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SUMMARY OF DOCTORAL THESIS

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Title: GROWTH PERFORMANCE AND MEAT CHARACTERISTICS OF CROSSBRED CATTLE (*BOS INDICUS*) AND CROSSBRED WATER BUFFALO (*BUBALUS BUBALIS*) UNDER DIFFERENT FEEDING REGIMES

The aim of this study was to compare the fattening performance, carcass yield and meat quality between Brahman grade cattle and crossbred water buffaloes at same young age (18–24 months) fed with an energy-rich diet or a high roughage diet via the four experiments (Experiment I, II, III and IV). A survey was also performed to establish consumer meat preference between the two species.

Experiment I. Twenty growing crossbred cattle and crossbred water buffalo (carabao) with an average age of 22 (18-24) months were fed the same ration made up of corn silage (50 %), wet brewer's spent grain (30%) and concentrate mixture (20%) as dry matter basis. The fattening performance of the animals and the *in vivo* digestibility of nutrients in the feed offered were determined. The economics of raising these animals under intensive production system was evaluated. Species differences did not influence total dry matter intake of the animals when expressed as percent of body weight and per metabolic body size. There were no significant differences in digestion coefficients of the different nutrients, except for crude protein, ($P < 0.05$) in crossbred water buffalo and crossbred cattle, although the digestibility of dry matter, organic matter and nitrogen free extract tended to be high in the former than the latter. Likewise, average daily gain (ADG) was similar, although crossbred water buffalo had numerically higher ADG than crossbred cattle during the 6 months feeding. During the first 3 months of feeding (1-90 days), the ADG of crossbred water buffalo was 1066.1 g compared to 940.1 g for crossbred cattle. From 91 to 180 days, the crossbred cattle had slightly higher ADG but the difference was not significant. The return above feed cost was comparable for crossbred cattle and crossbred water buffalo during the first 90 days of feeding. However, extending the feeding period from 91 to 180 days, income over feed cost was higher for crossbred cattle than crossbred water buffalo. Results show that crossbred water buffalo could attain similar growth rate with that of crossbred cattle when fed with high quality basal forage and concentrate.

Experiment II. The live traits, carcass yield and the physical, chemical, processing and sensory properties of meat from twenty crossbred cattle and crossbred water buffalo with an average age and weight of 29 months and 434 kg, respectively were determined and compared. The animals were fed similar diet for 180 days before slaughter. A survey was done to know the consumer meat preference between the two species. Live weights before slaughter of the two species were found to be different ($P < 0.05$) wherein the crossbred water buffalo had lower dressing yield based on hot and chilled carcass weight. The chilled carcass yield of the forequarters and hindquarters were comparable when expressed as percent of live weight and chilled carcass weight. The estimated lean yield was higher in crossbred cattle than crossbred water buffalo. Crude protein, ash, fat, cholesterol, myofibrillar, sarcoplasmic, and insoluble protein contents of the beef (meat from crossbred cattle) and buffalo meat (meat from crossbred water buffalo) were similar. Water holding

capacity, pH, muscle fiber diameter, tenderness, firmness and marbling score in buffalo meat were comparable to beef. Redness was found to be higher ($P < 0.05$) in buffalo meat than beef. Consumer meat preference survey showed that 55.9 % selected beef while 44.1 % preferred buffalo meat. The color and amount of fat outside the beef sample were the primary reasons used by the buyers for the selection.

Experiment III. The objective of Experiment III was to compare the fattening performance of Brahman grade cattle (crossbred cattle) and crossbred water buffalo of the same age fed high roughage based fattening ration. Ten crossbred cattle and ten crossbred water buffalo, aged between 18 to 24 months were used in this experiment. The animals were fed diets consisting of 85 % napier or para grass and 15 % concentrate mixture on a dry matter basis. The grass, total dry matter intake and body weight gain were significantly higher for crossbred cattle. There were no species significant difference in digestion coefficient and feed conversion between crossbred cattle and crossbred water buffalo. Return over feed cost for fattening was significantly more in crossbred water buffalo than crossbred cattle. These results clearly indicate that at younger age and under high roughage based fattening rations, crossbred water buffalo are not only better able to utilize the roughages and perform better in terms of feed intake and live weight gains than the crossbred cattle but also produce good quality meat in the Philippines

Experiment IV. The objective of Experiment IV was to compare the slaughter and carcass yield of growing (18-24 month old) crossbred cattle and crossbred water buffalo fed high roughage diet and to determine the effect of feeding high roughage based ration on the physical, chemical, processing and sensory properties of meat from crossbred cattle and crossbred water buffalo. Crossbred water buffaloes had significantly higher ($P < 0.05$) slaughter live weight but had lower ($P < 0.05$) dressing percentage, proportion of carcass lean meat and smaller rib-eye-area than crossbred cattle. No significant difference between species was observed on the proximate composition, pH, water holding capacity and marbling. The muscle fiber diameter was consistently smaller ($P < 0.05$) resulting to lower shear force values in crossbred water buffaloes. The L^* and b^* values of meat color were also lower ($P < 0.05$) in crossbred water buffaloes while the redness was similar with crossbred cattle. The cooked LD muscle from crossbred water buffalo was scored darker ($P < 0.01$) and more flavorful ($P < 0.05$) than crossbred cattle but no significant difference was observed in other parameters for sensory evaluation. Based on sensory evaluation scores, crossbred water buffalo has similar if not higher eating quality as beef. High roughage ration seems to work well in crossbred water buffalo in terms of sensory properties.

The following conclusions were drawn from the aforementioned results:

1. Crossbred water buffalo can be fattened and attain similar growth rate as crossbred cattle under intensive feeding system.
2. Feeding period for fattening water buffalo is 90 days instead of 180 days to reduce feed cost.
3. Carcass yield were similar for both species when fed high grain or high roughage based ration.
4. Proximate composition, water holding capacity, pH and marbling were similar between breeds in the two feeding regimes.
5. Color of buffalo meat was darker than beef attributable to higher a^* (redness) value in high grain based ration while the L^* (lightness) and b^* (yellowness) values were significantly higher on high roughage based diet.

From the findings in the current study it could be concluded that at a relatively young age and fed a fattening rations, and even under a high roughage based diets, carabaos, i.e. crossbred water buffaloes are slightly superior to crossbred native cattle in the utilization of roughage, live weight gain and also production of good quality meat in the Philippines.