UTILIZATION OF ROUGHAGE AND CONCENTRATE BY FEEDLOT SWAMP BUFFALOES *(BUBALUS BUBALIS)*

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Summary

Thirty-six yearling (18 bulls, 18 heifers) swamp buffaloes (Bubalus bubalis) with average liveweight 177 ± 26 kg, were randomly allotted to receive 6 dietary treatments according to a 2x3 factorial arrangement in a completely randomized design (CRD). Factor A assigned for two types of straw; untreated rice straw (RS) and urea-treated (5%, w/w) rice straw (UTS). Factor B assigned for three ratio of roughage to concentrate (R:C) at 80:20, 50:50 and 20:80. Feeding trial lasted for 9 months during which respective feeds were offered at 3% body weight and adjusted at bi-weekly intervals using corresponding liveweights. Parameters measured under this experiment were feed intake, ruminal fluid for pH, NH_3-N, volatile fatty acids (VFA), liveweight change at bi-weekly intervals, carcass characteristics and cost-net profit analysis. It was found that intakes and digestion coefficients of DM, OM, CP except NDF and ADF were improved appreciably when ratio of concentrate increased. The average daily gain (ADG) and feed conversion ratio (FCR) were highest in group fed urea-treated rice straw at R:C levels of 20:80 (551.2 g/d, 10.7 kg/kg) and 50:50 (542.3 g/d, 10.6 kg/kg). It was obvious that FCR was best in the group fed on urea-treated rice straw (13.8 kg/kg) as compared to untreated rice straw fed-group (24 kg/kg). Carcass compositions of buffaloes measured resulted in 48.2 dressing percentage in all treatments offered at R:C levels of 50:50 and 20:80, however, loin eye area were 46.0, 53.6, 50.0 and 54.0 cm^2 for RS and UTS at respective levels of R:C. It was notable that carcass fat content was low which resulted in higher content of lean meat particularly in group fed UTS at 50:50 ratio R:C. Simple cost-net profit analysis was performed, it was found that net profits were obtained as follows 27, 30, -47, 44, 58, 22 $US/hd for respective treatment groups of RS and UTS at respective R:C levels. As shown, the best net profit resulted in group fed UTS at 50:50 R:C level.

(Key Words: Feedlot, Swamp Buffaloes, Rice Straw, Urea-Treated, Roughage: Concentrate Ratio, Carcass, Cost-Profit).

Introduction

Swamp (water) buffaloes (*Bubalus bubalis*) are important livestock species contributing to the overall farming system and the well-being of the small holder farmers particularly in the Asia-Pacific region (Chantalakhana, 1981; Devendra, 1982; Wanapat, 1985). As reported by FAO (1988), over 96% of the total world population is raised in the Asia-Pacific area. As multiple purpose animals after being utilized as draft power, they are slaughtered for meat and other by-products usage such as hide and skin. Research on swamp buffaloes have been increasingly carried out and provided more relevant information relating to buffalo growth performance and carcass composition (Charles and Johnson, 1972, 1975), comparative studies among cattle and buffaloes (Johnson and Charles, 1975; Moran et al., 1979; Norton et al., 1979; Moran et al., 1983). As recently reviewed by Devendra (1987) and Wanapat (1989), swamp buffaloes have higher ability than cattle in a number of aspects such as N-utilization, higher population of cellulolytic bacteria in the rumen and a tendency of higher fiber digestion and the overall intake. However according to earlier reports by Charles and Johnson (1972, 1975), swamp buffaloes performed well and produced satisfactory carcasses with a high proportion of muscle, low bone and low fat content. Therefore, buffalo steer carcass is ideal for markets requiring a high yield of lean meat.

The objective of this present experiment was to

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study the effects of roughage and concentrate ratio on feedlot growth performance, feed utilization, feed efficiency, ruminal fermentation, carcass composition and the overall economic feedlot fattening system of swamp buffaloes.

Materials and Methods

Thirty-six heads of swamp buffaloes (18 heifers and 18 bulls) with average weight of 177± 26 kg and age of one year old were randomly allotted according to a completely randomized design to receive 6 dietary treatments in a 2x3 factorial arrangement. Factor A was two types of roughages; untreated and urea-treated (5%) rice straw. Factor B was three levels of roughage: concentrate; 80:20, 50:50, 20:80, respectively. The following treatment were imposed:

T_1 = untreated rice straw (RS) (80%) + concentrate (20%)
T_2 = RS (50%) + concentrate (50%)
T_3 = RS (20%) + concentrate (80%)
T_4 = urea-treated rice straw (UTS) (80%) + concentrate (20%)
T_5 = UTS (50%) + concentrate (50%)
T_6 = UTS (20%) + concentrate (80%)

The buffaloes were vaccinated against foot and mouth and haemorrhagic diseases. Injections of vitamins AD_3E were also given at initiation of the trial and of interval during the experiment. The feeding trial lasted for 270 days for animals in T_2, T_3, T_5, T_6 and 225 days for T_1 and T_4, respectively. All buffaloes were acclimated to untreated rice straw and some concentrate for the first two months. All animals were each individually housed in a 2x4 m. pen where water was available at all times. In addition, mineralized salt containing macro and trace elements was given at 50 g/hd/d with the concentrate portion. Roughage and concentrate were given to animals in two equal portions at morning and afternoon feeding times. Water drop system was provided once daily for buffaloes to cool off and to prevent skin disease which may occur during hot summer days.

Liveweights of buffaloes were recorded at bi-weekly intervals throughout a 9-month feeding trial. These weights were used to adjust for feed requirement on a bi-weekly basis in respective treatments accordingly.

Samples of feeds were collected and composited to be analyzed for chemical compositions using standard techniques. At the end of each month, samples of rumen fluid were taken using stomach tube with vacuum pump. Ruminal pH was measured immediately and orther portion of fluid was acidified and prepared for NH_3-N and volatile fatty acids (VFA) concentration analyses using NH_3-N electrode and Gas Chromatography, respectively.

Digestion coefficients of nutrients were determined using acid-insoluble ash (AIA) (Van Keulen and Young, 1977) as an internal indicator. Acid-insoluble ash contents were chemically analyzed in feeds and fecal samples (from rectal samplings). Data of liveweights were regressed using time intervals in order to obtain more justified liveweight changes and average daily gain (ADG) as influenced by dietary treatments. Representative buffaloes from treatment 2, 3, 5 and 6 were slaughtered at 350 kg liveweight to assess for carcass compositions. Simple cost/net-profit analysis was performed to compare economical return. The data were subjected to analysis off variance and a comparison of treatment means was conducted using Duncan's New Multiple Range Test according to Steel and Torrie (1960).

Results and Discussion

Chemical composition of feeds

Compositions of concentrate and chemical analysis of feeds are presented in table 1. As shown, crude protein (CP) content of rice straw (RS) was markedly increased from 3.3 to 8.8% on DM basis as a result of urea-treatment (5%) (UTS). Crude protein and the estimated total digestible nutrient (TDN) of concentrate were 11.9 and 77.2%, respectively. Lower percentage of CP of concentrate used in this experiment was based on a value as previously reported by Thammasang and Wanapat (1989). It was found that a ration containing 10% CP in a high level of energy 10.2 MJ ME/d resulted in higher digestibility and N-balance as compared to other levels.

Ruminal fermentation

Tables 2 and 3 report on ruminal pH, NH_3-N and volatile fatty acids (VFA) concentrations analyzed from ruminal samples at 0, 2, 4 and 6 h post-feeding. The pH values were similar and

TABLE 1. COMPOSITION OF CONCENTRATE AND ROUGHAGE USED IN THE EXPERIMENT

Item	Concentrate	RS	UTS
Ingredients of concentrate, on % DM basis			
Cassava chip	55.6	–	–
Corn meal	26.5	–	
Broken rice	9.8	–	–
Soybean meal	5.0	–	–
Urea	1.3		
Dicalcium phosphate	0.9	–	–
Sulfur[1]	0.1	–	–
Total	100.0	–	–
Calculated composition, on % DM basis			
CP	11.7	–	–
TDN	77.2		–
ME (MJ/kg DM)	12.6	–	–
	.... % of DM		
Analyzed composition, %			
DM	89.2	97.0	65.0
Ash	5.3	13.9	13.4
CP	11.9	3.3	8.8
NDF	19.1	77.1	78.0
ADF	5.8	50.6	52.5

[1]Urea : Sulfur = 22 : 1 (N:S = 10:1)

RS = untreated rice straw, UTS = urea-treated rice straw (5%, w/w), DM = dry matter, CP = crude protein, NDF = neutral detergent fiber, ADF = acid detergent fiber

were in normal level (6.6) in all treatments. The NH_3-N values increased correspondingly after increasing levels of concentrate and being highest for urea-treated straw fed group (9.0 mg%). This value was in a good range since Satter and Slyter (1974) and Boniface et al. (1986) reported on optimal rumen NH_3-N ranges as 2-5 mg% and 4.5-12.0 mg%, respectively. The volatile fatty acids (VFA) as C_2, C_3 and C_4 were measured. These VFAs markedly increased, particularly C_2 and C_3, as levels of concentrate increased and improvement resulted in urea treated fed group. Such increase indicated an improvement of ruminal fermentation by the microbes. The shift of VFAs as affected on ratio of C_2/C_3 being much narrower when levels of concentrate increased and in urea-treated straw fed group. Hence the occuring VFAs may have attributed to caloric efficiency on growth performance of buffaloes and feed efficiency. As reported by Hovell (1972) (cited by Orskov et al., 1979) a minimal ratio of C_2/C_3 required for the synthesis of sufficient glucose to generate NADPH for lipid synthesis via the pentose phosphate pathway was 4.1 to 1. However, Orskov et al. (1979) did not find any significant differences among different mixtures of VFA when infused at different concentrations in sheep using intragastric infusion technique.

TABLE 2. THE RUMINAL pH AND NH_3-N CONCENTRATIONS IN FEEDLOT BUFFALOES FED ON DIFFERENT TYPES OF ROUGHAGE AND VARIOUS LEVELS OF ROUGHAGE TO CONCENTRATE

Item	RS:Concentrate			RS	UTS:Concentrate			UTS
	80:20	50:50	20:80		80:20	50:50	20:80	
pH								
0 h, post-feeding	6.8	6.9	7.0		6.9	6.8	6.9	
2	6.7	6.7	6.7		6.7	6.5	6.7	
4	6.7	6.7	6.6		6.6	6.5	6.6	
6	6.5	6.4	6.2		6.5	6.1	6.5	
X	6.7	6.7	6.6	6.7	6.7	6.5	6.7	6.6
NH_3-N (mg%)								
0 h, post-feeding	3.3	5.8	7.3		5.9	8.2	6.3	
2	5.7	8.2	12.2		6.2	11.5	14.4	
4	1.8	5.5	4.1		8.9	7.6	5.5	
6	5.7	4.1	10.4		9.2	11.1	12.5	
X	4.1	7.1	8.5	6.6	7.8	9.6	9.7	9.0

RS = untreated rice straw, UTS = urea-treated rice straw

TABLE 3. THE VOLATILE FATTY ACIDS (VFAs) CONCENTRATIONS IN THE RUMEN OF FEEDLOT BUFFALOES FED ON DIFFERENT TYPES OF ROUGHAGE AND VARIOUS LEVELS OF ROUGHAGE TO CONCENTRATE

Item	RS:Concentrate			RS	UTS:Concentrate			UTS
	80:20	50:50	20:80		80:20	50:50	20:80	
Volatile fatty acids (mM L^{-1})								
C_2 : 0 h, post-feeding	48.2	67.2	58.4		32.1	61.6	83.6	
2	45.2	30.6	41.0		65.6	51.8	64.9	
4	49.3	54.8	56.4		47.4	42.4	48.9	
6	50.2	49.0	51.7		44.3	71.8	44.9	
X	48.2	50.4	51.9	50.2	47.4	56.9	60.5	54.9
C_3 : 0 h, post-feeding	8.7	15.5	12.8		8.8	15.3	17.2	
2	13.8	9.2	10.5		18.8	11.8	21.4	
4	10.6	11.1	12.1		11.3	15.5	10.8	
6	10.5	10.7	11.3		8.1	13.0	10.5	
X	10.9	11.6	11.7	11.4	11.8	13.9	15.0	13.6
C_4 : 0 h, post-feeding	3.9	5.9	5.7		2.5	4.3	6.7	
2	3.2	3.7	4.3		5.5	5.2	4.3	
4	3.5	2.5	4.7		3.6	3.4	3.3	
6	3.9	3.4	3.6		3.5	4.0	4.2	
X	3.6	3.9	4.6	4.0	3.8	4.2	4.6	4.2
C_2/C_3 : 0 h, post-feeding	5.6	5.6	4.6		3.7	4.0	4.9	
2	3.3	3.3	3.9		3.5	4.4	3.2	
4	4.8	4.9	4.7		4.2	2.3	4.4	
6	7.0	4.7	4.6		5.5	5.7	4.3	
X	5.2	4.6	4.4	4.7	4.2	4.1	4.2	4.2

RS = untreated rice straw, UTS = urea-treated rice straw

Digestion coefficients of nutrients

Digestion coefficients of DM, OM, CP were enchanced appreciably by increasing levels of concentrate regardless of type of straw. Readily available energy provided by concentrate could have attributed largely to the increase. However, the values for NDF and ADF were slightly depressed particularly the NDF of urea-treated rice straw. The higher level of concentrate may have affected on the type of microbes and the condition of the rumen (Kaufmann et al., 1980). As clearly shown, the digestion coefficients of DM, OM and CP as compared between untreated and treated group were significantly higher at all levels of supplementation except for NDF and ADF. The increase in digestibility could be well-explained by the urea-treatment as reported by Wanapat (1986), Hart et al (1987), Jayasuriya and Perera (1982). The overall intake of OM and CP were markedly improved as level of concentrate increased. The higher digestibility of diets resulted in higher ME MJ/kg DM. It was obvious that interactions between type of straw and levels of concentrate were existing. Despite lower figures of digestible OM and CP at 20:80 (urea-treated straw: concentrate) level, the ME intake of such straw still remained higher because of the corresponding higher OM digestibility (table 4).

Intake and growth performance

Table 5 and figure 1 contain details of intake data and growth performance of feedlot buffaloes. As indicated, the feeding trial lasted 9 months except for treatments 1 and 4 (control) due to

TABLE 4. DIGESTION COEFFICIENTS OF NUTRIENTS OF FEEDLOT BUFFALOES FED ON DIFFERENT TYPES OF ROUGHAGE AND VARIOUS LEVELS OF ROUGHAGE TO CONCENTRATE

Item	RS:Concentrate			UTS:Concentrate			SE	Source of Roughage		Level of concentrate			Interaction
	80:20	50:50	20:80	80:20	50:50	20:80		RS	UTS	20	50	80	
Digestion coefficients (%)													
DM	50.8^{a}	66.6^{b}	78.8^{c}	66.2^{b}	73.9^{d}	80.8^{c}	1.1	65.4^{e}	73.6^{f}	58.5^{e}	70.3^{f}	79.8^{g}	**
OM	66.3^{a}	79.0^{b}	89.9^{c}	75.0^{b}	83.0^{b}	88.6^{c}	0.7	77.4^{e}	82.5^{f}	71.1^{e}	81.0^{f}	87.8^{g}	**
CP	41.8^{a}	72.2^{b}	84.4^{c}	72.4^{bd}	75.5^{bcd}	82.5^{c}	2.4	66.1^{e}	69.8^{f}	57.1^{e}	78.9^{f}	83.5^{g}	**
NDF	62.6^{a}	67.9^{bc}	72.9^{d}	74.1^{d}	75.5^{cd}	64.5^{ab}	0.9	67.8	69.8	68.4	69.4	68.7	*
ADF	56.6^{a}	59.4^{bc}	56.7^{a}	69.6^{cd}	69.6^{cd}	68.5^{c}	0.9	57.6^{e}	69.2^{f}	63.1^{ef}	64.5^{e}	62.6^{f}	*
Digestible nutrient intake													
ME (MJ/kgDM)[1]	10.2^{a}	12.2^{bc}	13.5^{d}	11.8^{b}	12.9^{c}	13.7^{d}	0.6	12.2^{e}	12.9^{f}	10.9^{e}	12.6^{f}	13.5^{g}	**
OM (kg)	3.1^{a}	4.8^{ab}	6.1^{b}	3.4^{a}	4.3^{a}	4.8^{ab}	0.03	4.7	4.2	3.2^{e}	4.6^{f}	5.5^{g}	*
CP (g)	115.9^{a}	384.4^{b}	653.5^{c}	327.3^{b}	443.3^{ac}	529.3^{cd}	29.1	384.6^{a}	433.6^{b}	221.6^{e}	382.1^{f}	591.4^{g}	**

[1] ME (MJ/kgDM) = 0.155 DOM (%)
RS = untreated rice straw, UTS = urea-treated rice straw
R:C ratio = roughage: concentrate ratio
^{abcd}Mean on the same row with different superscripts differ ($p < 0.05$)
$^{efg}p < 0.01$, ** $p < 0.01$, * $p < 0.05$

TABLE 5. PERFORMANCE OF FEEDLOT BUFFALOES FED ON DIFFERENT TYPES OF ROUGHAGE AND LEVELS OF CONCENTRATE

Item	RS:Concentrate			UTS:Concentrate			SE	Source of Roughage		Level of concentrate			Interaction
	80:20	50:50	20:80	80:20	50:50	20:80		RS	UTS	20	50	80	
Duration of trial, d	225	270	270	225	270	270							
Liveweight (kg)													
Initial	178.0	173.0	176.0	181.0	179.6	173.6							
Final	225.5	325.6	334.2	248.0	333.8	340.0							
Total gain (kg)	47.5	152.6	158.2	67.8	154.2	166.4							
ADG (g/d)	137.6^{a}	526.9^{b}	545.1^{b}	257.0^{ab}	542.3^{b}	551.2^{b}	29.1	403.5^{e}	451.1^{f}	198.3^{e}	535.4^{f}	548.1^{f}	ns
Total DMI/d													
kg	5.2^{a}	6.6^{ab}	7.6^{b}	5.1^{a}	5.7^{ab}	5.9^{a}	0.3	6.5^{e}	5.6^{f}	5.2^{e}	6.2^{ef}	6.8^{f}	*
% BW	2.6^{a}	2.6^{a}	2.9^{b}	2.4^{c}	2.1^{cd}	2.3^{d}	0.04	2.7^{e}	2.3^{f}	2.5^{ab}	2.4^{b}	2.6^{a}	**
$g/kgW^{.75}$	97.5^{ac}	102.6^{a}	116.7^{b}	92.3^{c}	86.7^{c}	90.9^{c}	2.9	105.6^{c}	90.0^{f}	94.9^{a}	94.7^{a}	103.8^{ab}	**
R:C ratio	77:23	45:55	20:80	82:18	52:48	28:72		47:53	54:46	80:20	49:51	24:76	
FCR	38.9^{a}	12.0^{b}	13.6^{b}	20.2^{b}	10.6^{b}	10.7^{b}	3.7	24.1^{e}	13.8^{f}	33.1^{e}	11.6^{f}	12.2^{f}	**

RS = untreated rice straw, DMI = dry matter intake, ADG = average daily gain
FCR = feed conversion ratio, R:C ratio = roughage : concentrate ratio
^{abcd}Mean on the same row with different superscripts differ ($p < 0.05$)
$^{efg}p < 0.01$, ** $p < 0.01$, * $p < 0.05$

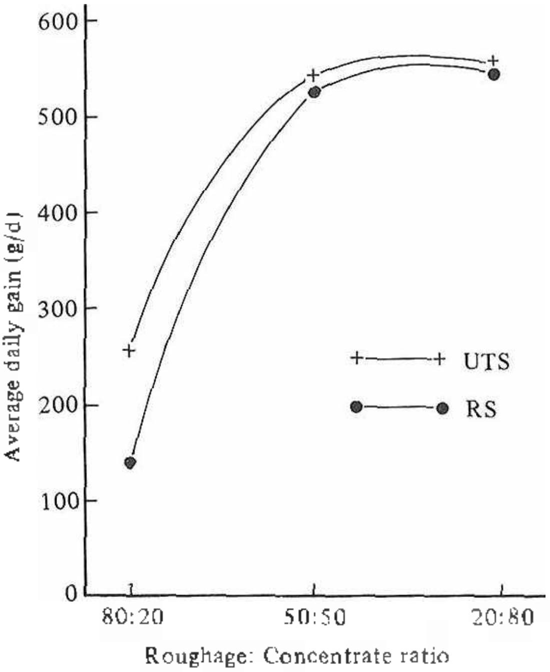

Figure 1. Average daily gain of feedlot buffaloes fed on rice straw (RS) or urea-treated rice straw (UTS) as affected by different types of roughage and roughage:concentrate ratio.

their slow growth rates. Although overall intakes were adjusted periodically to respective live-weights, the intakes were still variable. Highest intake was seen in group fed with untreated straw with varying levels of concentrate. However, the actual roughage and concentrate ratio were within expected ranges. Average daily gain were highest at 20:80 (R:C) level in both straw groups, however, differences between 50:50 and 20:80 (R:C) levels were not significant ($p < 0.05$). Better growth rates were obtained in group fed urea-treated straw at all levels. Greater difference between straw was seen particularly at roughage:concentrate ratio lower than 50:50. Creek et al. (1984) had reported similar result pattern. Feed conversion ratio were best at R:C 50:50, 20:80 for urea-treated straw and untreated straw, respectively. It is quite obvious that ADG were linearly increased until R:C ratio reached 50:50. Utilization of roughage as rice straw and concentrate by buffaloes seemed to be most efficiently at R:C not greater than 65:35 ratio (figure 1). Higher level of concentrate would likely to attribute to lower pH which may render adverse effect on other nutrient utilization, particularly ruminal fiber digestibility.

Carcass composition and net-profit of feedlot buffalo production

Table 6 and 7 provide data of carcass characteristic of feedlot buffaloes and estimation of net-profit of feedlot production system. Carcasses of buffaloes on treatments 1 and 4 (control) were not taken since their performance were not as great, however, animals on other ratio of R:C in both types of straw were slaughtered for carcass evaluation. It was found that the average dressing percentage was 48.2% and were the same for all

TABLE 6. CARCASS CHARACTER STICS OF FEEDLOT BUFFALO (BULL) AT 350 KG LIVE-WEIGHT

Item	Treatment (T)			
	2	3	5	6
Slaughter weight (kg)	324.0	353.1	335.6	368.6
Warm carcass weight (kg)	159.5	169.5	166.6	181.1
Chilled carcass weight (kg)	155.8	163.5	163.1	177.1
Dressing percentage	48.1	48.0	48.6	48.1
Loin eye area (cm^2)	46.0	53.6	50.0	54.0
Fore quarter (kg)	40.0	45.4	44.9	49.9
Hind quarter (kg)	35.8	37.1	34.4	39.2
Other carcass characteristics (% liveweight)				
Head	4.1	4.5	4.2	4.8
Skin	12.9	12.9	10.6	12.5
Lean meat	36.8	36.0	35.6	37.2
Bone	15.8	16.5	13.7	14.1
Lung	1.0	0.9	1.0	1.2
Stomach	2.6	2.4	2.7	8.0
Liver	1.0	1.1	1.2	1.2
Kidney	0.2	0.2	0.3	0.2
Intestine	2.1	2.1	2.1	2.6
Spleen	0.3	0.3	0.4	0.3
Heart	0.4	0.5	0.6	0.5
Tendon	0.6	2.0	0.9	0.7
Meat/Bone	2.2	2.0	2.5	2.5

T_2 = untreated rice straw (RS) (50%) + concentrate (50%)
T_3 = RS (20%) + concentrate (80%)
T_5 = urea-treated rice straw (UTS) (50%) + concentrate (50%)
T_6 = UTS (20%) + concentrate (80%)

TABLE 7. GROWTH PERFORMANCE AND NET PROFIT OF FEEDLOT BUFFALOES

Item	RS:Concentrate			UTS:Concentrate		
	80:20	50:50	20:80	80:20	50:50	20:80
Total DMI (kg/d)	5.2[a]	6.6[ab]	7.6[b]	5.1[a]	5.7[ab]	5.9[a]
R:C ratio	77:23	45:55	20:80	82:18	52:48	28:72
ADG (g/d)	137.6[a]	526.9[b]	548.4[b]	257.0[ab]	542.3[b]	551.2[b]
FCR	37.8[a]	12.5[b]	13.9[b]	19.8[b]	10.5[b]	10.7[b]
Feed cost[1],						
Baht/d	6.2	14.2	22.0	6.6	12.0	16.2
Feed cost/kg gain						
Baht	45.0	27.0	39.0	25.6	22.1	26.8
Cost of production, Baht						
Buying value of buffaloes						
@15 Baht/kg	2670.0	2595.0	2640.0	2715.0	2694.0	2604.0
Feed cost	1395.5	3834.0	5940.0	1485.0	3240.0	4374.0
Labor	315.0	378.0	378.0	315.0	378.0	378.0
Fixed cost	585.0	585.0	585.0	585.0	585.0	585.0
Total	4965.0	7392.0	9543.0	5100.0	6897.0	7941.0
Selling value of buffaloes						
@25 Baht/kg	5637.5	8140.0	8355.0	6200.0	8345.0	8500.0
Net profit, Baht	672.5	748.0	−1188.0	1100.0	1448.0	559.0
US$	27	30	−47	44	58	22

[1] Untreated rice straw = 0.5 baht/kg., Urea-treated straw = 0.8 baht/kg Concentrate = 3.5 baht/kg.
1 US$ = 25 Baht

treatments. However, the loin eye area were highest for treatments with higher level of concentrate and on urea-treated straw (46-54 cm^2). The dressing percentage obtained herein was significantly higher than those raised on pasture (Intaramongkol et al., 1981). As pointed out by Charles and Johnson (1972) and Johnson and Charles (1975) that buffalo carcass had a high proportion of muscle (68.6%), a low proportion of bone (17.3%) and a low proportion of fat (10.6%) relative to those found in steer carcasses. Therefore, the carcass was very lean. However, the report muscle portion was lower than that found by Johnson and Charles (1975) because of a lower value of slaughtering weight. From a simple net-profit analysis based on a one-fixed cost of animal, it was found that the best net-profit obtained was on animals fed on urea-treated straw and on a 80:20, 50:50 R:C ratio, being 44, 58 US$, respectively. If animals were sold on a carcass weight, net-profit would have likely to be higher. It suggests that feedlot buffaloes system are quite possible.

Based on the literature, a comparative study was carried out by Kantapanit et al. (1972) and reported that the average daily gains of swamp buffaloes, native cattle and crossbred Brahman were comparable (600 g/h/d) but were significantly lower than those in crossbred Holstein and crossbred Brown Swiss (900, 1,000 g/h/d). It was also reported in a later trial that dressing percentage of buffalo was lower than that of cattle (43.6 and 52.8%), however, notably lower percentage of fat was obtained. It was also shown in a trial conducted by Johnson and Charles (1975) that despite lower growth rate and dressing percentage an increase in fat (20% of carcass weight gain) in swamp buffaloes in feedlot was much lower than among other cattle breeds. The buffaloes, therefore, had a greater proporton of lean in their carcasses. However, in a mixed grass-legume grazing trial, comparable average daily gain (433, 430 g/h/d) and total meat percentage (65, 66) of swamp buffaloes were obtained as compared to those in crossbred Brahman, respectively (Intaramongkol et al., 1978). A comparative carcass characteristics of cattle and swamp buffaloes was reported by Intaramongkol et al. (1979). Percentage of different carcasses were similar between the cattle and swamp buffaloes and the carcasses were quite acceptable. The dressing percentages (48.2%) of the feedlot buffaloes under their experiment were higher than those obtained (44, 46%) by Intaramongkol et al. (1979, 1981) but were slightly lower than those (53%) reported by Johnson and Charles (1975).

Data from this experiment suggest many interesting points regarding feedlot buffaloes production system. Under the prevailing condition where crossbred cattle are available in limited nember and the corresponding price of yearlings is rather high, procurement of buffaloes for feedlot is possible since their growth performance, feed utilization, carcass characteristics and net-profit analysis are good indicators. However, research on feeding regimes and dietary manipulations for efficient production system in order to obtain large profits warrant future research undertakings.

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