Income Upgrading Model of Cattlemen in the Utilization of Artificial Insemination Technology: A Case Study in Village of Kanonang III, Regency of Minahasa

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Abstract. Ccattlemen allocate labor on their cattle business. These activities have contributed further to the family income used to meet household needs. Besides the beef business, they seek food crops such as rice, corn, peanuts and so forth to obtain additional income. The breeders utilize the technology of artificial insemination and natural mating in the beef cattle production. The usage of insemination technology is expected to increase the income derived from the beef cattle that will result in increasing the investments and the income of farming food crops. The objectives of this study are to analyze the correlating factors that affect the farmers' income from the cattle business and farming crops under condition of the usage of artificial insemination technology and to analyze the effects of the external factor changing toward the profits of beef cattle business, the costs of cattle production , the cost of crop production, food crops farm income, animal health costs and the cost of the barn with the condition of the artificial technology usage. The measurement technology of the artificial insemination uses the cost inseminator approach. This research is a case study of 100 cattlemen in the village of Kanonang III Minahasa District selected by random sampling. Model of simultaneous equations with the method of 2 SLS is used to estimate all the parameters of the study. The result of research showed that the economic model of breeders can explain in relation to the use of artificial insemination with income and costs of production in cattle and farm crops well. Insemination technology increases the profits for the cattle production, the costs of cattle production, the costs of crop production, farm food crops income, animal health costs and the cost of the barn. These results indicate that the artificial insemination technology can improve economics the performance of beef breeders.

Keywords: technology of artificial insemination, inseminator fees, revenues of beef breeders, economy model of the beef breeders

Abstrak. Peternak sapi mengalokasikan tenaga kerjanya pada usaha ternak yang dimilikinya. Kegiatan ini memberikan kontribusi terhadap pendapatan keluarga digunakan untuk memenuhi kebutuhan rumah tangga. Peternak juga mengusahakan tanaman pangan seperti padi, jagung, kacang tanah dan sebagainya untuk memperoleh pendapatan. Peternak memanfaatkan teknologi inseminasi buatan (IB) dan kawin alami dalam proses produksi ternak sapi. Penggunaan IB diharapkan meningkatkan pendapatan sehingga berdampak pada peningkatan investasi dan pendapatan usahatani tanaman pangan. Tujuan penelitian ini adalah menganalisis keterkaitan faktor-faktor yang mempengaruhi pendapatan peternak dari usaha ternak sapi dan usahatani tanaman pangan pada kondisi penggunaan teknologi insemianasi buatan dan menganalisis pengaruh perubahan faktor eksternal terhadap pendapatan usaha ternak sapi, biaya produksi ternak sapi, biaya produksi tanaman pangan, biaya kesehatan ternak dan biaya kandang pada kondisi penggunaan teknologi inseminasi buatan. Pengukuran teknologi inseminasi buatan menggunakan pendekatan biaya inseminator. Penelitian ini adalah studi kasus terhadap 100 peternak sapi di desa Kanonang III Kabupaten Minahasa yang dipilih secara acak. Model persamaan simultan dengan metode 2SLS digunakan untuk mengestimasi semua parameter penelitian. Hasil penelitian menunjukkan bahwa model ekonomi peternak yang dibangun dapat menjelaskan dengan baik keterkaitan penggunaan teknologi IB dengan pendapatan dan biaya produksi pada usahaternak sapi maupun usahatani tanaman pangan. Teknologi inseminasi meningkatkan pendapatan usahaternak sapi, biaya produksi ternak sapi, biaya produksi tanaman pangan, pendapatan usahatani tanaman pangan, biaya kesehatan ternak dan biaya kandang. Hasil penelitian ini mengindikasikan bahwa teknologi IB dapat meningkatkan penampilan ekonomi peternak sapi.

Kata kunci : teknologi inseminasi buatan, biaya inseminator, pendapatan peternak sapi, model ekonomi peternak sapi

Introduction

Minahasa is one of the districts where is potentially for cattle business. This business is a source of income for farmers in a rural area such as cutting jobless, cultivating the land and a means for transportation. The number of cattle population in Sulawesi Utara in 2009 were 108,335 and the most population was in the district of Minahasa as many as 27,938 (Sulawesi Utara, counted in number, 2010). The process of production, income and labor allocation in cattlemen households are as an interrelated unit so that any change of policy in managing the activities of beef cattle will affect the production, income, and employment (Rochaeni and Lokollo 2005; Hartono 2006). Cattlemen in the village of Kanonang III, besides the cattle business, they seek food crops such as rice, corn, peanuts, red beans, tomatoes and red onion to meet household needs. The cattles are used to cultivate the field and to transport the farm crops. Meanwhile the cows' dung is then used as a source of manure to fertilize the fields (Hoddi, 2010).

Beef breeding business in Kawangkoan regency of Minahasa is mostly traditional breeders managed in small-scale by using simple technology. The main characteristic of the cattlemen family shows that the business is managed by household and their family members in hereditary. Commonly, they do the business to cultivate their fields and to transport the farm crops. This phenomenon is as a household behavior as producer in economic activity. A household has a role as not only both producer and labor supplier but also consumer. The labor of family members is allocated for the business of breeding and the other agricultural activities like food crops to generate income.

Diwyanto (2008) claims that IB (artificial insemination) program has to improve the quality of beef cattle through artificial injection, further, to increase the production and the breeders' income. But there are still many obstacles for breeders in relation to insemination technology such as the available beef of mixed blood 'Ongole' (PO) by artificial insemination and the discontinuity of inseminators' member. They cause the breeders back to the natural mating even though the breeders have difficulties in supplying cow stud. This condition is similar to Hadi and Ilham (2002) statements that the efforts of 'IB' still have some obstacles as follows, the limited inseminator member, the qualified cow stud and the facilities of 'IB'.

Winarso et al. (2005) points out that the income, at small-scale farmer business, is net return and this is the subtraction of overall revenue with the cost expensed by the farmer. The farmer's income, thereby, comprises of the result of production selling, wage of family labor and interest rate it self (tools, land, etc). Thus, the income is divided into 1) Gross Income, an income of farmer business that has not been subtracted with the cost. Gross income consists of cash and non cash. The form of cash is the real result received, while non cash is the unsold product but to consume or stock, 2) Net income, a gross income is subtracted with the cost or revenue after subtracted with the cost, 3) Manager income is the subtraction result of total output with total input, either input actually paid or merely measured. If applied to small farmer, it is generally negative. Income value or production cost of beef production, based on economic theory, is overall liabilities that are bear by producer (farmer) to provide goods in terms of ready-used by consumer and, in the income measurement, it can be classified into two, fixed and unfixed cost (Sudarsono, 1995**).** In the short term, there is fixed and variable cost yet in the long term all costs are variable cost. Moreover, fixed cost is cost unrelated with production volume meaning that in certain period the amount is constant, such as cage depreciation, construction tools, interest over

capital and so on. Meanwhile, the unfixed cost is cost related directly with production volume meaning that the changing of variable cost will cause the changing of production volume resulted, for example feed cost, medicines and vaccine, cage cost and inseminator cost.

To boost income of beef cattle business, the breeder has to utilize artificial insemination technology (IB) or natural breeding system that the implementation requires several costs, inseminator cost for IB and natural breeding system by renting male cow. In term of cattle growth optimally, thus, the breeder has also expensed on feed cost, cattle medication cost, cage cost as well as labor cost. Therefore, the income of beef breeder also derives from food plant business such as rice, corn, peanut, red peal, tomato and shallot. The production process to obtain income from food plant business also requires production cost like fertilizer cost, drugs and labor cost. According that issue, the beef breeder will allocate their income in beef breeder and food plant business.

Unfortunately, the research dealing with technology utilization in beef cattle business is limited on integrated technology of cattle and plant, thus, the effect on the production and farmer's income (Elly, et.al, 2009; Priyanti, 2009), the effect of cattle fattening and feed technology toward the income of beef cattle business (Karyasa, 2007). The research concerning on the utilization of IB technology is still limited on the effect of the income of beef cattle business (Sulin , et.al. 2006; Eniza, et.al, 2006)), while the information relating the correlation of the utilization of insemination technology, income of beef cattle business, production cost of beef cattle business as well as income of food plant is inadequate indeed.

According to above consideration, thus, the research is aimed to (1) Analyze the relevance of factors affecting cattlemen's income of beef cattle business and food plant business in the condition of utilizing artificial insemination technology, (2) Analyze the effect of external factor changing on the income of beef cattle business, production cost of food plant, income of food plant, cattle medication cost and cage cost in the condition of utilizing artificial insemination technology.

Materials and Methods

Population And Research Sample

The research is a study case conducted in the village of Kanonang III, District of Kawangkoan, Regency of Minahasa, North Sulawesi Province on June 2011 – August 2011. The reason why village of Kanonang III is chosen as the research location is that the village has the largest population of beef cattle in Regency of Minahasa, 765 beefs in 2010 (North Sulawesi in Grade, 2010). The sample selection uses *simple random sampling* on 100 cattlemen that have utilized artificial insemination technology on their cattle. The research data is primary data that is inseminator cost, natural breeding cost, income of beef cattle business, cattle medication cost, income of food plant business and production cost of beef cattle as well as food plant collected through interview by using question list.

Data Analysis Method

In answering the research aim, it is used the approach of econometrics model (Greene 2003). Thus, the measurement of artificial insemination technology utilizes inseminator cost. Economic model of cattlemen established uses simultaneous equation, so it can explain the relevance factors affecting income of beef cattle business and food plant as well in the condition of insemination technology. This model has 6 equations consisting of 5 structural equations and 1 identity equation. The number of endogenous variable is 6, while exogenous are 4. Moreover, the model identification is done to determine assumption method parameter. Based on Koutsoiyannis (1977), the identified equation can be recognized by

comparing *exclude variable* (K-M), the number of equation is subtracted one (G-1). Since the simultaneous equation model consists of 6 equations (G) and 10 variables (K) as well as the amount of predetermined variable in each maximal equation is 3 (M), the established equation includes *over-identified* (K-M > G-1). Therefore, in order to assume estimation parameter is used 2 SLS (Two Stage Least Square) method and to acknowledge the effect of external factor changing on income and production cost of beef and food plant is conducted simulation analysis toward (1) 10% rising of inseminator cost, (2) 10% rising of natural breeding, (3) 10% rising of feed cost, (4) 10% decreasing of family labor wage in beef business, (5) 10% decreasing of inseminator and natural breeding cost, (6) 2 and 4 of simulation combination as well as (7) 3 and 4 of simulation combination. Simulation is conducted after the model was validated prior by using Theil's Inequality Coefficient and decomposition criteria (Greene, 2003) in order to compare actual value and assumed value of endogen variable. Thus, decomposition of U-Theil comprises of U^M (average bias) measuring how far the average simulation and actual value deviate from each other, U^S (regression slope bias) quantifying the deviation of regression slope and U^C (covariance bias) is component indicator of residual bias. A model has well prediction ability if U^M and U^S value close to zero and U^C closes to one. Data tabulation utilizes Statistical Analysis System (SAS) program version 9.1.3. Following is the simultaneous equation model established:

1. Income of Beef Cattle Business
   PDS = a0 + a1BIN + a2BKA +a3 BPH + ei
   Assumed parameter mark expected a0 <0, a1,a2,a3 >0
2. Beef Production Cost
   BPTS = BKD + BPH + BIN + BKA + BOB + BTK
   BOB = c0 + c1PDS + ei
   Assumed parameter mark expected c0,c1 >0
   BKD = d0 + d1PDS d2BIN+ei
   Assumed parameter mark expected d0, d1>0, d2<0
3. Food Plant Production Cost
   BTP = bo + b1BPTS+b2PTP+ei
   Assumed parameter mark expected b0,b1 <0, b1>0
4 Income of Food Plant Business
   PTP = e0 + e1BTP + e2BTK + e3PDS + ei
   Assumed parameter mark expected b0,b1,b3>0, b2<0

Where, PDS is incomne of beef cattle business (Rp/year/breeder), BIN is inseminator cost (Rp/year/breeder), BKA is natural breeding cost (Rp/year/breeder), BPH is feed cost (Rp/year/breeder), BTP is food plant production cost (Rp/year/breeder), BPTS is beef cattle production cost (Rp/year/breeder), BKD is cage cost (Rp/year/breeder), BOB is beef medication cost (Rp/year/breeder), BTK is labor cost of beef business (Rp/year/breeder), and PTP is income of food plant business (Rp/year/breeder)

Results and Discussion

Income Structure And Farm Business Cost

Table 1 shows the calculation result of breeder income on beef and food plant business in a year. The result explains that 69.84% of breeder income comes from beef business and 30.16% is from food plant activity. The type of plant cultivated comprises of rice, corn, peanut, red peal, tomato and shallot. In addition, the revenue from beef business is 64.44% derived from the cattle value that has not been sold, while 19.30% is the revenue from the cattle selling.

The revenue gained breeder from renting the beef labor is 12.91%. The biggest beef production cost is feed cost of 85.67%, while other cost component is below 10%. The calculation of revenue ratio on beef business cost (R/C ratio) shows 5.43 meaning that the breeder obtains Rp 5.430 of revenue for Rp.1.000 each of cost expensed. Further, the

Table 1. Income structure and farm business cost

	Description	Value
A.	Revenue of Beef Cattle Business (Rp/year)	48478206 (100%)
	Beef selling (Rp/year)	9356250 (19.30%)
	Compost value (Rp/year)	184255 (0.30%)
	Cattle labor (Rp/year)	6257701 (12.91)
	Renting male cow (Rp/year)	1440000 (2.97%)
	Value cattle has not been sold (Rp/year)	31240000 (64.44%)
B.	Beef cattle Production Cost (Rp/year)	8913733 (100%)
	Feed (Rp/year)	7636406 (85.67%)
	Labor (Rp/year)	813904 (9.13%)
	Drugs (Rp/year)	81750 (0.92%)
	IB Inseminator (Rp/year)	54650 (0.62%)
	Natural breeding (Rp/year)	173250 (1.94%)
	Cage and tools (Rp/year)	115330 (1.29%)
	Cage depreciation (Rp/year)	38443 (0.43%)
	R/C Ratio	5.43
C.	Income of Beef Cattle Business (A – B) (Rp/year)	39564473 (69.84%)
D.	Revenue of Food Plant Business (Rp/year)	33676561 (100%)
	Result selling (Rp/year)	31884968 (94.68%)
	Household consumption (Rp/year)	1791593 (5.32%)
E.	Food Plant Production Cost (Rp/year)	16595013 (100%)
	Seed (Rp/year)	201000 (1.21%)
	Fertilizer (Rp/year)	2530739 (15.25%)
	Insecticide (Rp/year)	870.000 (5.24%)
	Human and cattle labor (Rp/year)	12993274(78.30%)
	R/C Ratio	2.02
F.	Income of Food Plant Business (D-E) (Rp/year)	17081548 (30.16%)
G.	Income of Cattlemen (C+F) (Rp/year)	56646021 (100%)

revenue of breeder of food plant business is 94.68% of the result of food plant selling and 5,32% is the result for family consumption. The research result illustrates that the component of biggest food plant production cost is labor cost of 78.30% and the other production cost is smaller than 20%. The R/C ratio measuring for food plant business is as 2.02 meaning that food plant business is already efficient since Rp.1.000 each of cost expensed the breeder receives Rp. 2.020 of revenue.

Estimation of Economic Model of Cattlemen in Utilization of Artificial Insemination Technology (IB)

The estimation result of economic model of cattlemen can be seen in Table 2. All estimation signs for variable affecting endogen variable have adjusted with economic criteria. Meanwhile, most exogenous variable have actual affect on endogen variable at the level of 5%.

The analysis result demonstrates that the income of beef cattle business is affected by inseminator cost, natural breeding cost and feed cost with <.0001 of probability. Determination coefficient value (R^2) is 0.7224, which means that inseminator cost, natural breeding and feed cost affect income of beef cattle business as 72.24% and 27.76% is the rest of other factors not available in the model. In addition, inseminator cost has positive influence toward the income of beef cattle business by its parameter as 542.35 and it is statistically significant in interval test <.0001. Thus, natural breeding also has positive influence on beef cattle business by its parameter as 94.15 and it is statistically significant in interval test < .0001. Feed cost has positive influence as well on revenue of beef

Table 2. Estimation result of economic model of cattle farmer

Variable	Code	Estimation Parameter	Probability		R^2
			F-test	t-test	
Income of beef cattle business	PDS				
Intercept		-1.861E7	<.0001	0.0019	0.7224
Inseminator cost	BIN	542.35		<.0001	
Natural breeding Cost	BKA	94.15		<.0001	
Feed cost	BMT	1.62		0.0395	
Food plant production cost	BTP				
Intercept		-9856.9	0.0005	0.3825	0.5867
Beef cattle production cost	BPTS	-0.32		0.1344	
Income of food plant business	PTP	1.14		0.0003	
Cattle medication cost	BOB				
Intercept		32336.39	<.0001	<.0001	0.7298
Income of beef cattle business	PDS	0.0012		<.0001	
Cage cost	BKD				
Intercept		28635.28	<.0001	0.3472	0.6267
Income of beef cattle business	PDS	0.0060		0.0001	
Inseminator cost	BIN	-2.81		0.0414	
Income of food plant business	PTP				0.5877
Intercept		3934082	<.0001	0.3742	
Food plant production cost	BTP	0.59		0.2340	
Family labor cost on beef cattle business	BTK	-0.09		0.3526	
Income of Beef cattle Business	PDS	0.08		0.0090	

business by the parameter 1.62 and it is statistically significant in the interval test 0.0395.

The result shows that the analysis result explains food plant production cost is affected by beef cattle production cost and income of food plant business by 0.0005 of probability. Determination coefficient value (R^2) is 0.5867 meaning that beef cattle production cost and income of food plant business affect on food plant production cost as 58.67%, while 41.33% is the rest for other factor not available in the model. Moreover, beef cattle production cost has negative influence toward food plant production cost by its parameter of -0.32 and it is statistically not significant in interval test 0.1344. Income of food plant business has positive influence on food plant production cost with 1.14 parameter and statistically it is significant in the interval test 0.0003.

Analysis result demonstrates cattle medication cost is affected by income of beef cattle business by <.0001 probability. Determination coefficient value is 0.7298 meaning that income of beef business affects medication cost as 72.98%, and the rest of 27.02% is for other factor not available in the model. Thus, income of beef cattle business has positive control on cattle medication cost by 0.0012 parameter and it is statistically significant in the interval test <.0001.

Analysis result explains that cage cost is influenced by income of beef cattle business and inseminator cost by <.0001 of probability. Determination coefficient value (R^2) is 0.6267 which means that income of beef cattle business and inseminator cost affect on cage cost as 62.67%, while the rest of 37.33% is for other factor not available in the model. In addition, revenue of beef cattle business has positive influence on cage cost by its parameter is 0,0060 and statistically it is real in the interval test 0.0001. Inseminator cost has negative influence on cage cost with -2.81 parameter and it is statistically real in the interval test 0.0414.

Furthermore, analysis result points up that income of food plant cattle business is

influenced by food plant production cost, family labor cost on beef cattle business and income of beef cattle business by < .0001 probability. Determination coefficient value (R^2) is 0.5877 which means that food plant production cost, family labor cost on beef cattle business affect income of food plant business of 58.77%, and the rest of 41.23% is for other factor not available in the model. Thus, food plant production cost has positive influence on income of food plant business by its parameter is 0.59 and it is statistically not significant in the interval test 0.2340. Later on, family labor cost on beef cattle business has negative impact on income of food plant business by the parameter is -0.09 and statistically, it is not significant in the interval test 0.3526. Income of beef business has positive impact on revenue of food plant business by the parameter is 0.08 and it is statistically significant in the interval test 0.0090.

Validation Model

The result of validation model (Table 3) demonstrates U^M value closes to zero meaning that the model established is not experienced systematic bias. Then, U^S closes to zero meaning that analysis result of simulation can well follow the fluctuation of actual data. Thus, U^C closes to one meaning that it is meaningless error and does not follow certain pattern but it spreads in overall observation examples. Analysis result of validation indicates that economic model of cattlemen is valid enough used as simulation instrument.

Effect of External Factor Changing

The effect of external factor changing scenariowill be viewed on the endogen variable of Income of beef cattle business, beef production cost, food plant production cost, income of food plant business, cattle medication cost and cage cost in the condition of utilizing artificial insemination technology (Table 4).

The analysis result of cost and revenue of cattlemen illustrates that most their income comes from beef cattle business meaning that beef cattle business has became family main business. Moreover, beef cattle has greater contribution toward farmer's income rather than other incomes such as horticultural and plantation (Syafril and Ibrahim 2006; Dewa, et.al, 2008). Most of breeder's income on beef cattle business is value of cattle that is still being cared. The reason is that beef cattle is the main commodity for farmer that they can sell their cattle any time as they wished for instance for education tuition and medical cost or family gathering event (Winarso, et.al, 2010). The biggest beef cattle production cost is for feed cost comprising of grass, concentrate and agriculture residue. It, indeed, is suitable with Hoddi et.al research (2011) that the biggest production cost on beef business in Regency of Barru of South Sulawesi is feed cost reaching out of 73.42%. Then, the value of R/C ratio of beef cattle business and food plant is 5.43 and 2.02 respectively showing that both business financially have provided advantage for cattlemen in the research area (Suastina and Kayana, 2008).

Moreover, Analysis result of estimation model of cattlemen economy in utilizing artificial insemination technology demonstrates that inseminator cost affects on income of beef cattle business since the increasing of inseminator cost will motivate inseminator personnel to conduct insemination process right on the schedule, so that the farmer gains calf addition every year and their income increases as well. Later on, the natural breeding cost also affects on income of beef cattle business because the increasing cost will enhance the owner of bull to provide qualified bull in term of producing high value calf if mated with female cow of breeder. The feed cost also influences on income of beef cattle business since the breeder provides qualified

Table 3. Indicator of validation model

Endogen Variable	U^M	U^S	U^C
Income of Beef Business (PDS)	0.00	0.08	0.92
Beef Production Cost (BPTS)	0.00	0.07	0.93
Food Plant Production Cost (BTP)	0.00	0.11	0.89
Income of Food Plant Business (PTP)	0.00	0.22	0.78
Cattle Medication Cost (BOB)	0.00	0.20	0.80
Cage Cost (BKD)	0.00	0.16	0.84

U^M = average bias; U^S = regression slope bias; U^C = covariance bias

Table 4. Simulation of external factor changing effect

Variable	Basic Simulation	Alternative Scenario (%)						
		SIM 1	SIM 2	SIM 3	SIM 4	SIM 5	SIM 6	SIM 7
PDS	39601901	7.48	4.12	3.10	0.00	-11.60	4.12	3.10
BPTS	8825293	0.17	0.33	8.64	-0.92	-0.50	-0.59	7.72
BTP	16594517	5.32	2.81	-2.18	0.63	-8.13	3.44	-1.55
PTP	5684048	4.56	2.44	-0.62	0.41	-6.99	2.85	-0.21
BOB	81759.6	4.52	2.49	1.87	0.00	-7.01	4.49	1.87
BKD	115323	2.27	8.39	2.25	0.00	-13.82	8.39	2.25

SIM 1 = 10% rising of inseminator cost; SIM 2 = 10 % rising of natural breeding cost; SIM 3 = 10% rising of feed cost ; SIM 4 = 10% decreasing of family labor on beef business; SIM 5 = 10% decreasing of inseminator and natural breeding cost; SIM 6 = SIM 2 and SIM 4 combination; SIM 7 = SIM 3 and SIM 4 combination

feed from their farm such as bulrush, young corn, straw added with concentrate so that it will improve cow's weight, body shape and its selling price. Therefore, this result is in line with Soedjana's research (2007) that corn business system with beef cattle gives largest advantage in certain area.

The income of food plant business affects on food plant production cost since additional income enhances the farmer to re-invest half of the result on their farm business and expands the farming area, so it requires larger amount of seed, fertilizer, labor and insecticide.

Income of beef cattle business influences on cattle medication cost since beef cattle selling value in research area is highly determined by the health condition of cattle itself so that the cattlemen is willing to expense additional cost to prevent and cure the ill-cattle.

By contrast, inseminator cost has negative impact on cage cost because budget limitation possessed by breeder. Increasing inseminator cost causes the breeder reduces the budget to make a cage. It is in line with the research of Elly et.al (2009) that since the budget limitation so the increasing of input cost of urea fertilizer will reduce significantly the using of TSP fertilizer input in corn business. Meanwhile, revenue of beef business impacts on cage cost since increasing revenue shows the increasing number of beef ownership, thus, the breeder will expense additional cost to make cage protecting their cattle.

In addition, income of beef business influences on income of food plant business since the breeder invests half of income gained from beef business for expanding land management frequency and land expansion as well so that it improves the production and income of food plant business (corn, peanut, and so on).

Eventually, the analysis result of external factor changing effect views that the utilization of artificial insemination technology showed by the increasing of inseminator cost of 10% (SIM 1) provides well effect on all economic variables of beef breeder compared with other changing (SIM 2, SIM 3, SIM 4, SIM 5, SIM 6 and SIM 7). It

can be viewed from the great changing of income on beef business, beef production cost, food plant business cost, income of food plant business, cattle medication cost and cage cost that the increasing is relatively higher. The decreasing of inseminator cost and natural breeding cost that are 10% (SIM 5) respectively has decreased all economic variables of beef breeder. Thus, the feed cost increasing of 10% (SIM 3) has increased most economic variables of breeder, excluding on production cost and income of food plant business.

Conclusions

The relevance factors affecting cattlemen's economy are artificial insemination technology (inseminator cost), natural breeding cost and feed cost affects on income of beef business. Income of beef business and inseminator cost affect on cage cost. Moreover, income of beef business, food plant production cost and family labor cost on beef business affect on income of food plant business. Food plant business cost is affected by income of food plant business.

The effect of external factor on cattlemen household's economy is that 10% increasing of inseminator cost increases income of beef business, beef production cost, food plant production cost, income of food plant business, cattle medication cost and cage cost. Therefore, the utilization of artificial insemination technology increases all economic variables of cattlemen observed.

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