Buffalo Newsletter

Number 14 - March 2000

EUROPE - NEAR EAST

BULLETIN OF THE FAO INTER-REGIONAL COOPERATIVE RESEARCH NETWORK ON BUFFALO
INCLUDES SHORT COMMUNICATIONS, RESEARCH PAPERS, TECHNICAL NOTES, ONGOING RESEARCHES

From the editor

This is the first issue of the Buffalo newsletter in the year 2000. On this occasion I would like to wish all readers a happy and successful Millenium, while thanking them for showing a growing interest in our journal. I thank them for all letters that I receive with comments and suggestions for improving the journal as well as for the papers they send.
For the first time, in this issue you will read two papers on buffalo in Azerbaijan and in Nepal. Many buffalo experts will be surprised of reading on local buffalo breeds of Nepal, which fit well in the mountain climate, and to learn about the research trials of the Azeri.

follows page 2 ☞

INSIDE THIS ISSUE

COAGULATING PROPERTIES OF BUFFALO MILK PRODUCED IN FARMS OF LATIUM

S. Terramoccia, C. Tripaldi, S. Bartocci, F. Martillotti, M. Angelucci, V. Danese

Istituto Sperimentale per la Zootecnia
Via Salaria 31, 00016 Monterotondo Scalo (Rome), Italy

INTRODUCTION

In southern area of Latium region (Central Italy) are present about 9,000 milking Mediterranean buffaloes (*Bubalus bubalis* L.) and nearly all buffalo milk is transformed for the cheese making of "Mozzarella di Bufala Campana". This cheese, differently from cow milk "mozzarella", being obtained from a milk with a higher fat to protein ratio (about 2:1), results to be softer, more appetizing and more and more appreciated by consumers. In fact the local dairy are not able to cope with the increasing request of market, specially in the summer period.
As reported in a previous paper (Terramoccia et al., 1999), the local Council of Latium, together with the European Union, has financed a research program of Animal Production Research Institute of Rome regarding nutrition and reproduction, entitled "Improvement of buffalo breeding and valorization of relative yields", for the development of buffalo breeding in farms of the above mentioned area.
The first study has been an investigation, collecting data on milk productive parameters of the farms taking part in the project, kindly put at disposal by the Breeder Association of Latium region, and processing them; subsequently, the second action of nutrition researchers has been to organize a monitoring, visiting several time, in the years 1997 and 1998, the farms of project and collecting numerous samples of feeds and milk.
Few references are present in scientific bibliography on effect of feeding on buffalo milk chemical-physical characteristics and coagulating properties then the aim of present short communication is to offer information on this topic, considering the diets of the different farm typologies.

MATERIAL AND METHODS

The monitoring was carried out on 20 farms of southern area of Latium region (Central Italy); these farms were grouped in three different typologies according to the number of buffaloes, in lactation and dry: small farms (9) with less than 50 head, medium farms (4) with a number of buffaloes between 50 and 100 and big farms (7) with more than 100 head.
The number of controlled milking buffaloes in each farm was proportional both to total number and to average daily milk production.
Samples of forages (147) and

follows page 2 ☞

from page 1/From the editor

On this occasion, I would like to remind the readers of three important venues which are scheduled in 2000. At end March, the Conference of the Asian Buffalo Association will take place in Sri Lanka; theme is "Changing the role of the buffalo in the new millenium in Asia". In May, an International FAO-ICAR Buffalo Workshop on "Animal recording for improved management and breeding of buffalo" will be held in Slovenia, within the 32nd ICAR biennial meeting. In October, the 6th International Buffalo Congress will take place in Venezuela. All details are announced in the Buffalo News of this issue. As you can see, there is a lot to do for those who want to exchange research experiences in order to favour international cooperation in buffalo development.

Beyond these general activities, I emphasise again the growing interest in developing the awareness on buffalo genetic diversity. Bilateral projects are being carried out in our Institute, and we hope to enlarge the awareness of the importance of this subject by including as many buffalo populations as possible. FAO believes that the understanding of animal biodiversity is of fundamental importance for the development of a sustainable agriculture, and we hope that future meetings of the Buffalo Network will be especially dedicated to help the member countries in training people, increase awareness and implement new projects.

A special thank to the officers of the FAO Regional Offices for Europe and the Near-East who demonstrated that they trust the job that we are doing, through the financial support that they give to the activities of the network.

Prof. Antonio Borghese

from page 1 / COAGULATING PROPERTIES OF BUFFALO MILK PRODUCED IN FARMS OF LATIUM (ITALY)

feedingstuffs (134) were withdrawn in the farms, analyzed in lab (proximate and Van Soest analyses according to Martillotti et al., 1987) to calculate both nutrients content and metabolisable energy (AFRC, 1992) of diets.

Monthly milk samples (1416 after a careful filtering process) of controlled buffaloes were collected and analyzed for acidity determination (pH) by potentiometer; the three coagulation parameters: rennet clotting time (r), curd firming time (K_{20}) and curd firmness (A_{30}) were obtained by thromboelastograph Formagraph according to Zannoni and Annibaldi (1981) at 35° C using a liquid rennet (1:15,000 rennet unit), 90% chymosin, diluted 1:100 and added to whole milk as 200 l/100 ml.

The statistical software SAS (1993) was used for data processing using the GLM procedure (monofactorial model) for testing the statistical difference of coagulating properties, considered in three periods of distance from calving, between the farm typologies.

RESULTS AND DISCUSSION

In Table 1 the overall means and correlation coefficients of coagulation parameters and acidity are reported. As regards to the correlation coefficients, all statistically significant, the lowest value (-0.26) is obtained for r vs A30 while the highest correlation (-0.65) is recorded for K_{20} *vs* A_{30}, furthermore a good relationship (0.43) is obtained for r vs pH; similar results were obtained by Tripaldi et al. (1997) both in sign and in numeric values except for the correlation between r and A_{30} that was positive and not significant.

Considering the offered diets to milking buffaloes, the average values of protein and metabolisable energy were respectively the following: for small farms 98.32 g/kgDM and 8.96 Mj; for medium farms 115.68 g/kgDM and 9.48 Mj; for big farms 124.01 g/kgDM and 9.72 Mj. It can be noted a better feeding management for the big farms.

Table 2 reports the estimated means of coagulation parameters and acidity, considered in three periods of distance from partum, of the three farm typologies.

The best coagulation attitude of milk is determined by low values of rennet clotting time and curd firming time and by high values of curd firmness. As regards to the rennet clotting time (r), the recorded values are almost always higher when the lactation days increase, significant differences between farm typologies were

follows page 5

Table 1 - Overall means and correlation coefficients of coagulation parameters and acidity.

	Overall means ± SD	Correlation coefficients K_{20}	A_{30}	pH
r (min)	14.23±3.70	0.36***	-0.26***	0.43***
K_{20} (min)	3.01±0.87		-0.65***	0.35***
A_{30} (mm)	50.68±9.30			-0.35***
pH	6.70±0.07			

*** : P < 0.01

obtained in the first and, more accentuated, in second period of lactation with best values for the milk produced in small farms (12.34 min in 1st period and 11.64 min in 2nd period).
Considering the curd firming time (K_{20}), no significant differences between farm typologies are observed only in the central period of lactation with decreasing trend when lactation days increase; the best values are obtained for the milk produced in big farms (significant values: 3.13 min in 1st period and 2.82 min in 3rd period).
The highest values of curd firmness (A_{30}) are recorded in central period of lactation, there is a significant difference between farm typologies in each period of lactation and the best values of curd firmness is obtained for the milk produced in big farms (47.46 mm in 1st period, 54.88 mm in 2nd period, 52.42 mm in 3rd period).
Significant differences of pH between farm typologies are found only in the 2nd period of lactation.
In conclusion, judging the above mentioned results as a whole it can be asserted that diets with a high energetic concentration, used in big farms, influence positively the curd firming time and curd firmness of buffalo milk whereas the more fibrous and less energetic diets, used in small or medium farms have a positive effect on rennet clotting time, specially in the first part of lactation.

Work supported by E. U. Regione Lazio: Project ob. 5/b n° 11206007 "Improvement of buffalo farming and production"; coordinator: prof. A. Borghese. Publication n° 4.

REFERENCES

AFRC (1992). AFRC Technical Committee on Responses to Nutrients. Report No. 9. Nutritive Requirements of Ruminant Animals: Protein. Nutr. Abstr. Rev. 62, 787-835.

MARTILLOTTI F., ANTONGIOVANNI M., RIZZI L., SANTI E. and BITTANTE G. (1987). Metodi di analisi per la valutazione degli alimenti di impiego zootecnico, Quaderni metodologici n. 8 IPRA CNR Roma.

STATISTICAL ANALYSIS SYSTEMS INSTITUTE (1993). SAS user's guide, statistics. Statistical Analysis Systems Institute Inc., Cary, NC.

TERRAMOCCIA S., BARTOCCI S., TRIPALDI C. and MARTILLOTTI F. (1999). First results of an investigation on productive parameters of buffalo farms of Latium (Italy). Buffalo Newsletter, 12: 1-3.

TRIPALDI C., CATILLO G., MARTILLOTTI F. and ANGELUCCI M. (1997). Influence of some characteristics of diet on milk quality of water buffalo. Buffalo J., 13: 1-13.

ZANNONI M. and ANNIBALDI S.(1981). Standardization of the renneting ability of milk by Formagraph. Sci. Tecn. Lattiero-Casearia, 32(2): 79-94.

Table 2 – Estimated means of coagulation parameters and acidity, subdivided in three period of distance of partum, of the three farm typologies.

Dist. Partum	Small Farm	Medium farm	Big farm	RMSE
		Rennet clotting time, r (min)		
≤90	12.34^c	12.68^b	14.16^a	3.52
91 – 180	11.64^c	13.41^b	14.40^a	3.22
181 – 300	14.81	15.75	15.68	4.14
		Curd firming time, K20 (min)		
≤90	3.74^a	3.28^a	3.13^b	0.93
91 – 180	2.97	3.02	2.80	0.84
181 – 300	3.12^a	3.26^a	2.82^b	0.70
		Curd firmness, A30 (mm)		
≤90	42.65^b	46.10^{ab}	47.46^a	7.91
91 – 180	51.38^b	51.82^b	54.88^a	8.86
181 – 300	48.26^b	42.91^c	52.42^a	8.69
		Acidity, pH		
≤90	6.71	6.70	6.72	0.08
91 – 180	6.66^b	6.67^{ab}	6.69^a	0.07
181 – 300	6.72	6.72	6.72	0.07

a, b, c : P < 0.05

LACTATION LENGTH ADJUSTMENT IN NILI-RAVI BUFFALOES - A NEW PROCEDURE

M. Sajjad Khan

Department of Animal Breeding and Genetics, University of Agriculture, Faisalabad 38040, Pakistan

INTRODUCTION

Adjustment of milk yield data for lactation length is very common in buffaloes. The philosophy of adjustment is to correct for the factor, animals did not get equal opportunity. Records shorter than the standard lactation, such as 305 days, are projected to reduce the bias in estimating breeding values of sires. These projected records can be used to estimate total milk yield a cow or buffalo will produce in a lactation while her lactation is still in progress, facilitating the farmers to decide if she should be kept or culled. Further, it helps in the allocation of resources for an individual cow or for the herd. Early estimates of sire's breeding values by extending lactations in progress can also help reduce the generation interval.

The data being recorded at the institutional herds as well as under field conditions on buffaloes are standardized for lactation length with very crude adjustment procedures. Some persistency tables or multiplication factors developed from simple regression equations are used for standardization. Lactations shorter than 180 days are either used as such (milk yield considered as potential of a buffaloes) or deleted from the data sets, resulting in loss of huge data collected at a very high cost. Other inadequacies and use of nonlinear models for adjusting milk yield records for lactation length in buffaloes have been discussed previously (Khan, 1996). A better alternate of lactation length adjustment is the last test day adjustment procedure (Khan, 1997). This procedure improves accuracy and reduces bias. The procedure predicts future daily milk yield at any lactation stage. This estimated milk yield for the unknown lactation period is then added to recorded milk yield to get the standard lactation milk yield. Last test day milk yield (last recorded/available milk yield) alone (Akram, 1997) or last test day yield along with its interaction with lactation length have been suggested in buffaloes. A new development in this connection is predicting future daily milk yield from not just last test day yield but also from average daily milk yield of the recorded lactation. This not only reduces the bias and improves accuracy, but also accounts for the differences in high and low producers with similar last test day yield. Furthermore, records of all animals can be projected with or without the information on reason of drying. The genetic parameters of the projected yield with this procedure showed improvement over the procedures in vogue (Chaudhry, 1998). The actual adjustment procedure with least technical details and prediction equations are presented here along with examples.

Adjustment procedure

Milk yield is adjusted using last test day yield information and average daily milk yield of the known lactation period. The 305-day milk yield is estimated using last test day (record day) yield information (milk yield of morning and evening milkings added together on the last week). The 305-day milk yield was estimated as follows:

$Y_{305} = Y_t + (\alpha + b_1 X_{1i} + b_2 X_{2i})(305 - DIM)$ Eq. 1

where,

Y_{30} = Extended 305-day milk yield

Y_t = Total milk yield produced at the termination of lactation (recorded milk yield)

α = Intercept

b_1 and b_2 = Regression coefficients

X_{1i} = Available milk yield on the last test day (record day) at any lactation length.

X_{2i} = Average daily milk yield of known part of the lactation at any lactation length.

The $[\alpha + b_1 X_{1i} + b_2 X_{2i}]$ part of the Eq. 1 predicts the expected future daily milk yield for unrecorded lactation.

Steps for calculations

1. Unrecorded duration
   = (Standard duration of 305 days)-(days in milk)
2. Average daily milk yield
   = (Recorded milk yield)÷(days in milk)
3. Estimated future daily milk yield, calculated using appropriate factors given in Table 1.
   = (α) + (b_1 x Last recorded milk yield) +
   + (b_2 x Average daily milk yield)
4. Estimated milk yield for unrecorded duration
   = (Estimated future daily milk yield)
   x (unrecorded duration)
5. Standardized 305 day milk yield
   = (Recorded milk yield) + (estimated milk yield for unrecorded duration)

Example 1:

Partial milk yield of a buffalo in her third lactation, initiated in July (summer), was available.

She was recorded for (days in milk) = 140 days

Recorded milk yield for first 140 days (or 20 weeks) = 1400 liters

follows page 5 ☞

Unrecorded duration = 305-140 = 165 days
Average daily yield = 1400/140 = 10 liters
Available last recorded daily milk yield = 9.5 liters
Estimated future daily milk yield = 0.215 + 0.510(9.5) + 0.162(10) = 6.68 liters
(The coefficient of regression equation for near 140 days (i.e. 20 weeks) of lactation length for later (>1 lactation) calvers calved in summer from Table 1 have been used)
Estimated milk yield for unrecorded duration = 6.68 x 165 = 1102 liters
Standardized 305 day milk yield = 1400 + 1102 = 2502 liters
Graphical presentation of this example is given in Figure 1.

Example 2:
If the above buffalo had calved in December (winter), her predicted 305-day milk yield would be as follows:
305-day predicted milk yield =
= 1400 + [0.155 + 0.533(9.5) + 0.183(10)](165)
= 1400 + [7.05] (165)
= 1400 + 1163
= 2563 liters

Example 3:
If this buffalo was in her first instead of third lactation, had calved in December (winter), her predicted 305-day milk yield would be as follows:
305-day predicted milk yield =
= 1400 + [0.089 + 0.405(9.5) + 0.234(10)] (165)
= 1400 + [6.28] (165)
= 1400 + 1036
= 2436 liters

REFERENCES

AKRAM, M. (1997). Genetic and phenotypic aspects of diurnal variation in milk yield of buffaloes. M.Sc. Thesis., Dept. Anim. Breed. Genet., Univ. Agric., Faisalabad.

CHAUDHRY, H. Z. (1998). Genetic and environmental aspects of shorter lactations in Nili-Ravi buffaloes. M. Sc. Thesis, Dept. Animal Breeding and Genetics, University of Agriculture, Faisalabad.

KHAN, M. S. (1996). Adjustment of milk yield for lactation length in Nili-Ravi buffaloes. Pakistan J. Agric. Sci. 33:77-81.

KHAN, M. S. (1997). Predicting lactation milk yield from last test day yield in buffaloes. Buffalo Bulletin. 16(4):78-80.

Figure 1. Lactation length adjustment of milk yeld in Nili-Ravi buffaloes (example 1)

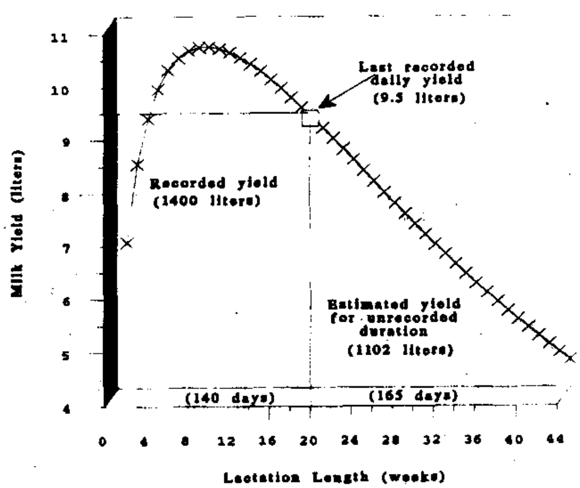


Table 1. Regression equations to predict future daily milk yeld from last test day milk yeld and average daily yeld in buffaloes.

Lact. Lenght	First Calvers (summer)			First Calvers (winter)			Later Calvers (summer)			Later Calvers (winter)		
Weeks	α*	b_1**	b_2***	α*	b_1**	b_2***	α*	b_1**	b_2***	α*	b_1**	b_2***
8	0.510	0.362	0.242	0.863	0.285	0.294	0.816	0.524	0.097	1.478	0.323	0.245
10	0.378	0.366	0.244	0.714	0.342	0.238	0.626	0.457	0.180	1.123	0.342	0.255
12	0.357	0.397	0.213	0.535	0.312	0.275	0.689	0.507	0.118	1.117	0.300	0.289
14	0.229	0.363	0.255	0.314	0.362	0.243	0.526	0.494	0.153	0.859	0.351	0.271
16	0.223	0.391	0.227	0.384	0.408	0.198	0.482	0.566	0.083	0.555	0.379	0.268
18	0.242	0.417	0.203	0.091	0.411	0.225	0.383	0.535	0.124	0.309	0.559	0.132
20	0.150	0.436	0.189	0.089	0.405	0.234	0.215	0.510	0.162	0.155	0.533	0.183
22	0.308	0.484	0.131	0.030	0.478	0.191	0.496	0.507	0.135	0.088	0.567	0.167
24	0.339	0.483	0.130	0.232	0.472	0.223	0.391	0.463	0.180	0.269	0.530	0.184
26	0.361	0.508	0.105	0.110	0.467	0.220	0.302	0.530	0.132	0.002	0.504	0.251
28	0.198	0.522	0.115	0.182	0.500	0.208	0.127	0.500	0.169	0.098	0.432	0.292
30	0.262	0.503	0.129	0.046	0.562	0.157	0.422	0.522	0.128	0.205	0.464	0.262
32	0.396	0.554	0.088	0.033	0.550	0.163	0.641	0.516	0.111	0.275	0.607	0.141
34	0.468	0.547	0.088	0.099	0.582	0.166	0.107	0.5694	0.125	0.036	0.606	0.179
36	0.517	0.671	0.016	0.137	0.601	0.137	0.110	0.657	0.096	0.135	0.627	0.193
38	0.315	0.712	0.037	0.157	0.617	0.175	0.081	0.568	0.192	0.049	0.724	0.124
40	0.245	0.784	0.027	0.039	0.655	0.147	0.007	0.743	0.093	0.104	0.617	0.207
42	0.165	0.794	0.054	0.063	0.671	0.147	0.098	0.802	0.071	0.273	0.662	0.154

* Intercept - ** Regression of future daily milk yeld on last test day milk yield
***Regression of future daily milk yield on average daily milk yield from recorded lactation

RECENT TRENDS IN BUFFALO PRODUCTION IN NEPAL - A REVIEW -

D.P. Rasali[1]

[1]Nepal Agricultural Research Council, Agricultural Research Station, Lumle P.O. Box 1, Pokhara, Nepal

PARKOTE TYPE BUFFALOES IN THE WESTERN HILLS

INTRODUCTION

Buffaloes have been raised under farming systems of Nepal throughout the known history. They are the traditional provider of milk, meat, hides, manure, draft power and also the reserve capital for the farm families. They are mainly raised by the smallholder farmers across all the physiographic agro-ecological (Agro-eco) zones of the country. Due to a key role played by buffalo in the farming systems of the country from the time immemorial to date, interest in this livestock species is ever growing as more systematic planning is adopted for growth of the country's agrarian economy. This paper attempts to focus some of the trends evident in the production of this species of livestock and future prospects for further development.

POPULATION TRENDS

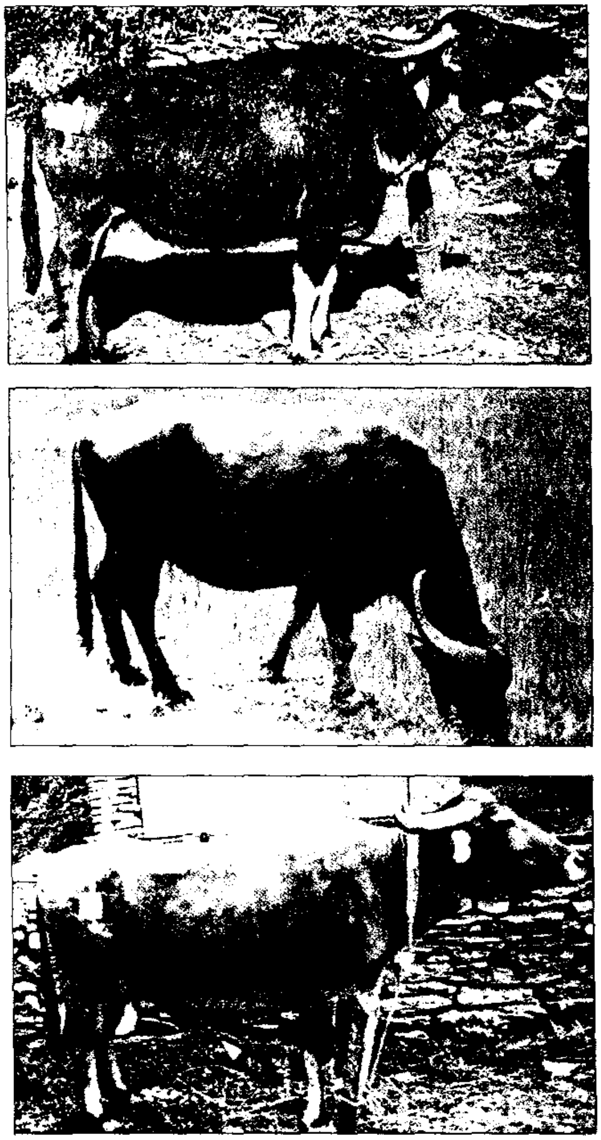
Official statistics (CBS, 1997) shows that Nepal has currently a population of 3.34 million buffalo which are distributed throughout the country's Agro-eco zones or the administrative development regions (See map) as presented in Table 1. The statistical figures indicate that the buffalo number is highest in Western Development Region (28.2%), followed by Central (24.3%) and Eastern (20.7%) regions. Overall across the Agro-eco zones, 57% of the buffalo population are found in the middle hills, followed by Terai plains (33.1%) in the South, and Mountains (9.1%) in the North. Analyzing the 1993 data, Moioli (1996) reported that Nepal ranked seventh in total number of buffalo among the countries world over, while there has been the trend of increase in the population between 1979 and 1993 by 28%.

follows page 7 ☞

Table 1. Buffalo population distribution across the physiographic agro-ecological zones and development regions in Nepal (figures in '000).

AGRO-ECO ZONES	DEVELOPMENT REGIONS					TOTAL
	Far-western	Mid-western	Western	Central	Eastern	
Mountains	89.3	31.8	0.2	96.5	86.6	304.5
Hills	184.3	265.7	756.1	410.0	302.9	1918.7
Terai	136.0	192.8	193.2	311.2	306.0	1139.2
Total	3409.6	490.3	949.6	817.5	695.4	3362.4

Source: CBS, 1997.



LIME TYPE BUFFALOES IN THE WESTERN HILLS

PRODUCTION AND ITS CONTRIBUTION TO THE ECONOMY

The estimates of buffalo milk and meat production for the year 1996/97 are shown in table 2 showing that most of the milk and meat production was distributed in three of five development regions, Western, Central and Eastern, with their percentage of milk produced being 31.6, 27.6 and 18.9 respectively, and that of meat produced being 22.6, 31.4 and 21.7 respectively (CBS, 1997). The figures of buffalo products amounted to 69% of the total milk production and 65% of the total meat production in the country (Singh and Chapagain, 1999). The level of buffalo milk production also places Nepal among a few other countries, viz. India, Pakistan and Egypt where buffalo milk has been evidently the main animal food (Moioli, 1996). National Planning Commission estimates for 1993 showed that the total livestock gross domestic product (GDP) amounted to the tune of NRs 11, 314 millions (currently, US$ 1 = NRs 68) which is 26.7% of the total agricultural GDP in the country, and buffalo is the key livestock species contributing about 53% of total livestock GDP, mainly through the production of milk and meat (Singh and Chapagain, 1999). Contribution of buffalo to soil fertility management is an integral component of farming systems in Nepal (Rasali et al., 1996). The buffalo drought power is of particular importance to Terai plains and inner Terai valleys. Other bye-products from buffalo such as hides and bones, and also the use of buffalo as the reserve capital assets of the smallholder farm families have significant importance to the rural economy of the country. In addition, export of buffalo ghee (clarified butter oil) to India is a traditional foreign exchange earner for Nepal. The total ghee exported through the major customs points located in Bhairahawa, Nepalganj and Dhangadi areas amounted to NRs 44.2 millions in 1994/95 (Customs Dept., 1995). And, recently, an avenue of fluid milk

follows page 8 ☞

Table 2. Buffalo milk and meat production across the development regions of Nepal (1996/97).

Development Regions	Milking buffalo and milk production		Buffalo meat produced ('000 mt)
	No. of milking cows ('000 Nos.)	Buffalo milk produced ('000 mt)	
Eastern	167.4	132.3	24.6
Central	207.3	194.0	37.9
Western	373.1	221.8	25.7
Mid-western	94.5	74.5	12.9
Far-western	115.0	79.4	12.5
TOTAL	957.4	702.0	113.5

Source: CBS, 1997.

export to India is also opened indicating the further potential contribution from the multipurpose buffalo production in the country. However, despite high economic importance of buffalo with their large domestic population, Nepal has also been importing buffaloes annually from India to the tune of 120 thousands (Shrestha et al 1998) mainly for meat supply in Kathmandu, the country's capital city and upgrading domestic herds with Indian Murrah breed.

PRODUCTION SYSTEMS

As the buffaloes are reared by most of the farmers who are by and large the smallholders in the mixed farming systems in Nepal, their production systems vary greatly across the Agro-eco zones. In Southern Terai belt, inner Terai and mid-hill river valleys, buffaloes are mainly kept under complete stall feeding during seasons of crop cultivation and are occasionally tethered or allowed to graze freely in the corp fields whenever there are no standing crops. Stall feeding is more permanent for the higher yielding animals. In the Himalayan foot hills, grazing of buffalo in the village pasture, forests and recently harvested crop fields is more frequently seen, although there is a tendency to keep the milking buffalo within the fence of the homesteads. In the high hills and mountains, they are even reared under migratory herds which are taken up to the high altitude of alpine pasture, sometimes beyond 3500m asl, crossing the tree line in the Southern face of the Himalayas. Thus, environments in which buffalo are reared are diverse depending upon their physiographic locations.

Buffaloes in Nepal are well known for their ability to thrive on low quality forage, as they utilize crop residues- straws of rice, millet, wheat and legumes across all agro-ecozones, but are also fed on green forage. It is usually a milking buffalo which is offered with high quality green fodder and some supplemental grains on regular basis.

In Terai, inner Terai and the lower hills, buffalo are usually given a permanent housing either separate from or attached to the house of the owner farmers. As the altitude increases towards North, the buffalo housing tends to be increasingly temporary and poorly built, exposing the animals to increasingly cold climate.

BREED TYPES AND THEIR GENETIC IMPROVEMENT

The buffalo population in Nepal can be broadly classified into three groups based on their breed characteristics- Hill buffalo, Terai buffalo and Indian breeds. Lime, Parkote and Gaddi are the three breeds of Hill buffalo reported in the literature (Rasali et al 1999). Lime and Parkote buffaloes have been characterised to the extent of being phenotypically recognisable.

Lime are found in greater number in the northern areas of high hills and mountains, Parkote are found more towards the southern mid hills. Recently, Rasali et al (1998b) reported four distinct clusters of hill buffaloes in the Western Hills- viz. Lime breed type, Parkote breed type, Lime dominant intermediate type and Parkote dominant intermediate type. These four clusters of Hill buffalo types which form majority of the buffalo population, are found to have karyotype of riverine buffalo, leaving probably no possibility that there could be any swamp buffalo in the country (Rasali et al, 1998b). Gaddi buffaloes are found in the Far-western Development Region. Due to lack of systematic study on the population and breed characterisation, Terai buffalo are largely considered as the non-descript type. Apart from these indigenous buffalo, about 10 % in the hills and little over 10% in Terai, of the total buffalo population, are said to be of Indian Murrah breed or their crosses which have come into existent in the various pocket areas of the country as a result of crossbreeding programme and occasional imports of buffaloes from India. There has been also introduction of Nili Ravi breed into Nepal, but their number is negligible. There has been some increase in milk production in the country as the result of the national programme of crossbreeding the indigenous buffalo with the Indian Murrah breed for more than 40 years. However, the trend of mongrelisation of buffalo due to indiscriminate breeding practices among the indigenous breeds, and also haphazard crossbreeding of indigenous breeds with Indian Murrah blood has been evident in the recent times.

In the efforts of genetic improvement, Animal Breeding and Artificial Insemination Section of Department of Livestock Services has been using Murrah forzen semen produced locally or imported from India for their insemination services provided through 132 outlets in some 42 accessible districts. The section has recently spelled out the policy of the unrestricted artificial insemination of buffaloes with Murrah bull semen in Terai and maintaining 62.5% of the Murrah breed blood level in the middle hills (ABAIS, 1997) as against the past blanket policy of indiscriminate crossbreeding with Murrah breed. Based on the studies carried out at Lumle Agricultural Research Centre of Nepal Agricultural Research Council, crossbreeding of indigenous buffaloes with Murrah breed in the Western hills for past four decades has not caused much impact on the buffalo population of the western hills and mountains (Rasali and Crow, 1999), as the combined adoption of crossbred cattle and buffalo the area was only 14.2% (Floyd et al, 1999).

HERDS SIZE AND PERFORMANCE RECORDING

A Murrah buffalo herd is maintained at Livestock Development Farm of Department of Livestock Services at Pokhara. This is the

follows page 9 ☞

largest institutional herd which was comprised of 6 breeding bulls, 88 milking cows, 33 young bulls, 68 heifers, 19 male calves and 21 female calves by the end of 1995/96 (Singh, 1996). This herd serves as a resource centre for supply of most of the Murrah buffalo bulls distributed annually to the farmers through buffalo breeding programme. There are other smaller herds of less than 50 breeding buffaloes which are established mainly for experimental purpose. These include a herd of Western Hill buffaloes kept at Lumle Station, a mixed herd of Terai buffalo and Murrah buffalo at both of Tarahara Station and Rampur Campus. Performance recording involving traits such as lactation yields, age at calving and calving intervals are routine records kept in these stations. The average performance of Murrah buffaloes at Lampatan Farm are presented at Table 3. Farmers herds are largely small holdings with most of the herds comprising less than 5 breedable buffaloes. There are only a very few number of large herds belonging to more resourceful farmers in Terai and a few migratory herds in the high hills, but their exact data are not available. There is a great lack of information on the production and reproduction performance in the farmers herds across the country. A few studies to compare the performance of indigenous and Murrah crossbred buffaloes involving milk recording activity in the farmers reared buffaloes have been reported for the hill buffaloes (Rasali et al, 1998a).

Table 3. The production and reproduction performance records of Murrah buffalo herd at Lampatan Livestock development Farm averaged (by 1996)

TRAITS	NUMBER OF RECORDS	MEAN±SD
Milk yield, kg/lactation	54	1265.9±380.7
Calving interval, days	60	587.6±151.5
Calving to conception, days	49	300.4±146.0
Days dry, days	57	333.3±62.7

Source: Singh (1997).

The performance of the buffaloes across various exotic blood level reported from the third round of milk recording study conducted in the Western Hills are given in Table 4 which showed that the performance of the Hill buffaloes except for the milk yield was comparable to Murrah crossbreds. However, apart from these comparative studies, regular milk recording as a tool for genetic improvement through selective breeding is lacking.

DEVELOPMENT PROSPECTS

The long term Agricultural Perspective Plan (1995-2015) of Nepal had envisaged that the milk and meat production in the country would grow during the plan period at the annual rate of 4.5 % and 5.4 % respectively with increases by 2.8 and 1.5 times respectively from the growth rates at the base year 1993 to meet the demands of these commodities (Singh and Chapagain, 1998). As this growth is expected to be largely achieved through the increase in buffalo production, the development prospects for this livestock have been highly emphasized in the plan.
The recent development in the national policy relating to the livestock sector focuses on promoting buffalo as the

follows page 10 ☞

Table 4. The least-squares means of performance traits of buffaloes across breed blood levels in the western hills of Nepal (Rasali et al 1998a)

PERFORMANCE TRAITS	BUFFALO BREED BLOOD		
	HILL BUFFALO	50% MURRAH CROSSBREDS	75% MURRAH CROSSBREDS
1. 305-day lactation yield, litres	874.7±30.7 (234)	1222.7±41.8 (93)	1560.3±51.3 (61)
2. Milk fat content, %	7.0± 0.2 (234)	7.0± 0.2 (90)	6.7± 0.3 (61)
3. Lactation length, days	351.3± 9.8 (223)	354.9±14.4 (88)	379.9±17.6 (57)
4. Age at first calving, days	52.9± 0.8 (215)	56.6± 1.2 (86)	55.5± 1.6 (53)
5. Calving to first service, days	197.8±14.0 (202)	189.1±20.8 (76)	201.9± 3.0 (45)
6. Calving interval, days	495.9±16.4 (188)	446.4±25.4 (63)	500.6±29.7 (47)

Figures in the parentheses indicate the number of records.

animal of choice for both milk and meat production, largely on the consideration that buffalo is the multipurpose species of livestock with lesser requirement of health care and high ability to convert low quality roughage into high quality food as compared to exotic dairy cattle breeds. The species has also an advantage over the cattle which are protected by religion and law of the land from culling and slaughtering. The nation wide network of Department of Livestock Services has been improved greatly in recent years through the inputs of development projects including an Asian Development Bank funded Livestock Development Project and an European Union grant funded project for strengthening of veterinary services. Livestock research has been institutionalised by Nepal Agricultural Research Council during the recent years. The Tribhuvan University has initiated program for Veterinary and animal husbandry education in the country. However, these three sectors which are in place now should be directly linked to address the manifold constraints of buffalo production (Rasali et al 1999) and alleviate them for improving the production, as there are ample opportunities for achieving the production targets set out in the Agricultural Perspective Plan through an integrated research and development programme for buffalo.

REFERENCES

CBS. 1997. Agricultural Statistics Nepal- 1996/97. Central Bureau of Statistics, National Planning Commission Secretariat, Kathmandu, Nepal.

ABAIS. 1997. Annual Report -1996-97: Animal Breeding and Artificial Insemination Section, Department of Livestock Services, P.O. Box 8814, Kathmandu, Nepal.

CUSTOMS DEPT. 1995. Customs records for 1994/95. Department of Customs, His Majesty's Government of Nepal.

FLOYD, C.N., HARDING, A.H., PAUDEL, K.C., RASALI, D.P., SUBEDI, K.D. AND SUBEDI, P.P. 1999. the adoption and Nepal. Overseas Development Institute, London, UK. AgREN Network Paper No. 90.

MOIOLI, B.M. 1996. An analysis of recent statistics on buffalo milk production and use in the world. Buffalo Journal. 2:115-126.

RASALI, D.P. AND CROW, G.H. 1999. Production of buffaloes (Bubalus bubalis) in the mountains and hills of Nepal: Constraints and opportunities. FAO/ILRI/ICIMOD/CIP Livestock in Mountain/Highland Production Systems E-Conference <Highlands L@mailserv.fao.org> (Nov.-Dec. 1999).

RASALI, D.P. GURUNG, D.B. AND YADAV, E.R. 1998a. Performance recording of lactating local and crossbred cows and buffaloes of various exotic breed blood levels under farmers' management in the Western Hills (1995-97). Lumle Agricultural Research Centre, Pokhara, Nepal. Working Paper No. 98/39:14 pp.

RASALI, D.P., JOSHI, H.D., PATEL, R.K. AND HARDING, A.H. 1998b. Phenotypic clusters and karyotypes of indigenous buffaloes in the Western Hills of Nepal. Lumle Agricultural Research Station, Pokhara, Nepal. Technical Paper No. 98/2: 24 pp.

RASALI, D.P., SUWAL, M.R.S., VAIDYA, A.K. AND JOSJI, K.D. 1996. Contribution of livestock to soil fertility management system in the western mountains of Nepal. Proc. Workshop on formulating a strategy for soil fertility research in the hills of Nepal 17-18 August, 1995. (Ed. Joshi et al.). Lumle Agricultural Research Centre, Pokhara, Nepal/ Natural Resource Institute, London, UK. p. 43-52.

SINGH, D.B. 1997. Buffalo Production Unit. In: Annual Report- Livestock Development Farm, Lampatan, Pokhara, Nepal-1995/96.

SINGH, S.B. AND CHAPAGAIN, D.P. 1998. Livestock sector in the Agriculture Perspective Plan. In "Proceedings of the first national workshop on animal genetic resources conservation and genetic improvement of domestic animals in Nepal- April 11-13, 1994 " Ed. J.N.B. Shrestha. Nepal Agricultural Research Council, Khumaltar, Nepal. p. 117-128.

SHRESTHA, H.R., KUNWAR, B.S., MANDAL, P., THAPA, M.S. AND PANDEY, S.B. 1998. Effect of feeding urea and molasses treated rice and wheat straw diet on the body weight gain and carcass characteristics of male buffalo calves. Proc. 8th World Conf. Anim. Prod., Seol, Korea, p. 70-71.

RICE STRAW FEEDING - DIFFICULTIES AND RESULTS

Sami Taher

13 Moh. Tawfik Bakry St., Heliopolis, Cairo, Egypt, email: eltaher@hotmail.com

During the Buffalo Feeding Conference that was held in September '98 at Mustapha Kemal University in Antakia – Turkey, I have introduced our success in feeding buffalo with ammoniated rice straw. It took us over 13 years (1986-1998) to create an adequate process to produce the nutritive mixture that we called **"Rice Straw Flakes" (R.S.F.).**

Now, I would like to accurately describe the difficulties that we faced and how we handled them. From the beginning, I believed that the ammoniated rice straw is an ideal source of food and so I insisted on following this track.

For feeders around the world, hay is just a substance that fills the animal stomach. I used to think the same. In Egypt we have three main sources of hay with different nutritive values (see Table at page 11).

Barley hay is the best. It has a soft fiber and is nutritive, but it is not available in our area. Wheat hay has stiff stems and low nutritive value. However, all animal breeders depend on it to feed their cattle. Most experts say that rice straw is nothing better than "sand".

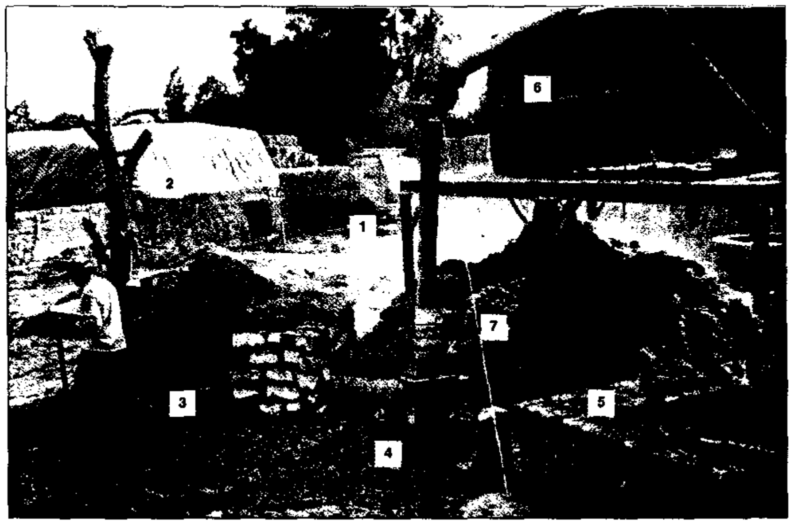
In our farm, we have used the rice straw to feed animals since a long time ago. Rice straw has a fine fiber with no nodules and its price is quarter the price of wheat hay.

In 1986, the Animal Research Institute in Cairo,

follows page 11 ☞

	HUMIDITY	RAW PROTEIN	FAT	ASH	DISSOLVE CARBOHYDRATES	RAW FIBERS
Wheat Hay	6.8	1.6	0.4	10	44	37
Barley Hay	6.9	2.2	0.8	13	42	34
Rice Straw	9.0	2.0	0.6	17	39	30

together with experts from Europe introduced the idea of treating rice straw with ammonia under plastic sheeting. We executed the idea under their supervision in limited quantities. Chemical analysis indicated a 6-8% increase in non-protein nitrogen.
The results were not easy to note in the appearance and productivity of the milking buffalo because they were fed concentrates and green fodder in big quantities. The dry buffalo (that were fed non-treated rice straw and green fodder only) showed an obvious improvement in the general appearance when fed with treated rice straw. The consumption of the treated rice straw by all buffalos increased. That gave an indication about the importance of ammoniating rice straw.
Later, the Institute experts and the European Consultants suggested adding molasses to the ammoniated rice straw. It was difficult to manually handle this idea. The workers had to carry the molasses in small containers and walk for a distance. Molasses was dropped everywhere, on the ground and on the sides of the concrete mangers. The place became dirty. The molasses was not evenly distributed. Some rice straw got big quantities of molasses while other got nothing. The far mangers didn't get any molasses. Thus, we tried putting the molasses in containers around the barn. We found that some buffalo sucked too much molasses while others didn't take its needs. Moreover, the buffalo, when moving its head around, dropped molasses from its mouth. It was a mess. In addition to the above experience, the delay in the delivery of the ammonia and molasses resulted in



1) A truck loading rice straw balls - 2) A Bile of 100 tons sheeted and ammoniated - 3) A cutter of rice-straw - 4) Blower - 5) A pool of 30 tons of molasses - 6) The mixer - 7) The feed completly prepared (rice-straw: ammoniated, cut, mollasse-added).

complications in the workflow. Thus, we stopped using molasses and ammoniating the rice straw.
I always had the idea in my mind. In a visit to an Agricultural Exhibition in Cairo, I found a mechanical unit that would satisfy the requirements to have the rice straw chopped and mixed with molasses.
This unit was bought and operated in January 1992. We started a new period of struggle to operate the unit. The workers are of low profile and found it difficult to handle the operation of the machine, and the electrical and mechanical mal functions. For example, the gearbox and the solid block were broken three times. Thus, I had to change the design and introduce belts in the motion points. Moreover, the electrical system on the unit was complicated and needed experts to handle it. Thus, I changed several parts of the machine to get a more practical design. The machine ended up as follows:

- Kept the large mixer and the new gearbox that we designed.
- Manufactured a new chopper
- Manufactured a new blower that sucks the rice straw and blows it to 3 meters high instead of 7 meters
- Built a big basin for the molasses. Its capacity is 30 tons instead of 0.5 ton and it has a granite ruler to measure the cycle of adding and withdrawing of the molasses. At the middle of the basin, there is a motor mixer that stirs the rare minerals and any other additions.
- Added a container – capacity 1 ton – over the mixer to be filled with the molasses once, instead of providing molasses on continuous basis. The molasses flow down to the mixer by itself through a handy valve.

follows page 18 ☞

It took us over 6 years (1992-1998) to simplify the work processes and overcome the bad functions. In this process, we treated the rice straw with ammonia, chopped it and added molasses and rare elements to produce the nutritive mixture of Rice Straw flakes.
We now consume 600 ton / year rice straw treated with ammonia and 180 tons of molasses to feed 120 mothers and 65 calves. We noted that we couldn't get tangible results unless the R.S.F. was available 24 hours for the buffalo.
This success was satisfactory after 13 years of persistence. The signs of success were obvious in the increase in the weight of the buffalo. On average, the mature buffalo weighs 500-550 kgs. The average weight after feeding buffalo with R.S.F. increased to 650 kgs. Milk production increased by 10%. The most important result was the reduction in the cost of food.

The following table compares prices of some food in Egypt:

Item	Price in Egyptian Pound per ton
R.S.F.	125 - 130
Corn Silage (Dry matter)	350
Grounded Corn	500

The following table (page 13) shows the effect of R.S.F. on the total cost of food per buffalo to produce 10 kgs. of milk.

In Jan. 1998, we conducted a trial on 4 buffalos to examine how an increase in a food component would affect their milk productivity. Each buffalo produced 10 kgs of milk per day before the trial. The Concentrate component was increased from 4 kg to 10 kg for each buffalo for 30 days. The milk produced by each buffalo increased by 0.5 kg only. This proved that the animal got all what it needed from the main program of feeding that we provided: low concentrates and high amount of R.S.F.

GROWING BUFFALOES FED 1KG. RSF

LACTATING BUFFALO. DAILY MILK YIELD-14 KG. FED 6 KG. RSF

****

I assume that the Rice Straw Flakes is not just a substance that fills the stomach, but it is a full source of energy and animal protein. This was proved as follows:

Treating rice straw with ammonia breaks lignin and the cellulose becomes free and easy to be digested either by stomach secretions or by rumen Protozoa and Bacteria. I suppose the percentage of digestion increased to 70-80%

The following is the most important issue to discuss:
We all know that micro-flora **helps** in digesting hard concentrates as cotton-seeds, corn, soya bean, bran ..etc. The micro-flora itself grows and benefits animals as animal protein to some extent.
In our case, **it is not just a matter of help.** The results indicate that we made a "Micro-flora Farm" that

follows page 13 ☞

produces animal protein.
For 24 hours, the rumen is filled up with:

- Big quantities of free cellulose (fine carbohydrates easy to digest)
- Some molasses to encourage and start growing of micro-flora
- Easy nitrogen to absorb and push growing of the micro-flora to build their protein contents.
- Enough elements to be used by micro-flora to grow and to keep doubling

ITEM	**E.G.P./ TON**	**JAN 1988**		**JAN 1998**	
		KG	**COST E.G.P.**	**KG**	**COST E.G.P.**
Concentrates	600.00	10	6.0	4	2.4
Berseem (e.g. clover)	45.00	30	1.3	30	1.3
R.S. untreated	50.00	4	0.2		
R.S.F. fully treated	130.00			10	1.3
TOTAL		44	7.5	44	5.0

The question is: Have we succeeded in transforming the R.S.F. to sufficient amounts of animal protein?

I suppose that the Micro-flora gets the ideal media to accelerate its doubling to compose around 3-4 kgs of the animal protein in the animal rumen.
I suggest more research about this subject and am willing to co-operate to reach scientific results. •

PREGNANT BUFFALOES FED RSF PLUS 1 KG. CONCENTRATE

THE YARD RE-PREPAIR TO RECEIVE NEW STOCK. IT IS BUILT FROM LIMSTONE & CLAY-MUD

LACTATING BUFFALOES

PREGNANT BUFFAOLES FED 1KG. RSF

THERMOREGULATION IN BUFFALO

M.M. Aliyev

Azerbaijan Agricultural Academy, 262 Ataturk street, Ganja 374700, Azerbaijan

Buffalo has peculiar biological and economical qualities which allow it to survive and to produce in hot climate countries. In these countries, buffalo development has good perspectives.
Chemical and physical parameters on which thermoregulation is based are not fully known yet. Without the knowledge of these parameters it is impossible to define maintenance requirements and optimal husbandry systems for this species.
Researches carried out in our Institute indicated that buffalo show peculiarities in gas metabolism, heat transfer and heat production. As regards to gas metabolism, buffalo behaves in a similar way as the high productive cattle breeds: in other words, energy expenditure is more economically and rationally utilized.
When submitted to high temperature conditions (over 27 °C) heat transfer and heat production arise proportionally. Heat is taken away from the body through the skin which has a peculiar microstructure in buffalo.
Gas metabolism and heat transfer are strongly affected by age, weight, season, level of milk efficiency and environmental conditions.
All components of the microclimate - temperature, humidity and wind - influence thermoregulation.
In our research we have determined neutral thermal zones for every age group of buffaloes, as follows:

AGE OF BUFFALOES	TEMPERATURE (°C)
< 1 month	18-23.5
1-6 months	15-20
> 6 months and adults	15-18

SIRE OF BULLS CHARDAK, BREEDING STATION OF DASHUZ

MILKING BUFFALOES AT DASHUZ STATION

Changes in the air temperature from the neutral zone, make heat production to increase or decrease. A temperature increase over the neutral zone produces an increase in lung ventilation and breathing frequency. A temperature decrease below the neutral zone stimulates metabolism and involves an increase in gas inter-change and energy expediture for warming feedstuff and drinking water.
When air temperature is over 27 °C, especially in sunny days, there is a decrease in heat transfer through the lungs and the skin and the animal accumulates energy in the body, reducing in this way the functional basis metabolism, and causing a rise of body and skin temperature. In this case usually buffaloes lie down in the paddock, in the mud or in the pool. The contact with a cooler means allows the heat transferring system to release the abundance of accumulated energy. Buffaloes that are offered a shower-bath pool for 30-60 minutes after two hours exposition to sun radiations restore all biological functions: respiratory, cardio-vascular, digestive and thermoregulation.
Aliev M., Nagiev R. and Gezalov S. have devised the following equation:

$$F=0.07865 \sqrt[3]{W^2}$$

to determine buffalo body surface (F) on the basis of body weight (W) following a study in which experimental measurements and weights taken from birth to mature age.
When sheds and paddocks for buffaloes are built, it is strictly necessary to observe optimal microclimate and consider objective parameters such as ventilation and heat measurements.

follows page 15 ☞

Table 1. Buffalo metabolism parameters

ANIMAL GROUP	BODY WEIGHT, KG	HEAT (KKAL/HOUR) TOTAL	HEAT (KKAL/HOUR) RELEASED	CARBONIC ACID (L/HOURS)
Young calf	30	64	45	9
	40	82	56	12
1-3 months	60	115	82	17
	80	141	98	23
3-6 months	100	176	117	25
	120	200	142	31
6 months to 1 year	150	257	180	39
	200	313	120	43
Over 1 year Heifers	250	420	297	65
	300	487	341	75
	400	566	326	86
Buffaloes two months before calving	500	715	503	110
	600	813	588	126
Lactating buffaloes by milk yield, kg				
2.5	400	578	404	88
	500	726	526	511
	600	836	591	128
5.0	400	625	436	96
	500	737	522	114
	600	855	607	132
8.0	500	758	536	116
	600	871	618	113

Moreover, the physiological parameters such as gas metabolism and thermoregulation must be considered. Because the physiological parameters are highly affected by age, lactation stage and weight, our researches have aimed to calculate these parameters for different age groups. Results are reported in Table 1. Optimal physical parameters of the air were calculated by our Institute and are reported in table 2.

Table 2. Phisical parameters of the air

	T °C	HUMIDITY (%)	AIR CHANGING SPEED (M/SEC)
Young	15-18	75-80	0.2-0.3
Adult	14-16	75-80	0.3-0.5

EFFECT OF TYPES OF BEDDING ON UDDER AND HOOF HEALTH AND BEHAVIOUR IN NILI-RAVI BUFFALOES

S.Hassan Raza, Shafiq Ahmad, M. Anwar and Arshad Iqbal

Department of livestock Management, University of Agricolture, Faisalabad, Pakistan

ABSTRACT

12 lactating Nili-Ravi buffaloes were randomly allotted to three bedding viz. (A) concrete floor, (B) concrete floor + sand (C) concrete floor + paddy straw. Data on hoof growth, wear, udder health, somatic cells count (SCC), and their behaviour were recorded and analysed. Results revealed that bedding has a significant effect on hoof wear and tear, somatic cell count and animal behaviour. Animals on sand bedding showed significantly less wear and tear in hooves. The SCC was minimum on sand bedding and animals exhibit better behaviour.

INTRODUCTION

An unsuitable flooring coupled with poor and unhygienic bedding often results in lameness and udder problems. These health hazards turn into source of ultimate infection and reduction in animal productivity (Phillips and Schofield, 1994). Hoof wear has been shown to be twice as rapid on a wet surface compared to a dry one because of softening of the horn tissue (Spindler, 1973). The effects of different types of bedding materials (rice straw, wheat straw, sand, wood shaving, saw dust, rubber mates, paper, etc.) and floor types on the hoof health and animal's performance have been well documented by many research workers (Rowlands et al, 1983 and Maton *et a.*, 1985) in exotic animals but no study so for has been undertaken to investigate the floor and bedding effects on animal's performance in buffaloes.

follows page 16 ☞

The present study was planned to investigate the effects of different types of bedding on the animal's behaviour, hoof growth and wear, incidences of lameness, mastitis and udder health in lactating Nili-Ravi buffaloes.

MATERIALS AND METHODS

Twelve lactating buffaloes of almost same age, lactation number and lactation stage were selected from herd maintained at Livestock Experiment Station, Department of Livestock Management, University of Agriculture, Faisalabad. These animals were randomly allotted to 3 treatments, A (concrete floor), B (concrete floor + sand) and C (concrete floor + paddy straw) for a period of 6 weeks excluding 2 weeks adjustment period. Treatment "A" served as control. During the experimental period animals were observed for any hoof and udder problem. To measure the hoof growth and wear, method described by Hahn *et al.* (1986) was used. The udder was washed before and after each milking, milk samples were analysed for sometic cell count using technique described by Schalm et.al. (1971). Data were recorded on standing, sitting and lying behaviour of individual animals to evaluate the comfort by technique reported by Phillips and Schofield (1994). Data collected were analysed using software MINITAB (Minitab version 9.2, 1993, USA).

RESULTS AND DISCUSSION

1: HOOF HEALTH.

The data on hoof growth, Wear and their combined effect (growth + wear) for rear and front hooves were statistically analysed.

1.1: FRONT HOOF.

The results revealed that effect of types of bedding on hoof growth for front hooves was non-significant ($P<0.05$) in all treatments (Table 1). However, the use of bedding significantly affected the rate of wear in all treatments. The highest rate of wear (0.1167 ± 0.0167 mm) was found in animals kept on concrete floor without bedding and the lowest value (0.05 ± 0.0224 mm) was for those animals kept on sand bedding. Comparison of means of treatments showed that treatment "A" differed with treatment "B" but not with treatment "C". While, the difference between means for treatments "C" and "B" were non-significant. The over all rates of combined effect of growth and wear found to be significant ($P<0.05$) in all treatments. The mean values for treatments "C" and "A" were found non-significant but differed significantly than those of treatment "B". In case of sand bedding, the combined effect of wear and growth was the highest.

1.2: REAR HOOF.

The values for wear and growth for rear hoof did not differ significantly in all treatments (Table 1) but rate of growth and wear (combined) was found to differ significantly ($P<0.05$). The treatment "A" differed significantly with treatment "B" but not with treatment "C". The difference for rate of growth+wear for treatment "B" and "C" was

follows page 17 ☞

Table 1: Effect of types of bedding on growth, wear and growth and wear rates (mm) in Nili-Ravi buffaloes.

	TRs	GROWTH	WEAR	GROWTH and WEAR
FRONT HOOF	A	0.1833 ± 0.0167^{a}	0.1167 ± 0.0167^{a}	0.0667 ± 0.0211^{a}
	(sand) B	0.1833 ± 0.0167^{a}	$0.0500 \pm .0.0224^{b}$	0.1333 ± 0.0211^{b}
	C	0.1833 ± 0.0167^{a}	$0.1000 \pm .0.000^{a\ b}$	0.0833 ± 0.0167^{a}
REAR HOOF	(straw) A	0.1500 ± 0.0224^{a}	0.1168 ± 0.0167^{a}	0.0333 ± 0.0211^{a}
	B	0.1833 ± 0.0168^{a}	0.0833 ± 0.0166^{a}	0.1000 ± 0.000^{b}
	C	0.1833 ± 0.0167^{a}	0.1167 ± 0.0167^{a}	0.0667 ± 0.0244^{ab}

*Values with the same super script are non-significant non significant. The results of the present study indicate that a higher rate of wear of hooves was observed in animals that were kept on concrete floor that those of bedding. Similar results were also reported by Hahn et al. (1986) and Gilmore (1978). They also reported that rate of wear was higher in animals who were confined on concrete floor than those on pastures, most probably because pasture grasses served as bedding and protected hooves from wear.

2: UDDER HEALTH.

The highest mean value for somatic cell count (SCC) 1000/ml was obtained in treatment "A" (421818 ± 19412) and the lowest mean value was found in animals kept on sand (210909 ± 11463) as shown in Table 2. Statistical analysis of the data on somatic cell count (SCC) in milk produced under different treatments was carried out and results showed significant differences in SCC among the treatments. Mean values for SCC were significantly ($P<0.05$) lower in treatment "B" than in treatments "A" and "C", whilst difference between treatment "A" and "C" was non significant.

The SCC ranged from 210909 ± 11463 to 421818 ± 19412 /ml in milk samples. Although higher number of somatic cell were observed in treatments than normal range of 50,000 to 100,000/ml, but still milk appeared to be normal and no signs of mastitis or oedema, injury or inflammation were observed in any treatment. The findings of the present study are in accord with those of Benda (1976), Facsar (1980a,b), Kelly (1985), Meaney (1986) and Matzke et. al. (1989). All these workers found that suitable bedding was helpful in keeping healthy udders, reducing the bacterial count, risk of teat injuries and mastitis.

The lowest mean for somatic cell count in animals on sand bedding is also substantiated by findings of Facsar and Hidasi (1977) and Joseph (1996). The use of masonry sand as bedding decreased the bacterial population by offering them very less harbouring environment. In this way, animals' udders stayed clean, unsoiled and with less risk of mastitis invasion. A clean surface and environment is more important for better health of udder than udder washing (Facsar and Hidasi, 1977).

Keeping in view the prevalent sanitary and hygienic conditions at farm and in our local surroundings, these values appear more than normal. If this study had been conducted for long term basis rather than 6 weeks, animals on control group might have become positive for mastitis.

3: BEHAVIOR

Behaviour of experimental animals were observed as standing, sitting and lying.

3.1: Standing Behaviour

The maximum standing time (53.62 ± 1.62 min/100 min.) was observed in animals in control treatment and the lowest values (33.97 ± 2.62 min./100 min.) was noted in treatment "B" where animals enjoyed the facility of masonry sand bedding. The time spent during standing differed significantly ($P<0.05$) in all treatments. Difference between mean standing time for control and for treatment "C" was non-significant but it differed significantly with treatment "B". On the other hand means for standing time between animals kept on bedding (sand or paddy straw) were non-significant.

Table 2: Effect of types of bedding on somatic cell count (scc) in Nili-Ravi buffaloes.

TREATMENT	S.C.C
A	424848±19412[a]
B	210909±11463[b]
C	381818±21253[a]

*Values with the same super script are non-significant

3.2: Sitting Behaviour

The highest mean sitting time (40.53 ± 2.86 min/100 min.) was observed in animals on sand bedding (treatment "B") and the lowest (36.10 ± 2.56 min./100 min.) in treatment "C". Statistical analysis showed that mean for sitting time did not differ significantly in any treatment although animals in treatment "B" showed a positive effect of bedding and spent slightly more time sitting .

3.3: Lying Behaviour

The animals on sand bedding spent significantly more time lying (24.32 ± 2.81 min./100 min.) than other treatments. The minimum time (9.68 ± 1.57-min.) was found in animals kept on concrete floor without any bedding. Statistical analysis suggested that lying time differed significantly in all treatments. The mean lying time of animals on sand bedding differed significantly with other two treatments while difference between mean lying time for treatment "A" and "C" was not significant.

A possible reason for less time spent for lying in control treatment could be that floor (bare) did not provide any protection or cushion against severity of weather and animals preferred to stand or sit than lying on floor.

The paddy straw bedding showed a disadvantage of warping during night time it served as harbouring place for mosquitoes and other insects. This interfered considerably in lying behaviour of animals in this group. This could be one of the reasons that animals in this group in spite of provision of bedding showed similar behaviour to that of animals in control group. On the other hand, buffaloes facilitated with sand bedding did not face such problems and in

follows page 18 ☞

presence of conducive environment spent more time lying than other groups. Similar behaviour of animals on sand bedding was reported by Keszthelyi (1982) where animals spent 50 % of their time lying on deep bedding. James (1995a,b) stated that with provision of bedding, cows spent more hours of day lying than before when they were kept without bedding. The animals kept without bedding refused to use their stalls (Moeller et. al., 1974 and James, 1995). Animals preferred clean and comfortable surroundings to exhibit their normal behaviour (Joseph, 1996) as in case of present research.

CONCLUSIONS:

The results of the present study indicate that by providing the better bedding environment, animals can be kept healthy and free from udder problems and expenditures on medical treatments can be minimised.

REFERENCES:

BENDA, J. 1972. Veterinary problems on large dairy farms. Veterinarstvi. 22(6): 210-212 (Dairy Sci. Abst., 37:1037, 1975).

FACSAR, I. 1980a. Effect of loafing area in dairy cowsheds on cleanliness of milk and udder health. Magyar-Allatorvosok-Lapja. 35(5):300-304 (Dairy Sci. Abst., 46:3795, 1984).

FACSAR, I. 1980b. Evaluation of industrialized dairy farms using deep litter systems from the point of view of milk hygiene and udder health. Allattenyesztes.29(6):495-502 (Dairy Sci. Abst., 44:7597, 1982).

FACSAR, I. and E. HIDASI. 1977. Relationship of changes in husbandry and milking techniques to the prevention and control of mastitis. Magyar-Allatorvosok-Lapja. 32(11):723-728 (Dairy Sci. Abst., 41:6012, 1979).

GILMORE, J. A. 1978. The effect of housing, age, breed and time after trimming on hoof measurements. J. Dairy Sci. 61(1):83 (Abst.).

HAHN, M. V., B. T. MCDANIEL AND J. C. WILK. 1986. Hoof growth and wear in Holstein cattle. Journal Dairy Sci. 69: 2148-2156.

JAMES, A. J. 1995a. We went to sand bedding in the free stalls. Hoard's Dairyman. 140(14):539.

JAMES, A. J.1995b. Rough concrete was making cows lame. Hoard's Dairyman. 140(18):697.

JOSEPH, G.1996. You can flush sand-bedded barns.Hoard's Dairyman. 141(2):6.

KELLY, M. 1985. Building design and management. Hygienic milk production. Edi. Castle, M. E.:44-58 (Dairy Sci., 1989).

KESZTHELYI, T. 1982. Optimum floor area allocations in industrial cattle farms. Allattenyesztes- es-Takarmanyozas.31(3):233-237 (Dairy Sci. Abst., 49:4054, 1987).

MATON, A., J. DAELMANS and J. LAMBRECHT. 1985. Housing of Animals. :108. Elsevier: Amsterdam.

MATZKE, P., O. RICHTER., A. HOLZER., J. DENEKE., E. KLEINSCHROTH., W. WITTMANN and F. LINDNER. 1989. Factors affecting udder disease. Bayerisches-Landwritschaftliches-Jahrbuch. 66(6):705-728 (Dairy Sci. Abst., 52:5223, 1990).

MEANEY, WJ. 1986. Environmental factors affecting new mastitis infection during winter housing. In "Animal health and machine milking".[Ed. J.O'Shea.], Dublin, Irish Republic : 266-300 (Dairy Sci. Abst., 49:1775, 1987).

MOELLER, N. J., D. L. HILL and J. L. ALBRIGHT. 1974. Concrete free stalls cause udder health and leg problems. Hoard's-Dairyman. 119 (12): 767-776 (Dairy Sci. Abst., 36:5515, 1974).

PHILLIPS, C. J. C. and S. A. SCHOFIELD. 1994. The effect of cubicle and straw yard housing on the behavior, production and hoof health of dairy cows. Animal Welfare. 3: 37-44.

ROWLANDS, G. J., A.M. RUSSEL and L. A. WILLIAMS. 1983. Effects of season, herd size, management system and veterinary practice on the lameness incidence in dairy cattle. Veterinary Record (113): 441-445.

SCHALM, O. W., E. J. CARROL and N. C. JAIN. 1971. Bovine Mastitis. Lea and Fabiger, Philadelphia. : 99-101.

Schieldt, L. 1990. Welcome to Cow Beach. International Agricultural Digest. 2(1): 10-11 USA.

SPINDLER, F. 1973. Le beton utilise les onglour, les resultats d'experience allemande L'elevage 19:73-75.

TOP NILI-RAVI BUFFALO AT LIVESTOCK RESEARCH INSTITUTE, BAHADURNAGAR, OKARA

32ND CONFERENCE OF THE INTERNATIONAL COMMITTEE FOR ANIMAL RECORDING (ICAR)

16-19 May, 2000

venue: Bled, Slovenia.
During the conference, a Joint FAO-ICAR Buffalo Workshop on **"Animal Recording for Improved Breeding and Management Strategies of Buffaloes"** has been organized, in which the major problems concerning the exploitation of recording data for management and breeding will be analysed.

Case studies have been prepared for the Workshop by resource persons from eleven countries that have already implemented buffalo recording systems and buffalo improvement schemes: Azerbaijan, Bangladesh, Bulgaria, Egypt, India, Italy, Iran, Nepal, Pakistan, Thailand, Vietnam. The case studies have taken into account

1. The characterization of the buffalo recording system in each country in terms of: number of herds involved, number of recorded buffaloes, involved animal categories, purposes of the system, animal identification methods, measured traits and frequency, pedigree collection, storing of data, financial support.
2. The existence of a genetic improvement programme for buffalo in each country in terms of: number of bulls and females of higher genetic merit, how is their genetic merit established, how frequently is the genetic evaluation performed, what is the responsible organization, how is genetic improvement distributed all over the country.

The eleven case sudies will serve as a base for discussion at the Workshop. Discussion will be organized in four sessions in which the participants will try to answer a list of questions and propose suggestions on four main topics: (1) how and why does a functional milk recording scheme work? (2) how and why can a functional milk recording scheme be implemented in the countries where it does not exist yet? (3) identify opportunities and constraints in establishing and maintaining a functional milk recording system (4) identify the necessary components for establishing and maintaining a management and improvement programme for dairy buffalo. The resource persons that have prepared the case studies will be present during the discussion. Beyond the resource persons that have prepared the case studies, also participants from Albania, Armenia, China, Greece, Iraq, Makedonia, Romania, Sri Lanka, Syria, and Turkey are expected. The Workshop is open to everybody.

Contact:
ICAR 2000 Secretariat - Groblje 3, 1230 Domzale Slovenia

Fax +386 61 7241005
Email: Marija.klopcic@bfro.uni-lj.si
or J.boyazoglu@rmnet.it

"Buffalo Newsletter"
Istituto Sperimentale per la Zootecnia
via Salaria 31
00016 Monterotondo, Italy

Do please suggest any people interested in receiving the "Buffalo Newsletter"

Name...
Address...
City, code...
Country...

"Buffalo Newsletter"
Istituto Sperimentale per la Zootecnia
via Salaria 31
00016 Monterotondo, Italy

Do please suggest any people interested in receiving the "Buffalo Newsletter"

Name...
Address...
City, code...
Country...

Buffalo Newsletter
email: ISZ @ flashnet.it
www.inea.it/ISZ/newnet.htm
Number 14 -March 2000

Editor
Antonio Borghese
Assistant Editor
Bianca Moioli

Network Co-ordination Centre, to which all correspondence is to be sent:
Istituto Sperimentale per la Zootecnia
Via Salaria, 31
Tel. 06900901 - Fax 069061541
00016 Monterotondo
Italy

Typeset
Roberto Bellini
email: ro.bellini@tiscalinet.it

Printed by: ANIS EDITRICE
via Val di Fiemme 16/20
Roma - Telef. 06/8180396

buffalo news - buffalo news - buffalo news - buffalo news - buffalo news - buffalo news

3RD ASIAN BUFFALO CONGRESS

27-31 March, 2000

Venue: Kandy, Sri Lanka
Theme: **Changing the role of the buffalo in the new millenium in Asia**
Plenary I: Review of buffalo production systems
Plenary II: Buffalo as a multi-purpose animal in the farming systems of Asia
Plenary III: Country reports
Plenary IV: Vision of the new millenium
Symposium I: Genetics and breeding
Symposium II: Nutrition I
Symposium III: Reproduction
Symposium IV: Health
Symposium V: Biotechnology
Symposium VI: Nutrition II
Symposium VII: Production systems
Symposium VIII: Product technology

For further information, contact:

CONGRESS COORDINATOR 3RD ASIAN BUFFALO CONGRESS

Faculty of Veterinarian Medicine and Animal Science
University of Peradeniya
Peradeniya, Sri Lanka
Tel +94 8 389542
Fax +94 8 232343
Email: neil@vetpara.pdn.ac.sl

6TH WORLD BUFFALO CONGRESS

23-26 October, 2000

Venue: Maracaibo - Zulia - Venezuela
Technical sessions:
Systems of production, Grass and forages, Genetics and reproduction, Nutrition and feeding, Health, Products and marketing - Milk and meat, Management.

Contact:

The 6th World Buffalo Congress
University of Zulia, School of Veterinary Sciences
Tel +58 61 482978
Fax +58 61 596100 or 495056
Email: asovazu@iamnet.com or nmontiel@mail1.lat.net

"Buffalo Newsletter"
Istituto Sperimentale per la Zootecnia
via Salaria, 31
00016 Monterotondo, Italy