# EFFECT OF DRAUGHT USE OF COWS ON FERTILITY, MILK PRODUCTION AND CONSUMPTION[1]

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## INTRODUCTION

An increasing number of cows are being used in Bangladesh for draught and recently researchers, mostly overseas, have opened a debate on this issue. According to Dolbert (1981), cows in Bangladesh are more efficient than bullocks as they reproduce, give milk, dung and draught power. Use of cows for cultivation is

> believed to lead to problems with fertility and lactation although to what extent and at what level of utilization such problems take effect is not clear. For the smallholder who does not have sufficient land to justify keeping a pair of bullocks the use of cows for cultivation may offer an economically attractive alternative. The amount of work to be done on such holdings would not be large, so that problems of lactation and fertility if they arise at all would not be likely to be serious. If this is the case, the smaller farmer could have multipurpose animal, providing draught, milk and calves, thus reducing capacity utilization problems. (Gill 1981a, pp 21-22; also see Gill 1981b, p 210)

Jabbar (1980) argued, on the basis of empirical evidence from Thailand,[2] that use of cows for draught decreased fertility and milk yield; too much use for

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[1] Extract of a report entitled "The Status and Potential of Livestock within the Context of Agricultural Development Policy in Bangladesh" by M A Jabbar and D A G Green, Department of Agricultural Economics, The University College of Wales, Aberystwyth.

[2] A study in a Thai village revealed that herds kept exclusively for breeding provided herd reproductive rates about double those of dual-purpose herds (De Boer 1972). Johnston (1975) also noted that about 50% of animal numbers in developed country cattle herds are cows while about 10% of total animal numbers in LDC cattle herds may be productive cows because LDCs rely heavily on draught power.

draught may cause complete loss of fertility. Draught use of cows has created a vicious circle: more draught use results in lower fertility and so less availability of male draught, thus more dependence on cows for draught, and so on. Mettrick (1981) found considerable differences in the calving percentages between herds using their cows for draught and those which did not; this evidence was used as a possible explanation for low herd productivity in Bangladesh.

Fertility and reproductive activity of cattle are very complex phenomena. Consequently, many factors can and do cause variations in these traits. In standard text books on animal production, genetic, management, nutritional, disease, and climatic factors are mentioned as affecting fertility. Draught is not mentioned in any of these categories (see for example Payne 1970). Any effect of draught may be difficult to isolate because the final outcome may depend on the interaction of a number of factors. If factors other than draught remain constant or do not vary significantly, then any difference in fertility or milk yield may be ascribed to draught use.

Relationships between draught, fertility and milk yield will be examined in this study using data available from the farm survey conducted in Mymensingh. Before the analysis, theoretical issues of the production possibilities for multipurpose cows are discussed.

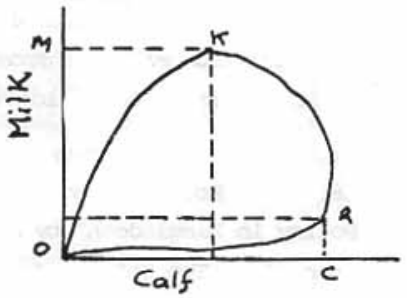


Figure 1:
Milk/calf production possibilities for cows in industrialised countries

## PRODUCTION POSSIBILITIES FOR MULTI-PURPOSE COWS

In the specialised livestock production systems in more developed countries, calves and milk production show ranges of complementary and competitive relationships (Figure 1). If maximum possible milk production, OM, is intended,

MK calves will also be produced in the process but the calves may not be allowed to suck their dams. If maximum possible calf production, OC, is intended, some milk, say RC, may also be produced because in the early days, calves may not be able to consume the entire milk. However, segment RC is of less practical importance, being shown principally for symmetry. Segment KR represents a competitive relationship whereby more calves can be produced only by foregoing some amount of milk and vice versa.

In Bangladesh, the relationship between calf and milk production is not as straightforward. First, Indian cows of Bos indicus breeds are very low yielders and only lactating while their calves are alive and at foot. Milking is normally possible after the calf has suckled the dam for some time. Moreover, some dams have the capacity to withhold a proportion of milk which is released to the calf after milking. Empirical evidence from other countries suggests that suckling or keeping a calf at foot reduces fertility of the cow (Payne 1970). Secondly, with increasing numbers of cows used for draught purposes, the trade-off is not between milk and calf production but between draught and calf or milk depending on the age at which draught use of the cow is started and the extent of this use.

Assuming that the cow is used for draught purposes throughout her entire life, the relationship between draught and calf is illustrated in Figure 2. Unlike milk/calf production possibilities in specialised systems, draught/calf relationship may be entirely competitive. If maximum power is derived from the cow, it may become infertile. If biologically attainable maximum fertility is to be achieved, no power may be obtained. Between these two extremes, any combination of draught and calf is possible.

Draught/milk production possibilities may also be competitive throughout the entire range as illustrated in Figure 2. Total milk production during the lifetime of a cow is given by the following relationship:

$$M = \sum_{i=1}^{N} Y_{ij}; \quad j = 1 \ldots k;$$

where M is total milk output (in litres),

Y is the milk yield of the $j^{th}$ day in the $i^{th}$ lactation (in litres),

N is the total number of lactations.

Maximising draught may lead to reduced milk production through any one or a combination of all the components, i e reduced number of lactations, shorter length of lactation, decreased daily yield.

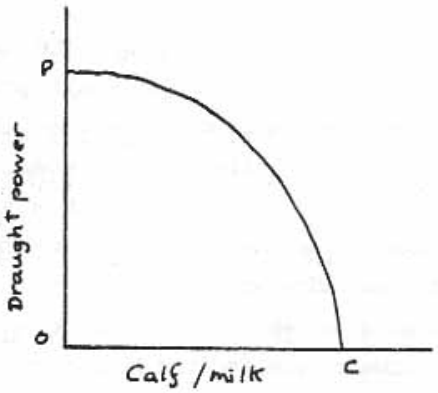


Figure 2:
Production possibilities for multi-purpose cows in less developed countries

## FERTILITY OF DRAUGHT AND NON-DRAUGHT COWS

The following measures of fertility and reproductive performance are commonly used for organised commercial herds (Payne 1970):

1. Number of calves per cow in lifetime
2. Age at first calving
3. Service per conception
4. Proportion of cows and heifers diagnosed pregnant to first service
5. Calving interval
6. Calf crop or calving rate, i e number of calves born in comparison to number of females of breeding age exposed to bulls
7. Number of calves reaching weaning age as compared to number of breeding females in herd during the year
8. Non-return rate, i e proportion of cows not requiring re-insemination within 60-90 days of first insemination
9. Interval between first service and conception
10. Interval between calving and first oestrus
11. Regularity of oestrus cycle
12. Incidence of reproductive difficulties in herd
13. Age at puberty

Each of these measures have certain advantages and disadvantages. Moreover, the concept of a cow herd could be hardly applied in this study because many farms own only one cow, some farms have both draught and non-draught cows, and frequent trading means that many of the cows might not have been on the farm for the farm for the entire year.[3] So, only those fertility measures for which

data were available and which could be applied to individual cows were considered.

**Number of calves per cow's lifetime:**

Out of 644 cows over 3 years of age, complete information on the number of calves given during lifetime was available for 570 cows (Table 1).

Table 1:
Number, average age and average number of calves in lifetime of draught and non-draught cows in selected areas in Mymensingh

| Type of cow[1] | Number of cows | | Average age (years) | Number of calves per cow in lifetime |
|---|---|---|---|---|
| Non-draught 1 | 54 | 9 | 7.3 | 2.04 |
| Non-draught 2 | 64 | 11 | 4.0 | 0 |
| All non-draught | 118 | 20 | 5.5 | 0.92 |
| Draught 1 | 156 | 28 | 8.7 | 2.13 |
| Draught 2 | 103 | 18 | 8.1 | 1.62 |
| Draught 3 | 193 | 34 | 6.2 | 0 |
| All draught | 452 | 80 | 7.5 | 1.10 |
| All cows | 570 | 100 | 6.9 | 1.06 |

[1]Notes and definitions:

Non-draught 1: non-draught cows which had already given a calf or were pregnant at the time of the survey.

Non-draught 2: non-draught cows which had not given a calf or were not pregnant at the time of the survey.

Draught 1: cows used for draught after the first calf was born.

Draught 2: cows used for draught at least one year before the first calf was born, or in the case of first pregnancy before the cow became pregnant.

Draught 3: draught cows which had not given any calf or were not pregnant at the time of the survey.

For each pregnant cow, 0.5 calf was added.

**These definitions will be used throughout this paper (Field Survey 1981).**

On average, draught cows were 2 years older than non-draught cows

[3]Mettrick (1981) ignored these aspects in measuring calving percentage. He assumed the entire sample as constituting a single farm and all cattle as constituting a single herd. Moreover, the data were not fully appropriate for measuring calving percentage.

($P < 0.01$) but gave, on average, only 0.18 more calves. Taking both draught and non-draught cows, only 1.06 calves were born in an average lifetime of about 7 years. Draught cows, constituting 80% of the total cows, contributed significantly to the low overall fertility. Forty-five per cent of the cows were yet to give any calf and three quarters of these were draught cows with an average age of 6.2 years. Some of these draught cows were reported as barren by their owners; others may also remain infertile if draught use was continued.

Correlation between age and number of calves given in lifetime was considerably higher for non-draught compared to draught cows and correlation was the lowest for those draught cows which were used for draught for a longer period (Table 2). In general, non-draught cows gave larger numbers of calves than draught cows at any specific age. Moreover, non-draught cows started calving at an earlier age than draught cows (see below).

Table 2:
Relationship between age and number of calves born in lifetime of draught and non-draught cows in Mymensingh[1]

| Age (rounded years) | Non-draught 1: No of cows | Calves per cow in lifetime | Draught 1: No of cows | Calves per cow in lifetime | Draught 2: No of cows | Calves per cow in lifetime |
|---|---|---|---|---|---|---|
| 3 | 1 | 1.00 | - | - | - | - |
| 4 | 7 | 0.78 | 10 | 0.70 | - | - |
| 5 | 13 | 0.88 | 17 | 0.73 | 8 | 1.00 |
| 6 | 10 | 1.60 | 21 | 1.14 | 20 | 1.12 |
| 7 | 3 | 2.33 | 26 | 1.61 | 18 | 1.08 |
| 8 | 6 | 2.17 | 23 | 1.84 | 18 | 1.19 |
| 9 | 3 | 3.83 | 12 | 2.50 | 7 | 1.57 |
| 10 | 4 | 3.62 | 15 | 2.90 | 19 | 2.32 |
| 11 | - | - | 6 | 3.83 | 1 | 4.00 |
| 12 | 4 | 3.25 | 27 | 3.85 | 6 | 3.25 |
| 13 | 1 | 5.00 | 4 | 5.00 | 3 | 3.67 |
| 14 | 1 | 5.00 | 2 | 5.00 | 1 | 3.00 |
| 15 | 1 | 8.00 | 3 | 4.33 | 2 | 5.00 |
| All | 54 | 2.04 | 156 | 2.13 | 103 | 1.62 |
| Correlation (r) | 0.89 | | 0.78 | | 0.60 | |
| Significance (P =) | 0.0001 | | 0.0001 | | 0.0001 | |

[1] Field Survey (1981)

**Age at first calving:**

Most respondents were able to recall the total number of calves born to a cow in her lifetime but few could recall the exact age at first calving or the age at which the cow was first used for draught. This information was available for 330 cows and is shown in Tables 3 and 4. Most of the non-draught and draught 1 cows had calved for the first time by the age of four while most draught 2 cows had their first calf after four years. All the draught 2 and draught 3 cows were first used for draught by the age of four compared to two-thirds in the case of draught cows.

Table 3:
Distribution of draught and non-draught cows already calved according to age at first calving, Mymensingh [1]

| Type of cow | Age at first calving (rounded years) 3 | 4 | 5 | 6 | 7+ | All ages |
|---|---|---|---|---|---|---|
| | % cows in each class | | | | | |
| Non-draught 1 | 17.1 | 65.0 | 12.1 | 4.0 | - | 100 |
| Draught 1 | 12.4 | 70.5 | 16.2 | 1.0 | - | 100 |
| Draught 2 | - | 16.3 | 34.6 | 33.7 | 15.4 | 100 |
| All types | 8.0 | 47.2 | 23.2 | 15.2 | 6.4 | 100 |

Chi-square = 94.0; df = 8; P = 0.0001.

[1] Field Survey (1981).

Table 4:
Distribution of draught cows according to age at first ploughing, Mymensingh

| Type of cow | Age at first ploughing (rounded years) 2 | 3 | 4 | 5 | 6+ | All ages |
|---|---|---|---|---|---|---|
| | % cows in each class | | | | | |
| Draught 1 | 1.8 | 34.5 | 29.2 | 29.2 | 5.3 | 100 |
| Draught 2 | 13.9 | 64.4 | 21.7 | - | - | 100 |
| Draught 3 | 16.5 | 57.7 | 25.8 | - | - | 100 |
| All draught | 10.3 | 51.4 | 25.8 | 10.6 | 1.9 | 100 |

Chi-square = 85.8; df = 8; P = 0.0001.

[1] Field Survey (1981).

Average ages at first ploughing and first calving are shown in Table 5. A number of pairwise comparisons must be considered to understand the full implications of these data.

(i) Age at first calving did not differ significantly between non-draught 1 and draught 1 cows.

(ii) Draught 2 cows were first used for draught purposes at a lower age than draught 1 cows ($P < 0.01$). Consequently, calving occurred at a higher age than draught 1 and non-draught cows ($P < 0.01$).

(iii) Draught 3 cows did not yet calve because they were put to draught use at a very early age. However, figures for draught 2 cows indicate that some draught 3 cows may become fertile at a slightly older age if the extent of draught use is kept low.

Table 5:
Average ages at first ploughing and first calving of draught and non-draught cows in Mymensingh[1]

| Type of cow | No of cows | Average age at first ploughing (years) | Average age at first calving (years) |
|---|---|---|---|
| Non-draught 1 | 41 | - | 3.82 |
| Draught 1 | 109 | 3.77 | 3.85 |
| Draught 2 | 103 | 2.91 | 5.45 |
| Draught 3 | 76 | 2.82 | - |

[1]Field Survey (1981).

Services per conception:

During the 12 months preceding the date of interview, 101 cows were serviced; 22 artificially[4] and the remainder naturally. Of all the serviced cows, 50% conceived with one service, 38% with 2 or more services, and 12% did not conceive or in a few cases aborted (Table 6). Services per successful conception were higher for draught compared to non-draught cows. The difference between non-draught 1 and draught 1 was not significant; the difference between draught 1 and draught 2 was significant ($P < 0.01$).

Table 6:
Number of cows serviced and number of services per conception of draught and non-draught cows in Mymensingh[1]

| Services / Type of cow | % conceiv Number serviced | Services per conception | % conceived with one service | % conceived with 2 or more services | % not conceived or aborted |
|---|---|---|---|---|---|
| Non-draught 1 | 18 | 1.44 | 67 | 22 | 11 |
| Draught 1 | 46 | 1.57 | 57 | 35 | 9 |
| Draught 2 | 37 | 2.03 | 35 | 49 | 16 |
| All types | 101 | 1.70 | 50 | 38 | 12 |

[1]Field Survey (1981).

On average, 1.3 to 1.6 services per conception are considered to be quite

satisfactory. This is equivalent to about 60 to 70% of the cows conceiving and calving to the first service. In large commercial cattle herds, up to 1.8 services per conception may be accepted without undue alarm (Payne 1970). Services per conception of non-draught 1 and draught 1 cows in the present study were within the range of satisfactory performance. Services per conception of draught 2 cows were higher than the acceptable maximum for commercial herds.

Successful servicing requires detection of heat at an early stage, finding a healthy mature bull and servicing at the optimum time. In tropical climates a cow's heat period is generally shorter than in temperate climates. This does not create much of a problem because most farms keep their one or two breeding cows under close supervision, detecting heat in time. Finding a healthy mature bull at the optimum time is currently somewhat more difficult. Previously, big landlords and rich peasants used to release young calves for raising as community bulls grazing freely in the locality and often destroying standing crops. At maturity, the animal would be slaughtered and the sale proceeds would be spent for some community work, such as building a school, a mosque or a club. Today, free grazing community bulls are rarely found, primarily because grazing land is almost absent and poor peasants are less prepared to allow the bull to eat and destroy their crops, even though they require a bull for servicing their cows. Some rich farmers now maintain bulls by stall feeding and provide a free service to neighbours; some owners make a small charge per service. The AI Service and breeding bulls provided by the government have not yet gone beyond the urban peripheries.

Of the 500 sample households in this study, only 12 had a bull, most of them immature and not very healthy. If they were to service all the 644 cows of breeding age on these farms, there would be 54 cows per bull. In commercial herds, one immature bull per 20-25 cows or one mature bull per 30-35 cows is recommended for good herd performance. However, commercial herds have a definite breeding policy and breeding season, normally lasting 90-120 days. The farmers in Bangladesh have no breeding season, a cow is put to the bull whenever ready and, thus, the pressure on the bull is distributed throughout the year. Even then, the number of cows per bull in sample areas would appear

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[4] From the AI Centre at Bangladesh Agricultural University, about 2 km from one of the sample areas.

to be more than is reasonable for successful servicing.

Had it been possible to collect data on frequency of success and failure in heat detection, and in servicing the cow at the right time, the statistics presented in Table 6 would have been calculated more accurately.

## MILK YIELD OF DRAUGHT AND NON-DRAUGHT COWS

Lifetime milk production of a cow depends on number of lactations, length of each lactation, and lactation yield. Earlier, it was shown that draught use may lead to reduced, and in some cases complete loss of, fertility and consequently milk output. Draught use also affects the length of lactation and daily yield.

**Lactation length and yield:**

Questions were asked about the age at last calving and the length of last lactation for each cow at the time of the survey. Respondents were unable to give the lactation length accurately in days; some could not recall the length in months because the last calf was born a few years ago. Those who could confidently give length in terms of months were considered for analysis. Average lactation lengths for non-draught 1, draught 1 and draught 2 cows were 10.8, 10.2 and 9.6 months respectively. Pairwise differences were not significant. Apart from draught use, older age of draught cows might also be partly responsible for their slightly shorter lactations. This aspects needs more careful investigation.

During a full lactation, daily milk yield varies considerably, generally having a declining trend although sometimes it may first increase, if better feed is available, and then decrease. Therefore, a single visit was considered inadequate to obtain accurate data on lactation yield. Daily, or at least weekly, recording would be essential for this. Questions were asked about the highest daily milk yield in the latest lactation for cows in milk at the time of interview. "Latest" meant the current lactation. This was expected to give an indication of the milk yielding potential of draught and non-draught cows. For cows in milk at the time of interview, milk yield for two days preceding the interview date was also recorded.

**Highest daily milk yield:**

Differences in highest daily milk yield between draught and non-draught cows were statistically significant ($P < 0.01$) but, unlike fertility, differences between draught 1 and draught 2 cows were not significant (Table 7). This indicates that milk yield was more sensitive than fertility to draught use.

These differences remained almost unchanged when age at last calving was controlled.

Differences in yield values between draught and non-draught cows may appear to be small but the impact on overall milk production is substantial because of the larger number of draught cows. The only notable point is that the general milk yielding potential of Bangladesh cows, whether used for draught or not, is very poor. Potential yield ranges are shown more clearly in Table 8.

Table 7:
Highest daily milk yield of draught and non-draught cows in latest lactation in Mymensingh[1]

| Type of cow | Including current lactation Cows | Including current lactation Milk yield (kg/day) | Excluding current lactation Cows | Excluding current lactation Milk yield (kg/day) |
|---|---|---|---|---|
| Non-draught 1 | 45 | 1.42 | 14 | 1.57 |
| Draught 1 | 184 | 1.21 | 99 | 1.16 |
| Draught 2 | 101 | 1.21 | 63 | 1.20 |
| All draught | 285 | 1.21 | 162 | 1.18 |
| All cows | 330 | 1.24 | 176 | 1.21 |

[1]Field Survey (1981).

Table 8:
Frequency distribution of draught and non-draught milk cows according to highest daily milk yield in latest lactation in Mymensingh[1]

| Milk yield (kg/day) | Class of cow: Non-draught 1 | Draughts 1 and 2 | All milking cows |
|---|---|---|---|
| | | % of total cows | |
| Under 1.00 | 26.7 | 45.3 | 42.6 |
| 1.00-1.49 | 22.2 | 23.5 | 23.3 |
| 1.50-1.99 | 42.2 | 25.4 | 27.7 |
| 2.00 + | 8.9 | 5.8 | 6.4 |
| All | 100.0 | 100.0 | 100.0 |

[1]Field Survey (1981).

**Daily milk yield:**

On average, draught cows gave lower daily yields than non-draught cows; the difference was significant ($P = 0.06$) (Table 9). Correlation analysis showed that lactation stage and size of holding (a proxy for quantity and quality of feeds) were important variables in explaining milk yield variations and these variables were more important for draught cows. At later stages of lactation

milk yield of draught cows decreased at a higher rate than non-draught cows. Thus it appears that draught use may significantly reduce lactation yield through reduced daily yield at later stages of lactation.

Table 9:
Factors affecting daily milk yield of draught and non-draught cows in Mymensingh[1]

| Type of cow | No of cows | Milk yield (kg/day) | Correlations[2] $YX_1$ | $YX_2$ | $YX_3$ |
|---|---|---|---|---|---|
| Non-draught | 29 | 0.92 | -0.24 | -0.18 | 0.23 |
| Draught | 125 | 0.75 | -0.39* | -0.06 | 0.26** |
| All cows | 154 | 0.78 | -0.36* | -0.09 | 0.25** |

[1] Field survey (1981).

[2] Y is daily milk yield per cow in kg; $X_1$ is stage of lactation in months; $x_2$ is age of the cow in years; $x_3$ is size of holding (a proxy for quantity and quality of feeds).

* $P < 0.05$; ** $P < 0.01$.

Positive correlation between milk yield and size of holding implies that the extent of draught use of the cows was smaller on larger holdings or that part of the stress caused by draught use was compensated by more and better feeds available on larger holdings. However, the majority of the draught cows were found on smaller holdings, so the negative effects of draught use on milk yield results in significantly reduced overall milk production.

## FEMALE DRAUGHT USE AND MILK CONSUMPTION

Adult lactose tolerance is not considered a normal characteristic of the species mammalia including man. However, pastoral man acquired this characteristic because of long dependence on foods of animal origin. People in the Indian subcontinent acquired this characteristic because of their long association with migrants and invaders from pastoral societies of central and west Asia. In the traditional subsistence production[5] framework of the Indian economy, most farming families produce milk for their own consumption. Milk was not only liked by a majority of the people. A higher social value is attached

[5] Wharton Jr (1964) made a distinction between subsistence production (production for home consumption); subsistence consumption (consumption level enough for life sustenance); and subsistence income (income level that allows subsistence consumption). Thus, an economy may be highly commercialised in the sense of trading the majority of its produce, yet the people may derive only a subsistence income. Such a situation would contradict the need for commercialisation as a condition for economic development.

to its consumption and a lower social value to selling farm-produced milk. Population pressure has drastically reduced the capacity to rear milk cows, with consequent drastic reduction of milk production and consumption. The situation has further deteriorated through draught use of cows.

Reliable data on production and consumption of milk and milk products in Bangladesh are not available. Government sources show that 375,000 tonnes of fluid milk and 44,000 tonnes of milk products were produced per year during 1972/73 - 1975/76 which gave per caput per day availability of 13.5 g milk and 1.6 g milk products (Bangladesh 1977). Corresponding figures for the 1976/77 - 1979/80 period are 333,000 tonnes of milk and 39,000 tonnes of milk products; 10.9 g milk and 1.3 g milk products (Bangladesh 1982). On the other hand, the 1973-74 household expenditure survey shows a daily per capita milk consumption of 29.6 g, with two thirds of the sample consuming less than this amount (Table 10).

Table 10:
Average family size and per caput daily consumption ofmilk by monthly income group in Bangladesh (1973-74)[1]

| Monthly income (Taka) | Proportion of households )%) | Persons per household | Milk consumption (g/caput/d) |
|---|---|---|---|
| Under 50 | 0.07 | 2.55 | 0 |
| 100-149 | 1.64 | 2.79 | 4.98 |
| 100-149 | 5.23 | 3.37 | 3.11 |
| 150-199 | 8.45 | 3.86 | 4.67 |
| 200-249 | 10.1 | 4.22 | 6.84 |
| 250-299 | 10.2 | 4.71 | 9.95 |
| 300-399 | 17.9 | 5.25 | 16.8 |
| 400-499 | 12.9 | 5.98 | 24.2 |
| 500-749 | 18.1 | 6.87 | 35.1 |
| 750-999 | 7.45 | 8.23 | 55.0 |
| 1000-1499 | 5.11 | 9.98 | 62.8 |
| 1500-1999 | 1.27 | 10.9 | 62.5 |
| 2000 + | 1.37 | 10.8 | 65.3 |
| All groups | 100.0 | 5.83 | 29.6 |

[1] Household expenditure survey 1973-74 (quoted in Bangladesh 1977).

The 1962-64 nutrition survey showed a daily per caput milk and cheese consumption in rural and urban areas of 17.3 and 52.2 g respectively (FAO 1977). Thus, it appears that the gap in knowledge about milk production and consumption is quite substantial.

Among 500 sample farms in Mimensingh, 27.8% had one or more cows in milk at the time of the survey and 81% of the cows were used for draught purposes. Of the 27.8% of farms producing milk, 16.8% consumed the entire output, 6.8% sold the entire output and 4.2% sold part of the output (Table 11). Farms consuming the entire or part of the output had significantly larger holdings than farms selling their entire output ($P < 0.01$). A larger proportion of farms using draught cows sold milk compared to farms without or with male draught animals (Table 12). Small farmers selling milk might be assumed to represent Wharton's (1964) "subsistence income" situation (milk is sold for cash to buy subsistence needs).

Table 11:
Average daily production and consumption of milk according to type of farm in Mymensingh[1]

| Type of farm | Proportion of farms (%) | Average size of holding (acres) | Daily milk output (kg) | Per caput daily output (g) | Per caput daily consumption (g) |
|---|---|---|---|---|---|
| No milk output | 72.2 | 2.61 | a | a | a |
| Entire output consumed | 16.8 | 5.01 | 0.79 | 104 | 104 |
| Entire output sold | 6.8 | 2.20 | 0.92 | 162 | a |
| Part of output sold | 4.2 | 2.89 | 4.17 | 164 | 65 |
| All farms | 100.0 | 3.00 | 0.37 | 51 | 27b |

[1] Field Survey (1981).

a None.

b Information on any consumption by purchase was not collected. Asked about the characteristics of milk purchasers, most farms selling milk reported that they sold milk to local milk traders who collected milk from the farms and resold in the nearbytowns. Consequently, the villagers consumed less milk than they produced. Recall that landless households were not included in the sample. Their inclusion would significantly reduce average production and consumption per caput.

Table 12:
Frequency distribution of farms according to sex composition of draught animals and extent of milk production and consumption in Mymensingh[1]

| Sex composition of draught animals | Extent of milk production and consumption: No milk production | Entire output consumed | Entire output sold | Partly sold | All |
|---|---|---|---|---|---|
| | % of farms by class of draught animals | | | | |
| No draught animal | 91.9 | 4.1 | 2.7 | 1.4 | 100 |
| Only male | 87.1 | 7.5 | 3.2 | 2.1 | 100 |
| Only female | 17.3 | 15.6 | 10.4 | 6.6 | 100 |
| Both male and female | 57.3 | 33.6 | 5.7 | 3.3 | 100 |
| All farms | 72.2 | 16.8 | 6.8 | 4.2 | 100 |

[1] Field Survey (1981).

Chi-square = 98.2; df = 9; P = 0.001.

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