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# Utilization pattern of draught animal power by different categories of farmers and their suggestions regarding efficient use of draught animals

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**Abstract**
The present study was conducted in Beed district of Marathwada Region of Maharashtra. The results obtained from this investigation found that in the study area operation like, ploughing completed by the farmers using different energy sources like own bullock-pairs, tractor and bullock and tractor combine energy source was highest by tractor combine energy that is 73.75 per cent. Harrowing operation completed by the farmers using different energy sources, highest utilization of animal power by own bullock-pairs 43.33 per cent. Animal draught power was mostly used for light agricultural operation i.e. intercultural operation followed by transportation, harrowing, ploughing and least use for drilling which is considered by them as time consuming. Highest bullock pair average annual working days was recorded in marginal farmers i.e. 76.21±6.98 days. Major suggestions reported by farmers are implements should be framed in such a way that with minimum changes it should be useful for many farm operations.

**Keywords:** Draught, Power, Utilization, Marginal farmer, Suggestions

## Introduction
The importance of draught animal welfare can be viewed from a number of different perspectives as economic, ecological, social, cultural, and emotional or affective. Draught animals have contributed a great deal to human civilisation. Even in this century, when petroleum-based mechanical and electrical equipment has replaced animals in advanced countries, draught animals still play an important role in certain developing countries, and will continue to do so for many years. Livestock sector alone contributes nearly 25.6 per cent of value of output at current price of total of output in agricultural, fishing and forestry sector. The overall contribution of livestock sector in total GDP is nearly 4.11 at current price during 2012-2013. (Anonymous 2012) [3] there are 190.9 million cattle which constitute nearly 37.28 per cent of the total cattle population comprising of about 151.17 million indigenous and 39.73 million crossbreds, of the total indigenous cattle population, about 20 per cent belongs to well-defined 37 indigenous breeds (Anonymous 2012) [3].

At an optimal replacement rate of 10 bullocks per tractor, the herd of draft power equals to 8.6 million tractors which saves about 28 million kilo liters of diesel per year. However, these draft animals are being displaced at a rate of 4.3 per cent per annum mainly due to mechanization of farm operations (Ulmek, 2012) [11]. According to current estimate, India's petroleum and natural gas resources may last for 25-30 years and coal for 130-140 years (Sastry and Thomas, 2005) [8]. At this juncture mechanization in agriculture creates overburden on petroleum import policy.

Whatever developmental work took place in draught animal power (DAP) utilization, attitude of farmer towards draught animal play an important role in the efficient utilization of bullocks in farming practices. When the farmers have positive attitude towards the utilization of draught bullocks in agriculture, then only the actual utilization of the animals can be achieved. The use of DAP varies from one area to another depending on the historical background, farmers attitudes and incidence of livestock disease (Kumwenda 2000). Land holding of farmers is decreasing generation by generation due to the fragmentation of family. Indian agriculture is facing global warming; erratic nature of monsoon with decreasing rainy days, occurrence of frequent droughts, all these factors affects the crop production drastically.

In Indian agriculture, crop production and livestock industry dependent to each other and remains inseparable. Livestock particularly draught animal power plays an important role to carry different agricultural operations due to which Zebu bullock pair is said to be a cheap and chief source of energy in rural India. Though all these merits are with animal power but its utilization is decreasing day by day. Either some factor may be responsible for this scenario or some constraints may be there which farmers are facing in utilization of draught animal power (DAP). There are some points of curiosity for research study.

## Materials and Methods

A survey on draught animal power utilization was conducted during the 2015-2016. A purposive sampling technique was utilized where all the 240 farmers of different categories selected. four tahsils i.e. Ambejogai, Ashti, Beed and Georai of Beed District of Maharashtra were selected purposively. Data collected from each tahsils five villages were selected. Randomly 3 farmers from each category of marginal, small, medium, large were selected from each village. Thus data from 240 farmers were collected and recorded by taking interview. Structured questionnaires were developed and use for data collection. Data was analyzed using unequal CRD Panse and Sukhatme (1986) [7].

## Result and Discussion

### Utilization pattern of draught animals under different categories of farmers

The data pertaining to the agricultural operations carried out by using different energy sources is presented in Table 1. It was observed that operation like, ploughing completed by the farmers using different energy sources like own bullock-pairs, tractor and bullock and tractor combine energy source contributes 22.92, 73.75 and 3.33 per cent, respectively.

Harrowing operation completed by the farmers using different energy sources was highest by own bullock pair i.e. 43.33 per cent. Drilling operation completed by the farmers using tractor and bullock by only 6.25 per cent farmers. Intercultural operation completed by 55.83 per cent farmers majorly by own bullock pair. Transportation operation completed by the farmers using different energy sources like own bullock-pairs, hired bullock-pairs, tractor and bullock or tractor contributes 55.83, 22.50, 11.25 and10.42 per cent, respectively. For threshing operations none of the respondent was found utilizing own bullock pairs, hired bullock pairs, and bullock or tractor energy for threshing of farm produce, but threshing operations completed the farmers by using tractor was 6.67, 5.00, 16.67 per cent small, medium and large categories of farmer, respectively.

**Table 1:** Various agricultural operations carried out by using different source of energy

| S. No. | A) By own bullock pair | | | | | | B) By Hired bullock pair | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Categories / Operations | Marginal | Small | Medium | Large | Total | Marginal | Small | Medium | Large | Total |
| 1 | Ploughing | 14 (23.33) | 20 (33.33) | 09 (15.00) | 12 (20.00) | 55 (22.92) | 00 (00) | 00 (00) | 00 (00) | 00 (00) | 00 (00) |
| 2 | Harrowing | 09 (15.00) | 35 (58.33) | 37 (61.67) | 23 (38.33) | 104 (43.33) | 10 (16.67) | 10 (16.67) | 02 (3.33) | 03 (5.00) | 25 (10.42) |
| 3 | Drilling | 17 (28.33) | 38 (63.33) | 37 (61.67) | 33 (55.00) | 125 (52.80) | 37 (61.67) | 12 (20.00) | 11 (18.33) | 03 (5.00) | 63 (26.25) |
| 4 | Intercultural | 09 (15.00) | 38 (63.33) | 47 (78.33) | 40 (66.67) | 134 (55.83) | 47 (78.33) | 16 (26.67) | 10 (16.67) | 02 (3.33) | 75 (31.25) |
| 5 | Transportation | 09 (15.00) | 38 (63.33) | 47 (78.33) | 40 (66.67) | 134 (55.83) | 37 (61.67) | 12 (20.00) | 03 (5.00) | 02 (3.33) | 54 (22.50) |

| S. No. | C) By tractor | | | | | | D) By Bullock + Tractor | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Categories / Operations | Marginal | Small | Medium | Large | Total | Marginal | Small | Medium | Large | Total |
| 1 | Ploughing | 46 (76.67) | 40 (66.67) | 48 (80.00) | 43 (71.67) | 177 (73.75) | 00 (00) | 00 (00) | 03 (5.00) | 05 (8.33) | 08 (3.33) |
| 2 | Harrowing | 00 (00) | 12 (20.00) | 12 (20.00) | 17 (28.33) | 41 (17.08) | 41 (68.33) | 03 (5.00) | 09 (15.00) | 17 (28.33) | 70 (29.17) |
| 3 | Drilling | 06 (10.00) | 08 (13.33) | 06 (10.00) | 17 (28.33) | 37 (15.42) | 00 (0.00) | 02 (3.33) | 06 (10.00) | 07 (11.67) | 15 (6.25) |
| 4 | Intercultural | 00 (0.00) | 00 (0.00) | 00 (0.00) | 00 (0.00) | 00 (0.00) | 04 (6.67) | 06 (10.0) | 03 (5.00) | 18 (30.0) | 31 (12.92) |
| 5 | Transportation | 00 (00) | 07 (11.67) | 09 (15.00) | 11 (18.33) | 27 (11.25) | 14 (23.33) | 03 (5.00) | 01 (1.67) | 07 (11.67) | 25 (10.42) |
| 6 | Threshing | 00 (00) | 04 (6.67) | 03 (5.00) | 10 (16.67) | 17 (7.08) | 00 (00) | 00 (00) | 00 (00) | 00 (00) | 00 (00) |

(Note: Figure in parenthesis indicates the percentage to the total.)

### 2. Total working and non-working days of bullock pairs

The various agricultural operation carried out by farmers with source of animal energy particularly by own bullock pair either for own land cultivation or bullock pair given to other on hired basis was considered for calculation of total working and non-working days in a year. Data regarding this is presented in Table 2. (a)

The various agricultural operation carried out by farmers with source of animal energy particularly by own bullock pair either for own land cultivation or bullock pair given to other on hired basis was considered for calculation of total working and non working days in a year. Highest bullock pair average annual working days was recorded in marginal categories farmer i.e. 76.21±6.98 days, followed by small, medium and large categories were 73.02±5.57, 66.07±4.41 and 63.93±3.12 days respectively. While that of non working days of bullock pairs from marginal, small, medium and large categories farm ers were 288.79±6.98, 291.98±5.57, 298.93 ±4.41 and

301.07±3.12days respectively. Working days recorded in present study from 63.93 to 76.21 days (i.e highest in marginal farmers and lowest large farmers). The data on total working and non working days of bullock pair in a year under different categories of farmer were complied, tabulated and subjected to unequal CRD Panse and Sukhatme (1986) [7].

Table 2. (b) revels significant (p> 0.05) difference in working and non working days of bullock pair between marginal and large categories of farmers, where as working and non working days in large farmers were at par with small and medium farmers.

The findings is well corroborated with the reports of Shanmungam (1993) he reported that in crop production, bullock pairs were employed for 60 to 86 days per year, which increased with farm size. Haque *et al.* (2000) [5] also reported working periods of draught animals ranged from three to five months annually. Mishra and Pandey (2000) also reported that the bullocks have been use on an average 18.2 days during *Karif* and 39.5 days in *rabbi* season for ploughing/ cultivation.

Akila and Chander (2009) [1] that the lean day for small farmer were 144.46 days, 208.84 days for medium farmer and 318.39 days for large farmer.

**Table 2a):** Total Working and non-working days of bullock pairs

| Categories/ Block | Marginal | | Small | | Medium | | Large | | Mean | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Working days | Non-working days | Working days | Non-working days | Working days | Non-working days | Working days | Non-working days | Working days | Non-working days |
| B I | 85.50±5.30 (04) | 279.5±5.30 (04) | 70.2±7.38 (13) | 294.8±7.38 (13) | 66.58±4.81 (13) | 298.42±4.81 (13) | 59.02±1.61 (15) | 305.94±1.61 (15) | 66.91±5.64 (45) | 298.09±5.64 (45) |
| B II | 71.00± 11.0 (06) | 294.0± 11.0 (06) | 70.83±7.53 (11) | 294.17±7.53 (11) | 66.81± 4.61 (13) | 298.19±4.61 (13) | 70.25±3.85 (15) | 294.75±3.85 (15) | 69.26±5.92 (45) | 295.74±5.92 (45) |
| B III | 81.0±4.94 (05) | 284.0± 4.94 (05) | 71.8±1.68 (10) | 293.2±1.68 (10) | 62.27± 3.49 (14) | 302.73±3.49 (14) | 67.06±3.81 (15) | 297.94±3.81 (15) | 69.93±5.93 (44) | 295.07±5.93 (44) |
| B IV | 59.5±6.71 (04) | 305.5±6.71 (04) | 71.2±5.70 (11) | 293.8±5.70 (11) | 68.54±4.76 (13) | 296.46±4.76 (13) | 60.68±3.21 (14) | 304.32±3.21 (14) | 66.73±5.66 (42) | 298.27±5.66 (42) |
| Mean | 76.21± 6.98 (19) | 288.79±6.98 (19) | 73.02±5.57 (45) | 291.98±5.57 (45) | 66.07±4.41 (53) | 298.93±4.41 (53) | 63.93±3.12 (59) | 301.07±3.12 (59) | 68.20±5.78 (176) | 296.80±5.78 (176) |

(**Note**: Number in parenthesis indicates no. of bullock pair owner)

**Table 2.b):** Average working and non- working days of bullock pairs in different categories of farmers

| Parameter Cate. of farmer | Working days | Non-working days |
|---|---|---|
| Marginal | 76.21 [a] | 288.79 [a] |
| Small | 73.02 [ab] | 291.98 [ab] |
| Medium | 66.07 [ab] | 298.93 [ab] |
| Large | 63.93 [b] | 301.07 [b] |
| SE ± | 3.62 | 3.44 |
| CD at 5 % | 10.98 | 10.30 |
| Grand Mean | 68.22 | 296.78 |

(Significant (p> 0.05) differences are shown having different superscripts within a column)

**Suggestions from farmers regarding efficient utilization of draught animal power**

In present study suggestions from respondent farmers regarding efficient utilization of draught animal power were invited and data regarding same is presented in Table 3.

In present study suggestions from respondent farmers regarding efficient utilization of draught animal power were invited. It was observed that, 91.67 per cent farmers suggested that new implement should be created in such a way that with minimum/ minor changes fittings it should be useful for many operations. This suggestion was ranked 1st. Cost of newly innovated implement should be affordable to farmers, this suggestion was reported at second rank by 90.00 per cent respondents. Innovated machines, implements should be repaired by local artisans, this suggestion was reported at third rank by 83.75 per cent total respondents. For intercultural operations single bullock drawn implement should be innovated, this suggestion was reported at fourth rank by 77.50 per cent total respondents. To create the implement according to size and drafting capacity of bullock this opinion pointed by 41.25 per cent respondents. By 39.58 per cent respondents suggested to create bullock drawn machine for crop harvesting and threshing. A spraying machine be innovated which should be motivated by animal power, this suggestion was suggested by 35.83 per cent total respondent farmers.

Bhoite and Deokar (2004) [4] reported measures to increase efficiency and output of draught animal power such as, by using improved yokes and harnessing them in most convenient way to get maximum draught force from them, use of matching implements/ equipments, and use of improved implements may result in decrease in wastage of power, injury and suffering to animals and damage to roads. Singh *et al* (2009) [10] reported that, bullock drawn sprayer has been devised and evaluated for application of chemicals in field which increased utilization hours of draught animal and reduce the exposure of chemical spray mist to the operators, which occurs during spraying with commonly used manually operated knapsack sprayer.

Alex *et al.* (2013) [13] reported that, in most developing countries animal-drawn implements, carts and devices are of crude traditional design, with very little improvement having been made for centuries. Efforts have been made for improvement of yokes ad harnesses, crop production equipment and agro - processing machinery. Improved crop production equipments have high area of coverage and lower cost of operation in comparison to existing size of implements with an increased power output 30-70 per cent.

**Table 3:** Suggestions given by farmers for increasing utilization of animal power in the farm operation

| S. No. | Suggestions | Marginal (n=60) | Small (n=60) | Medium (n=60) | Large (n=60) | Total (N=60) | Rank |
|---|---|---|---|---|---|---|---|
| 1 | To create single bullock drawn implements for intercultural operations. | 58 (96.67) | 54 (90.00) | 42 (70.00) | 32 (53.33) | 186 (77.50) | IV |
| 2 | To create the implements according to size and drafting capacity of bullock. | 22 (36.67) | 28 (46.67) | 28 (46.67) | 21 (35.00) | 99 (41.25) | V |
| 3 | With minimum/ minor changes/ fittings single implement useful for many operations. | 52 (86.67) | 58 (96.67) | 54 (90.00) | 56 (93.33) | 220 (91.67) | I |
| 4 | Newly innovated implement should be repaired by local workers. | 55 (91.67) | 42 (70.00) | 46 (76.67) | 58 (96.67) | 201 (83.75) | III |
| 5 | Cost of newly innovated implement should be affordable. | 54 (90.00) | 56 (93.33) | 58 (96.67) | 48 (80.00) | 216 (90.00) | II |
| 6 | To create new animal power operated spraying machine. | 12 (20.00) | 14 (23.33) | 28 (46.67) | 32 (53.33) | 86 (35.83) | VII |
| 7 | To create bullock drawn machine for crop harvesting and threshing. | 12 (20.00) | 18 (30.00) | 25 (41.67) | 40 (66.67) | 95 (39.58) | VI |

(**Note**: Figure in parenthesis indicates the percentage to the total.)
*Multiple responses

## Conclusion

Intercultural operation completed by draught animals was 43.33 per cent farmers highest than other agricultural operations and for threshing operation none of the respondent was found utilizing own bullock pairs, hired bullock pairs, and bullock or tractor energy for threshing of farm produce, but threshing operations completed the farmers by using tractor was 6.67, 5.00, 16.67 per cent small, medium and large categories of farmer, respectively. Completed by draught animals was majorly by own bullock pair. Bullock-pairs average annual working days of marginal categories farmers were 76.21 ± 6.98 days, then small, medium and large categories were 73.02 ± 5.57, 66.07 ± 4.41 and 63.93 ± 3.12 days, respectively. While that of non-working days of bullock-pairs for marginal, small, medium and large categories farmers were 288.79 ± 6.98, 291.98 ± 5.57, 298.93 ± 4.41 and 301.07 ± 3.12 days, respectively. Significant ($p > 0.05$) difference in working and non working days of bullock pair between marginal and large categories of farmers, where as working and non working days in large farmers were at par with small and medium farmers. Major suggestions reported by farmers are implements should be framed in such a way that with minimum changes it should be useful for many farm operations followed by cost of newly innovated implements should be available at affordable and the farm implements should be easily repair by local artisans.

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