



RESEARCH PAPER

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Financial valuation and growth performance of cattle through diverse feeding formula and practices in Caraga region, Philippines

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Abstract

This study was conducted to determine the financial valuation and growth performance of cattle through diverse feeding formulas and practices through measures of profitability. Forty-five (45) yearling animals composed of Philippine native, crossbreed (native × brahman), and brahman breeds of cattle were subjected with different treatment combinations through commercial feeding practices, conventional feeding, organic feeding, and good agricultural practices with fifteen (15) heads of cattle per treatment within six months of feeding as fattening period. Results showed that commercial feeding methods have significant differences in terms of average body weight gain (145.90kg) and feed efficiency (51.98). On the other hand, financial valuation through a cost benefit analysis revealed that commercial feeding ration has the highest in terms of net present values (PHP 809,200.57), income statement (PHP 172,480.58), and internal rate of return (86%). This is due to complete and balanced nutritional requirements that beef up the growth performance and feed efficiency which lead to better financial benefits as compared to other feeding methods or practices, thus commercial feeding is recommended.

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Introduction

The livestock industry in the country has a great potential business to engage whether backyard or commercial scheme considering its increasing market product demand, abundant agro-industrial by products, favorable climate condition, available land area, and government support. Its contribution to the economy in terms of production approach is vital due to its high value product, thus contribution to the local economy is very low due to its low productivity.

The financial valuation on the performance of cattle under diverse feeding methods and practices is an important process in identifying the best possible outcomes in terms of benefits, practices, and measures profitability. Profitability analysis is one of the necessary evaluation tools in determining the feasibility and viability in business projects. It measures the economic performance in terms of production cost and its benefits to guide farmer entrepreneurs to its decision making whether to invest or not with current data available in the locality. With this tool, it can analyze agricultural practices and determine the optimum performance of cattle breeds considering the diverse feeding system, methods, and practices in cattle production. The said analyses analyzes data on uncertainties and change in the market environment and minimizes financial risk considering the scarce resources which would result in an efficient and effective use of resources from an economic point of view, thus optimizing resources.

Based on Philippine Statistics Authority (2020), the total cattle inventory in the country was estimated at 2.542 million heads. This was higher by 0.3 percent compared with the previous year's stocks of 2.535 million heads. In backyard farms, cattle population at 2.392 million heads increased by 0.3 percent from the previous year's count of 2.385 million heads. Similarly, stocks in commercial farms improved by 0.1 percent, from 150.08 thousand heads in 2019 to 150.24 thousand heads in 2020. The top three regions in terms of inventory were Ilocos Region, Central Visayas, and CALABARZON with

shares of 12.2 percent, 11.3 percent, and 10.6 percent, respectively. These regions accounted for 34.1 percent of the country's total cattle inventory. However, the different breeds of livestock had a diverse management and production system which can affect performance and economic production traits of these animals depending on environmental situation, market, and resources in the region.

Findings by Gaudare *et al.* (2021) highlighting differences between organic and conventional farming on animal productivity, feeding strategy and feed use efficiency in dairy cattle wherein productivity using organic farming was lower in terms of productivity, feeding concentrate, and lower feed efficiency which provide critical information on the sustainability of organic livestock management. As cited by Brito and Silva, 2020, feeding forage based diets are known to be often less balanced than grain based diets thus affecting performance of cattle. Feed-use efficiency differences between organic and conventional livestock production may also be explained by differences in the way the farm is managed (Mottet *et al.*, 2017).

Considering its relevant data information from the research studies, this shall be evaluated in the financial valuation considering that growth performance in cattle with diverse feeding formulas will have various results depending on the feeding management.

With these, there is a need to analyze through a cost benefit analysis and project worth measure and determine the growth performance of cattle breeds in diverse feeding formulas, methods and practices to improve productivity and making smart business decisions, thus this study was conducted.

Material and methods

Experimental setting

A total of forty-five (45) heads of cattle were used in the study, which was composed of fifteen (15) Philippine native, fifteen (15) crossbreeds, and fifteen

(15) Brahman. Prior to the start of the study, these animals were acclimatized for a month as an adjustment period. The animals were divided into four experimental treatments. Each treatment had 15 heads of cattle with five (5) cattle (one male and four female) per replicate. The animals then treated according to the type of feed formula, methods and practices in cattle production as follows:

Treatment 1

Commercial feeding practices, wherein 60% concentrate feeds (Rice bran, Copra Meal, Ground Yellow Corn, Molasses and Salt), 40% are grasses (Napier grass and Corn fodder) and Urea Molasses Mineral Block as supplement;

Treatment 2

Good agricultural practices, with a ratio of 10.25 kg of rice bran, 0.33 kg of Ipil-Ipil and salt (per 100 kg of cattle). The method is adapted from Philippines recommended feed formulation for livestock;

Treatment 3

The conventional farming where animals are tethered in pasture areas. Feeds were composed of concentrates (39 % Rice bran, 69% Copra meal and 1% salt) and grasses (Napier grass/Para grass/Guinea and Leguminous grasses, free of choice) (da.gov.ph/backyard cattle fattening); and

Treatment 4

Organic agricultural practices and range type pasture with no antibiotic and growth hormone (PNS Livestock Cattle). Compositions of feed are concentrates (Rice bran, 1.5% of cattle body weight) mixed with indigenous micro-organism (IMO), and salt and grasses (Napier grass/ Para grass/ Guinea grass).

These test animals were treated with duration of six (6) months excluding the adjustment period. Data were gathered, tabulated, and analyzed through a randomized complete block design and Tukey test determined the significance among treatment means. Data on weight gain, final weight, feed efficiency, live-

weight market price, supplies and materials in every treatment with a current price list were consolidated to determine the financial viability of each treatment combination.

A buying, fattening, and selling scheme on this study were conducted as one of the agri-preneur practices to improve the cash flows. These 15 yearlings per treatment were procured and fattened for six (6) months and sold in the local market annually and procured again for the succeeding year. With this scheme, it can shorten its duration from production to marketing considering the gestation period of cattle of 10 months and maturity of 18 months. Acquisition cost of cattle, land rental, pasture establishment, cost of forages, farm inputs, labor, and among others were tabulated and recorded based on the prevailing market price and pricing standard in the region as part of the current assumption with regards to treatment combination. Commercial feeding, conventional feeding, organic feeding practices, and good agricultural practices had common farm inputs in the production and marketing except for commercial feeding systems which required higher investment considering the manner of management practices.

Cost benefit analysis

A cost benefit analysis (CBA) was used in the conduct of this study to determine the weight between the cost and benefits of diverse practices in livestock farming. A financial profitability measures such as income statement, cash flows, return of investment, net present value, internal rate of return, and benefit cost ratio were the financial tools to evaluate which of these agricultural practices such as commercial feeding practices, conventional feeding, good agricultural practices, and organic agriculture practices gave the highest and lowest financial return.

The income statement was calculated by adding all the sales in live-weight cattle 15 heads and dried manure in year one. These were multiplied by price/kg of liveweight and sales in cattle manure as fertilizer deducted by the establishment and

operational costs incurred within a period to acquire the total benefit. The establishment cost consisted of acquisition of cattle, farm inputs, housing and facilities, and other equipment needed before engaging cattle fattening and as reflected in the annex tables. The operational cost differs only from the feeding ingredients due to its various feed ingredients per feeding practices.

The cash flows measure the cash inflow and outflow of the project to monitor all the cash entering and leaving to pay its obligations to sustain project operations. The benefits in terms of cash serve as the cash inflow while the operating and establishment cost serve as cash outflow. The return of investment (ROI) was calculated by net benefit of the project over the total cost of investment.

Project worth measures: The net present values (NPV), internal rate of return (IRR), and benefit cost ratio (BCR) were calculated by the following formula:

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

Where, Rt - net cash flow or the cash inflow deducted by the cash outflow for a specific time period

i- Discount rate

t- Number of time periods that will be calculated.

C- This value represents the initial cash investment.

The NPV is a set of discounted values at a predetermined interest rate to determine its present value. The net present value with a positive and

largest value is recommended. Internal Rate of Return (IRR) is the incremental net benefit stream or incremental cash flow for measuring the worth of a project is to find the discount rate that makes the net present worth of the incremental net benefit stream or incremental cash flow. Accept the project if the IRR is greater than the default discount rate as a decision rule. The benefit cost ratio (BCR) was one of the financial tools in evaluating a project's worth. A BCR with values greater than 1 is expected to deliver a positive net present value with a decision to invest or expand the project.

BCR = discounted incremental benefits (sales from livestock)/discounted incremental costs (production cost)

Result and discussion

Growth performance

After one hundred eighty (180) days of feeding, the commercial feeding practices obtained the highest average gain in weight with 145.90kg followed by the good agricultural practices with 129.54kg. However, conventional feeding practices and organic agricultural practices were the lowest, with an average of 117.04kg and 111.61kg, respectively. Results revealed a significant difference among treatment means as shown in Table 1. The complete nutritional requirements in commercial feeding systems gave to the animals with a high protein concentrate diets, roughages, and *ad libitum* feeding sufficient enough to provide more nutrients and beef up the performance of body weight gain as compared to other treatment means.

Table 1. Average body gained weight (kg) of livestock cattle under different feeding scheme

Treatment combination	Native	Cross- breed	Brahman	Mean*
Commercial feeding practices	145.50	154.00	138.19	145.90 ^c
Good agricultural feeding practices	139.21	133.42	115.98	129.54 ^b
Conventional feeding practices	120.85	113.50	116.78	117.04 ^a
Organic feeding practices	110.58	108.40	115.85	111.61 ^a
Mean	129.04	127.33	121.70	126.02

Having the same letter has no significant difference among treatment means @ 5% level of significance.

However, among the breeds of cattle (native, crossbreed and brahman), no significant differences were observed. Crossbreed cattle revealed the highest average weight (129.04kg) while Brahman had the

lowest (121.70kg) body weight gain. Breeds under commercial feeding practices recorded the highest average weight, followed by good agricultural practices, (145.90kg, and 129.54kg, respectively).

The result indicates that native and crossbreed cattle have potential on growth performance provided that a commercial or good agricultural practices/feeding scheme is practiced.

The inclusion of mixed concentrate diets (rice bran, copra meal, ground yellow corn, molasses and salt) and 40% are grasses (napier grass and corn fodder)

and urea molasses mineral block as supplement are the nutritional factors which lead to obtain the highest body gained weight (treatment 1) as compared to other treatment means. This implies that rumen microbial fermentation may favor these kinds of feedstuff converting into animal protein, thus gaining more weight as compared to other treatments.

Table 2. Average feed efficiency of livestock cattle under different feeding method and practices

Treatment	Native	Crossbreed	Brahman	Mean*
Commercial feeding(a) practices	85.86	23.75	46.32	51.98 ^a
Good agricultural(b) feeding practices	38.39	44.62	100.36	61.13 ^b
Conventional feeding(c) practices	54.78	157.92	100.12	104.28 ^b
Organic feeding(d) practices	235.14	202.77	176.02	204.65 ^c
Mean ^{ns}	103.55	107.27	105.71	105.51

Having the same letter has no significant difference among treatment means @ 5% level of significance.

Feed efficiency

Efficiency is a significant contributor to profitability (Reuter *et al.* 2013). The term efficiency implies a ratio of outputs vs. inputs (Carstens and Tedeschi, 2006). The findings, as shown in Table 2 shows that commercial feeding practices have the highest average feed efficiency of 51.98, followed by good agricultural production (61.13). Organic feeding practices, on the other hand, obtained the lowest feed efficiency with an average of 204.65. Statistical analysis showed significant differences among treatment means. The findings imply that commercial feeding is the most efficient where a 51.98kg of feed (roughages + concentrates) is needed to convert a kilogram of live weight.

The results are consistent with the findings of Russell *et al.* (2016) wherein the relationship between growth and feed efficiency were studied, a high fiber diet had

higher digestibility than a high concentrate diet. Further, cattle with greater feed efficiency had higher dry matter digestibility (Richardson *et al.*, 1996; Nkrumah *et al.*, 2006).

Financial analysis

A financial analysis was conducted to assess and determine the financial performance of different farming methods and practices in cattle. These involve financial measures through income statement, cash flows, net present value, internal rate of return, return of investment, and benefit cost ratio. As shown in Fig. 1, the net benefits from diverse feeding practices in cattle revealed positive income from year one to year ten. Commercial feeding practices consistently had the highest net benefits as compared to good agricultural practices, conventional and organic feeding practices.

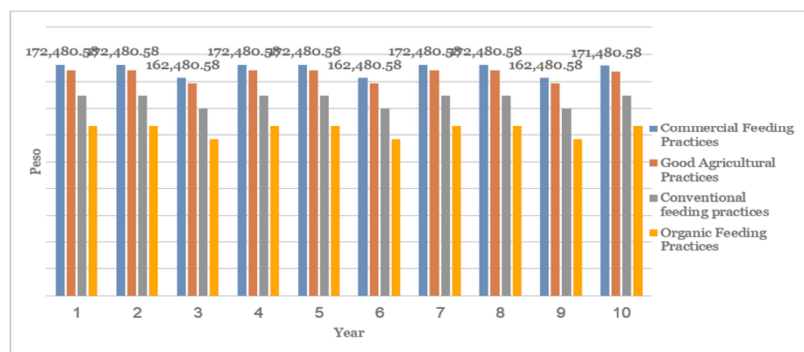


Fig.1. Projected net benefit of cattle from diverse feeding formula and practices

The variation of revenue from the income statement of each type of feeding was based on the performance of cattle in the average final weight of cattle in a particular treatment multiplied by the prevailing market price (live-weight) of cattle as reflected in the annex table. The total benefits, establishment cost, and operational costs of the various agricultural practices were tabulated, computed, and showed positive monetary values from year one to year ten. However, commercial feeding practices had the highest investment in terms of operational cost but with the highest return in terms of benefit due to improved nutrition which beefed up the performance of cattle in terms of weight after a period of feeding as compared to other feeding practices. This implies that various agricultural practices shall take consideration before engaging feedlot cattle farming which can

affect production performance and its profitability, thus identification of these feeding practices with the highest farm efficiency and effectiveness is relevant.

Cash flow statement

In cattle production, there is a need to determine the project cash flow due to its biological nature of the project which is long term. In establishing cattle production, the housing, breeder stocks, pasture development, medical/agricultural supplies and materials, mechanical chopper, records keeping, and among others should be accounted for to provide farm records to determine project investments. In the investors point of view, a working capital and operating capital is needed for project establishment for a period of two to three years depending on the performance.

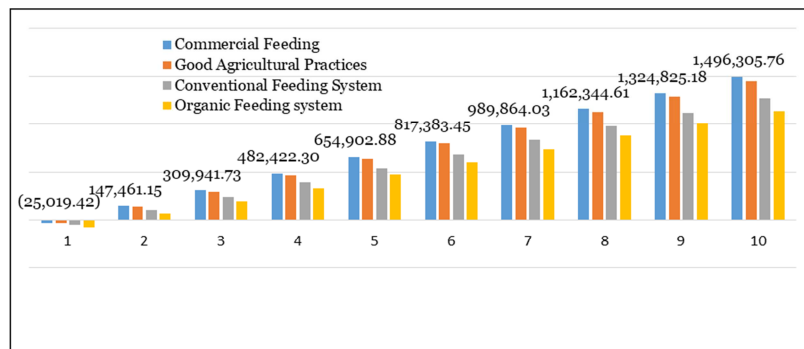


Fig. 2. Projected net cash flow of cattle from diverse feeding formula and practices

Fig. 2 showed the net cash flow of cattle from a diverse feeding method and practices. Results showed that organic feeding practices had negative cash flow for a period of two years while commercial, good agricultural practices, and conventional feeding practices had a positive cash flow in the year two onwards. The commercial feeding practices obtained

the highest net cash flow followed by conventional agricultural practices. This implies that in the beef cattle business, diverse agricultural practices will result in different cash flow depending on the cattle production and management which affects the performance and efficiency.

Table 3. Projected project worth measures of cattle production from a diverse feeding formula and practices

Particular	NPV (PHP)	IRR (percent)	BCR	ROI (percent)
Commercial feeding practice	809,200.57	86	1.35	35.42
Good agricultural practices	788,798.38	84	1.38	38.91
Conventional feeding practices	695,198.48	75	1.34	35.05
Organic feeding practices	370,317.01	63	1.29	28.06

Project worth measure

Data showed that commercial feeding practices consistently showed the highest project worth measures in net present value (NPV) and internal rate of return as shown in Table 3. The outcome of the financial analysis in commercial feeding practices showed optimum performance as compared to other feeding practices/methods due to response of cattle fed with roughages (napier grass/corn fodder) mixed concentrates, and urea molasses mineral block which had better growth performance and feed efficiency.

Conclusion

It is concluded that beef cattle farming in a buy, fatten, and sell scheme is profitable business enterprise regardless of breed and feeding system based on income statement, cash flow and project worth measures (NPV, IRR, BCR, ROI). Commercial feeding practices revealed the highest financial performance in terms of net present value and internal rate of return. This is due to complete and balanced nutritional factors that beef up the growth performance and feed efficiency which lead to better financial benefits as compared to other feeding methods or practices. Utilizing commercial feeding practices in cattle production will result in higher financial net benefit, growth rate and feed efficiency as compared to other feeding methods. However, it has also the highest investment cost as compared to other feeding methods. In addition, a significant difference was observed in feed efficiency and body weight gain.

Recommendation

Based on the results of the study, a commercial feeding method in beef cattle production is recommended since it has the highest benefits, better profit, and economically viable. It is recommended to feed cattle with a combination of forages and concentrates as indicated on their treatment combination.

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References

- Almeida MTC, Paschoaloto JR, Perez HL, Carvalho VB, Homem JAC, Favaro VR, Ezequiel JM.** 2019. Effect of adding crude glycerine to diets with feed additives on the feed intake, ruminal degradability, volatile fatty acid concentrations and in vitro gas production of feedlot Nellore cattle. *Journal of animal physiology and animal nutrition* **4**, 988-996.
- Austral TM, Bantugan C.** 2016. Nutrient Digestibility in Goats Fed with Corn Fodder Supplemented with Palm Kernel Meal. *Annals of Tropical Research* **38 (1)**, 168-173
- Ayasan T.** 2016. Use of Copra Meal in Poultry and Ruminant Nutrition. *Turkish Journal of Agriculture-Food Science and Technology* **4(2)**, 61-65.
- Beef cattle nutrition.** 2009. Division of Agriculture Research and Extension, University of Arkansas System, South University Avenue retrieved at <https://uaex.edu>.
- Brito AF, Silva LHP.** 2019. Symposium review: Comparisons of feed and milk nitrogen efficiency and carbon emissions in organic versus conventional dairy production systems. *Journal of Dairy Science* **103(6)**, 5726-5739.

- Canesio P, James D.** 2006. User manual for benefit cost analysis using microsoft excel. Economy and environmental program for Southeast Asia.
- Carstens GE, Tedeschi LO.** 2006. Defining feed efficiency in beef cattle. In Proceedings of Beef Improvement Federation 38th Annual Research Symposium and Annual Meeting, Choctaw, Mississippi, **12-21**.
- Eckert M, Bell M, Potterton S, Craigon J, Saunders N, Wilcox R, Garnsworthy P.** 2018. Effect of feeding system on enteric methane emissions from individual dairy cows on commercial farms. *Land* **7(1)**, 26.
- Figueiras JF, Detmann E, Paulino MF, Valente TNP, Valadares Filho SDC, Lazzarini I.** 2010. Intake and digestibility in cattle under grazing supplemented with nitrogenous compounds during the dry season. *Revista Brasileira de Zootecnia* **39(6)**, 1303-1312.
- Food and Agriculture Organization of the United Nations.** 2015. The Impact of Natural Hazards and Disasters on Agriculture and Food Security and Nutrition: A Call for Action to Build Resilient Livelihoods. Food and Agriculture Organization of the United Nations, **1-16**.
- Gaudare U, Pellerin S, Benoit M, Guillaume DB, Dumont PB, Nesme T.** 2021. Comparing productivity and feed-use efficiency between organic and conventional livestock animals. *Environmental Research Letter* **16 (2)**.
- Gaudaré U, Benoit M, Durand G, Dumont B, Barbieri P, Pellerin S, Nesme T.** 2021. A Global Meta-Analysis About Organic Vs Conventional Livestock Production.
- Herrero M, Thornton P K.** 2013. Livestock and global change: emerging issues for sustainable food systems. *Proceedings of the National Academy of Sciences* **110 (52)**, 20878-20881.
- Parish JA.** 2017. Understanding the Ruminant Animal Digestive System. Mississippi State University, Mississippi State University Extension Service retrieved from <https://extension.msstate.edu>
- Philippine Recommends for Livestock feed formulation.** 2000. DOST- PCAARRD Publication
- Philippine Recommends for Forage Corn Production and Utilization.** 2000. DOST-PCAARRD Publication
- Philippine Recommends for Forage and pasture crops.** 2000. DOST- PCAARRD Publication
- Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development (PCAARRD).** 2007. Profitability analysis : 25-doe level goat production
- Philippine Council for Agriculture, Aquatic and Natural Resources Research and Development (PCAARRD).** 2007. Profitability analysis : 200 hen module native chicken production
- Shike DW.** 2013. Beef Cattle Feed Efficiency, presented at the driftless region beef conference retrieved from <https://lib.dr.iastate.edu>.
- Russell J R, Sexten WJ, Kerley MS, Hansen SL.** 2016. Relationship between antioxidant capacity, oxidative stress, and feed efficiency in beef steers. *Journal of animal science* **94(7)**, 2942-2953.
- Nkrumah JD, Okine EK, Mathison GW, Schmid K, Li C, Basarab JA, Moore SS.** 2006. Relationships of feedlot feed efficiency, performance, and feeding behavior with metabolic rate, methane production, and energy partitioning in beef cattle. *Journal of animal science* **84(1)**, 145-153.
- Warnecke S, Schulz F, Paulsen HM, Rahmann G.** 2014. Differences in feeding practices on organic and conventional dairy farms–data from a farm network. *Building Organic Bridges* **2**, 343-346.
- Zerbe RO, Scott T.** 2015. A Primer for Understanding Benefit-Cost Analysis. Benefit-Cost Analysis Center. Daniel J. Evans School of Public Affairs University of Washington.