

# Feed Conversion and Economic Value on the Use of Concentrates in TMR (Total Mixed Ratio) Feed in Lactation Dairy Cattle

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**Abstract**— TMR Feed (Total Mixed Ratio) is a special feed for ruminants prepared from forage and concentrate feed with a ratio that can meet the nutritional mass needs of dry matter, crude protein or TDN (Total Digestible Nutrient). This study aims to analyze the effect of using concentrate in TMR feed on feed efficiency and IOFC (Income Over Feed Cost) in Frish Holland (PFH) dairy cattle in the lactation phase. The materials used were 9 lactating dairy cattles producing 10 liters of milk per day, factory concentrate and fresh corn forage, dairy machine, Laktoscan. This study used an experimental method, Completely Randomized Design including 3 treatment feeds using concentrate in TMR feed, T1=20% concentrate, T2 = 30% concentrate from T3 = 40% concentrate of TMR feed which was repeated 3 times. Each treatment, fresh corn forage was given *ad libitum*, which was given after the concentrate was administered twice a day. Variables observed were feed conversion, economic value of feed and IOFC (Income Over Feed Cost). Furthermore, the data obtained were analyzed for variance and the Duncan test to determine the differences between treatments. The results showed that the increasing use of concentrate in TMR feed significantly increased the significantly feed conversion decreased (9.85 to 8.69), Economic Value of Feed decreased from IDR 22538-21412 and IOFC revenue (RP/head) for 20 days increased from IDR. 995.107.00–163.426.00. The conclusion is that the greater the level of use of concentrate in TMR feed for dairy cattle was increased IOFC and the cost of feed for the production of 1 kg of milk DM (dry matter). Furthermore, it is recommended to use 40% concentrate of TMR feed in DM needs to generate IOFC and lower feed costs.

**Keywords**— Concentrate, TMR, feed conversion, economic value.

## I. INTRODUCTION

Dairy cattle development in Indonesia is still lacking compared to beef cattle fattening especially in cold temperature areas. Limited sources of forage feed are an obstacle in the development of dairy cattle. The main purpose of developing dairy cattle is for milk products. Milk production in Indonesia mostly comes from dairy cattles, therefore the development of dairy cattles needs to be considered in order to further improve the welfare of smallholder farmers (Utari, et al. 2012).

Feed TMR (Total Mixed Ratio) is a special feed for ruminants prepared based on the ratio between concentrate feed and fresh forage feed of 40% and 60% in the form of dry matter. With this ratio quantitatively atleast it can meet the nutritional needs in the form of dry matter (DM) feed, it is better to consider the need for grams of crude protein or TDN energy (McDonald et al. 2010). The standard nutritional requirement

for dairy cattles is dry matter (DM) as much as 3% body weight. Roughly the use of concentrate in TMR feed for dairy cattles is 1-2% body weight, while the amount of forage is 10% body weight. Utilization of agricultural waste is one way to meet the needs of dairy cattle feed. Corn crop waste in the form of corn straw is one of the raw materials for animal feed that is widely available in Indonesia. Corn straw production in Indonesia can reach 11 million tons per year, but its use as animal feed is not optimal (Lee et al. 2010). Therefore, because of its abundant availability and good nutrition, corn straw has the potential to be used as dairy cattle feed. However, corn straw has a drawback, namely the presence of high lignin content. Lignin has the potential to reduce digestibility, therefore corn straw needs to be processed to release lignin bonds.

The composition of nutrients in rice called *karak*, dry rice waste, is mainly high digestible carbohydrates, low fiber and less than 29% protein, so it is an energy source. Its use in a complete feed mix can replace the portion of corn up to 60%. The ration given to poultry is not all of its nutrients are fully digested and absorbed. Efficient use of protein can be seen from the level of protein digestibility of the feed given. This is inseparable from the crude fiber content of feed ingredients, if the crude fiber content in feed ingredients is high it will be able to reduce the digestibility and use of the nutrients contained therein.

Based on the description above, it is necessary to conduct a series of studies that can answer the level of use of concentrate feed in TMR feed that can provide the best response of feed conversion and economic ratio in dairy cattle.

## II. MATERIAL AND METHOD

The lactating dairy cattles used in this study were Fries Holland (PFH) dairy cattles which were lactating in three groups of 12 lactating periods.

This research uses factory concentrate feed, while the forage of Leaf corn is still green. The cage used by the colony system and each dairy cattle tied heard to heard. There are facilities for feeding and drinking and sitting scales for weighing feed and there are scales for weighing dairy cattles and milking machines.

### Research methods

This research was conducted in an independent dairy farm owned by company. Milkindo Kepanjen, District, using the

experimental method and Randomized Block Design (RBD) which included 4 treatment feeds using 0.5% to 2% Body Weight (BW) concentrate feed in TRM feed, each treatment was repeated in three groups of dairy cattles during lactation so that the total cattle milk as much as 12 heads. As for the treatment feed, namely the use of concentrate in TMR feed and ad libitum provision of forage for Leaf corn. TMR's feed uses fresh corn husks on an ad libitum basis, while the use of concentrates is arranged as follows:

- T1 = Concentrate Use of 20% in TMR
- T2 = Concentrate Use of 30% in TMR
- T3 = Concentrate Use of 40% in TMR

It was continued by testing the nutritional content (dry matter and organic matter) in concentrate and fresh corn kernels which were carried out periodically at the Central Laboratory of the Islamic University of Malang. Placement of dairy cattles in the pen is done by drawing lots so as to produce a research plan as follows:

T3R3	T1R2	T2R3	T3R1
T2R1			
T1R2	T3R3	T2R1	T1R2

T: Treatment R: Repeat

In each treatment, fresh corn forage was given ad libitum, which was given after the concentrate was administered twice a day. Variables observed were feed conversion, economic value of feed and income Income over feed cost. Furthermore, the data obtained were analyzed for variance and the Duncan test to determine the differences between treatments.

### III. RESULT AND DISCUSSION

TABLE I. Average of Feed Efficiency, Economic Value and IOFC in Dairy Cattle

Variable	Treatment		
	T1 (20% concentrate)	T2 (30% concentrate)	T3 (40% concentrate)
Feed conversion	9.85	9.44	8.69
Feed Economy (IDR)	22430	21215	22430.133
Income Over Feed Cost (IDR)	995.107.333	1.408.103	1.634.268

#### Feed Efficiency and Economic Value

The results showed that the increasing use of concentrate in TMR feed significantly ( $P < 0.05$ ) decreased feed conversion in PFH cattle, which means increased feed efficiency. The results of the Duncan test, the feed conversion value at T1 = 9.44 was not different from T1 8.69. Overall, the highest forage requirement was in T1 as much as 31 kg and for T1 using 19 kg of corn stalks. Feed Conversion Ratio or feed conversion ratio is a unit for calculating feed efficiency. The smaller the FCR value, the more efficient the feed provided (Utami et al. 2014). Meanwhile, according to Atriana (2012) that the ability of livestock to convert feed into milk production depends on the quality of feed protein, energy and crude fiber. The higher the nutritional value in the feed, the lower the FCR, the better the efficiency of using feed. Added Suhardi (2011) that the amount

of nutrients needed and the ability to consume rations for ruminants will depend on milk production.

Furthermore, the economic value of feed can be calculated from the conversion value of feed multiplied by the price per kilogram of DM feed (Suhendra, 2015). Just as a higher feed conversion value means the feed is less efficient, the higher economic value of feed indicates that the cost of feed required to produce 1 kilogram of milk (fresh milk production x % milk DM) is getting more expensive. The results showed that the increasing use of concentrate in TMR feed could significantly reduce the economic value of feed which means lower feed costs (Trijayanti et al. 2015). The decline in the economic value of this feed was in line with the decrease in the value of feed conversion as a result of relatively the same feed consumption but significantly increased milk production. Although the price per kg of feed is more expensive when using 40% concentrate, the economic value of feed has decreased from IDR. 22.538 to IDR. 21.412.67.

#### Income Over Feed Cost (IOFC)

The IOFC is an important change by economically generating huge gains for each treatment. In this study, there were three treatments using concentrate, namely T1 = 20%, T1 = 30%, T1 = 40% of the need for DM feed, using forage feed in the form of corn and silage. In T1 using 31 kg of corn husks, 2.24 kg of concentrate, 5 kg of silage, for the IOFC value itself, T1 = 995.107.333. At T1 corn leaf 25 kg, concentrate 3.37 kg, silage 6 kg, the IOFC value itself at T1 = 1.408.102.667. T1 used 19 kg of corn floss, 4.49 kg of concentrate, 8 kg of silage, the IOFC value itself at T1 = 1.634.268. Overall, for the most forage needs, T1 uses 31 kg of corn husks and for T1 uses 19 kg of corn husks. IOFC value at 20% treatment Rp.995.107.33. The IOFC value at 30% treatment increased by Rp. 1.408.102.667. In the treatment of 40% also increased by Rp. 1.634.268.000.

In this study, the best results were on T1 which consisted of Leaf corn 19 kg, concentrate 4.49 kg, silage 8 kg. T1 resulted in lower costs than T1 and T1 due to lower forage consumption but resulted in higher production than T1 and T1. Because in T1 the consumption of concentrate is higher. In T1 the cost of feed is lower than T1 and slightly more expensive than T1 but the highest production is produced in T1, so it can be said that T1 is more efficient in terms of milk production. This is in accordance with the opinion of Greter (2011), that the more efficient the livestock converts nutrients into milk production, the better the IOFC value. The high IOFC value at T1 indicates that the treatment used is efficient compared to other treatments. Production increases for T1, so the efficient T1 treatment for the feed used has an impact on high production (Guetouache et al. 2014).

### IV. CONCLUSION

Increasing the level of concentrate use in TMR feed dairy cattle can significantly increase IOFC income as well, but can reduce feed conversion value, milk fat content and feed costs to produce 1 Kg DM of milk cheaper. Concentrate usage ratio of 40% of DM feed requirements resulted in the highest feed efficiency and IOFC income.

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