x	x	x	x	x	x	x	x	x	x	x	x	6260	6260	(AC)
Financial Revenue																		
Loan (Interest = 10%)	(AD)	x															0	(AD)
Capital Stock (AE)	5000	x															5000	(AE)
Total Revenue	**(AF)**	5000	0	0	470	470	3370	470	470	17270	470	470	18870	470	470	6260	54530	(AF)
Operating Expense																		
BeefCattle (AG)	Market 1	x		1x200			1x200			1x200			1x200					
	Market 2	x					2x300			2x300			2x300					
	Market 3	x					3x400			3x400			3x400					
	Market 4	x					1x500			1x500			1x500					
	Total	x		200			2500			2500			2500				7700	(AG)
Dairy Cattle	(AH)	x		[1]														
1000/DC		x		1000													1000	(AH)
Corn	(AI)	x		[2]	[2]	[2]	[8]	[8]	[8]	[8]	[8]	[8]	[8]	[8]	[8]			
		x		200	220	180	640	560	560	640	960	720	640	560	720		6600	(AI)
Log	(AJ)	x	[7]			[3]											10	
100/piece		x	700			300											1000	(AJ)
Stall	(AK)	x	[1]			[1]												
150/stall		x	150			150											300	(AK)
Silo	(AL)	x	[1]															
50/silo		x	50														50	(AL)
Employee	(AM)	x		[1]	[1]	[1]	[2]	[2]	[2]	[2]	[2]	[2]	[2]	[2]	[2]			
100/stall		x	0	100	100	100	200	200	200	200	200	200	200	200	200		2100	(AM)
Public Utility	(AN)	x																
300/month		x	0	300	300	300	300	300	300	300	300	300	300	300	300		3600	(AN)
Financial Expense																		
Interest (10%)	(AO)	x															0	(AO)
Refund	(AP)	x																(AP)
Total Expense	(AQ)	x	900	1800	620	1030	3640	1060	1060	3640	1460	1220	3640	1060	1220	0	22350	(AQ)
Cash Balance	(AR)	5000	4100	2300	2150	1590	1320	730	140	13770	12780	12030	27260	26670	25920	32180	32180	(AR)

Fig.5. Cash flow Management Sheet (Table A)

BASE.AGR.C.SAMPLE Depreciation			
	Number	Price	
Log	10	1000	(BA)
Stall	2	300	(BB)
Silo	1	50	(BC)
Total (BA)+(BB)+(BC)		1350	(BD)
Depreciation		135	(BE)
((BF lastyear)+(BD))*0.1			
Stall, Silo, Log as Asset (BF last year)+(BD)-(BE)		1215	(BF)

Fig.6. Depreciation calculation sheet (Table C)

BASE.AGR.D.SAMPLE INCOME STATEMENT		
Income		
Sales Revenue (AA)+(AB)+(AC)	49530	(DA)
Expense		
1.Production Cost (AG)+(AH)+(AI)	15300	(DB)
2.Employee (AM)	2100	(DC)
3.Public utility (AN)	3600	(DD)
4.Interest (AO)	0	(DE)
5.Depreciation(BE)	135	(DF)
Total Expense (DB)+(DC)+(DD)+(DE)+(DF)	21135	(DG)
Pre-tax income (DA)-(DG)	28395	(DH)
Corporate Tax (DH)* 0.35	9938.25	(DI)
Net Profit (DH)-(DI)	18456.75	(DJ)

Fig.7. Income Statement (Table D, P/L)

BASE.AGR.E.SAMPLE BALANCE SHEET							
Asset				**Liability**			
Current Asset				Current liability			
	Cash (AR)	32180	(EA)		Tax (DI)	9938.25	(EI)
Fixed Assets				Long term debt			
	Stall, Silo, Log as Asset (BF)	1215	(EB)		Initial (EM-LAST YEAR)		(EJ)
					New loan (AD)	0	(EK)
					New Refund (AP)	0	(EL)
					Total debt (EJ)+(EK)-(EL)	0	(EM)
				Total liability (EI)+(EM)		9938.25	(EN)
				Stockholder Equity			
					1.Capital Stock (AE)	5000	(EO)
					2.Earned Surplus		
					Initial (ER-LASTYEAR)	0	(EP)
					Net profit (DJ)	18456.75	(EQ)
					Retained Earnings (EP)+(EQ)	18456.75	(ER)
				Total Stockholder Equity (EO)+(ER)		23456.75	(ES)
Total Asset (EA)+(EB)		33395	(EC)	**Total Liability & Stockholder Equity (EN)+(ES)**		33395	(ET)

Fig.8. Balance sheet (Table E, B/S)

and Table E (Balance Sheet).

5.5 Winner

After completing the game, all players need to complete the accounting table to determine the total assets of each team. The team with the most assets will be the winner.

6. Results

We operated AGR at Thammasat University in Thailand. We conducted some surveys to prove whether or not AGR is an effective teaching method.

6.1 Survey on the understanding of Business Ideas

In February 2017, 33 students of Thammasat University (SIIT students), had to complete questionnaires before and after the use of the simulation game. The surveys consisted of 8 general business ideas, together with the business ideas included in AGR. The Likert Scale was used to assess the questionnaires: (1=Do not Understand at all to 5=Understand all). The students that participated in this experiment were from various faculties. All were beginners at the business simulation game.

Table 5 shows the principal questions from the survey. In all eight query, the answers in the after simulation questionnaire were higher than before playing the game. The average raising ratio is 1.2. Three points of evidence from the results of the surveys point to the improvement of teaching effectiveness. Raising understandings of "Beefiness Ecownomics" can be proved by the outcome of B/A ratio. According to this result, we mostly achieved our teaching purpose that is shown in 3.3. We reconfirm our learning goals below.

1. To understand the basic economic concepts of the agriculture business. (Q1): increased at 43%.
2. To understand the length of time involved in raising cattle. (Q2): increased at 27%.
3. To understand that there is timing. (Q3): increased at 32%.
4. To understand economic fluctuations. (Q4): increased at 13%.
5. To understand the strict rules of accounting principles. (Q5): increased at 29%.

Table 4

Results of the SIIT students' questionnaire (2017)

No	Content of Questions	Before	After	B/A	*t*-value
1	Understand Nature of Agriculture Business	3.03	4.33	1.43	-7.867**
2	Understand that to grow up cattle take a long time	3.42	4.36	1.27	-6.247**
3	Understand there is a timing to buy or not to buy items	3.27	4.33	1.32	-6.775**
4	Understand Climate affects agriculture business	3.76	4.24	1.13	-2.617*
5	Understand Economy has fluctuation like a wave	3.42	4.42	1.29	-6.373**
6	Understand Accounting Rule is strict	3.27	4.27	1.31	-5.573**
7	Prefer to learn by gaming rather than traditional lecture	3.45	4.39	1.27	-5.782**
8	This game increases communication or friendship	3.82	4.39	1.15	-2.885*

Note: $N = 33$, * $p < 0.005$ **, $p < 0.0005$, one-tail

Additionally, we can consider the awareness of the economic principles involved in the agricultural business (Q7), and students welcomed the gaming (Q8).

However, the BASE AGR game does not show the effects of climate (Q4). Climate changes are difficult to measure in this simulation game. Furthermore, communication and friendship do not significantly increase between players because of the stress of competition (Q8). The open-ended question answers indicated that almost all of the players liked the "Bidding Phrase" of the BASE AGR game. Furthermore, they preferred the length of playing time at approximately 2-3 hours.

7. Conclusions

AGR is a new business board game about cattle and dairy farming, which allows participants to gain a better understanding of the economic principles of the agricultural industry. According to the statistical analysis, it helps a learner to understand how to manage their resources and thus become successful in their business.

7.1 The effects of the Board Game on the participants

As we review in the previous chapter, it worked well and satisfied our learning goals. After launching and testing the game with SIIT students, we gather feedbacks as well, and comments were mostly positive. Therefore, we can conclude this game can encourage participants to consider strategically and deliberately, to plan their actions.

It also helped to forecast the future of the participants' company performances and the market prices. And the most important point is this game contributes to the student, not only for the animal husbandly nor agriculture professionals. This game contributes to understand the basic market mechanism and let student understand nature of beef husbandly business (Beefiness Ecownomics) throughout students' experience.

7.2 Discussions

On the other hands, there are several remained problems. Firstly, to improve this game, we need to try out more. In our experiment, most participants are students of School of Management Technology, and they had an experience of studying financial accounting when they were second-year students. It is required for us to determine its availability for those people who have no previous knowledge. Secondly, we design this game only for one-year operation. This cause irregular behavior and rule at the end of the year. However, the real economy never terminates. We need to develop the second year as soon as possible. Thirdly, the economic fluctuation is well included in this game. Drawing a card per month to define different prices is comfortable and practical way, but real price of beef and corn is determined based on many factors. To improve this game, we have to keep in mind those problems.

Despite the authors aim to spread this idea to the people working in the agricultural sector as well, we didn't have an opportunity. We tried only once in the university class. To consider the way to spread this idea to a real business sector is our remained important issue.

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