



Labour requirements for animal management and fodder production in an organised dairy farm[#]



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Abstract

The present study was undertaken to assess the labour requirements for the management of various categories of Ongole cattle and the Super Napier fodder production in Livestock Research Station, Mahanandi, Nandyal district, Andhra Pradesh. It was found that milking operations were the most time-consuming activities for milch animals and took 24.02 ± 0.58 man-minutes per animal per day. The management of milch animals, 7 days to 3 months old calves, 3 to 6 months old calves, above 6 months old calves, dry animals, pregnant animals and teaser bull took 37.31, 1.69, 2.77, 7.64, 46.41, 3.98 and 0.20 per cent of total labour input on animal management in a day. Milking operations, grazing, feeding, cleaning of sheds, washing of animals and other management activities took 17.96, 50.17, 1.32, 26.76, 0.88 and 2.91 per cent of total labour input on animal management in a day. Land preparation, sowing, irrigation, application of fertilizer, harvesting, loading, transport and chaffing required 7.69 ± 0.18 tractor hours per acre, 35.68 ± 1.02 man-hours per acre, 8.32 ± 0.31 man-hours per acre, 0.51 ± 0.04 man-hours per acre, 95.31 ± 8.42 man-hours per acre, 31.65 ± 3.43 man-hours per acre, 0.26 ± 0.01 tractor hours per km and 15.96 ± 2.10 man-hours per acre respectively. Based on the results of the present study, it could be concluded that one person working for six hours a day (excluding idle time) is required to manage seven milch animals or 102 calves of 7 days to 3 months of age or 40 calves of 3 to 6 months age or 54 calves of above 6 months age or 17 dry animals or 17 pregnant animals, or can perform daily fodder production activities required for 0.67 tons of chaffed green fodder.

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Dairy farming is a labour-intensive enterprise with the cost of labour being rated as the second highest expense (28.78 per cent of total costs) after the cost of feed (57.91 per cent of total costs) in a dairy farm (Agrawal and Raju, 2021). Labour is one of the most critical resources in a dairy farm and hiring efficient and honest labour is key to the success of a dairy farm. Labour efficiency on a dairy farm is a critical measure that impacts the cost of production as well as the farm's work environment. The cost of labour can be reduced by mechanisation and/or optimal utilisation of labour force which can be done only after conducting time study of various activities.

On-farm fodder production helps to reduce the cost of feed and provides feed security for animals. Promoting on-farm fodder production is important in the present context of the fodder deficit in India. There was a deficit of 11.24 per cent for green fodder in the country (Roy *et al.*, 2019) which was projected to increase to 40 per cent by 2025 (NIANP, 2013). The total available green fodder in 2011 was 641.26 million tons, which was projected to decline by 6.40 per cent to 600.24 million tons in 2025 (Gorti *et al.*, 2012).

Existing labour norms, such as those of Sreedhar (1999), may not align with the present-day context because of changing climatic conditions and lifestyles, which affect the quantum of work performed by a labourer, and the increasing mechanisation of farm activities. The present study aimed to provide insights into labour requirements for the management of various categories of animals and fodder production and give inputs to the farmer to optimize labour utilization and cost of production.

Materials and methods

The present study was carried out at Livestock Research Station, Mahanandi, Nandyal district, Andhra Pradesh for a period of 120 days from 2nd September 2022 to 30th December 2022. The Ongole cattle were

maintained on the farm under a loose housing system, with each shed consisting of an open paddock and a covered area with cement concrete floor. The various categories of animals were milch animals (n = 40), 7 days to 3 months old calves (n = 23), 3 to 6 months old calves (n = 15), above 6 months old calves (n = 55), dry animals (n = 106), pregnant animals (n = 9), and a teaser bull. The farm had 50 acres of land under fodder production, which catered to the fodder (Super Napier) requirement.

The study involved recording time spent on various animal management activities such as milking operations, grazing, feeding, cleaning of sheds, washing of animals and other management activities, and different fodder production activities such as land preparation, sowing/planting, irrigation, application of fertilizer, inter-cultivation, harvesting, loading, transport and chaffing.

Milking of animals was done in the milking barn by hand method twice daily i.e., morning and evening. Calves were allowed to suckle before and after milking and weaning was not practised. Dry animals, milch animals and calves above 3 months of age were taken for grazing by four, two and two persons, respectively. The animals were fed with concentrate and chaffed green fodder. Cleaning of sheds, including the milking barn, was done once a day. Milch animals were individually washed daily in the milking barn after evening milking while all other categories of animals were washed in groups, once a week. The other management activities included bull parade, counting of animals, vaccination, treatment, artificial insemination, pregnancy diagnosis, tattooing of calves, deworming of calves, checking patency of teats and milk flow immediately after parturition, assistance in feeding colostrum to calves, cutting of naval sheath and application of Povidone Iodine, and weighing and taking body measurements of calves.

The land preparation was done by using a tractor (JOHN DEERE 5310) and implements such as mould board plough, nine tyne cultivator, rotavator, leveller and bund former. The distance between two consecutive

bunds on the seed bed was one metre. The activities of sowing/planting included harvesting of planting material, preparation of stem cuttings at 14000 stem cuttings per acre, distribution of stem cuttings, and planting of the stem cuttings in the field. The stem cuttings were planted at a gap of one foot in a row. The furrow method of irrigation was followed on the farm. The recordings of irrigation were taken when one 7.5 HP motor of 2.5 inches water output was used. Fertilizer was broadcasted manually in the field at the rate of 35 kg per acre. The activities of Inter-cultivation included the application of an adjusted cultivator to work between crop rows, and weeding which was done manually with the help of sickle. The process of harvesting included cutting the stems with a sickle and making them into bundles. The process of loading a fodder bundle included bringing the bundle to the tractor trolley by a person and handing it over to another person present on the tractor trolley. Transport of fodder from field to chaff cutter was done with the help of tractor. Chaffing of green fodder was done with help of chaff cutter (Sardar SP 40, 15 HP).

A total of 33 people were engaged on the farm to carry out various farm operations and were allowed a weekly day off.

The data obtained from the study was analysed through statistical tools such as percentage, mean and standard error as per Snedecor and Cochran (1967).

Results and discussion

Management of animals

The mean time (man-minutes per animal per day) required for the management of various categories of animals in the farm is presented in Table 1. The overall time (man-minutes per day) spent on different activities for the management of various categories of animals in a day is given in Table 2.

The total time spent on milking operations was 24.02 ± 0.58 man-minutes per animal per day which was in agreement with the findings of Naik (2016) and Kumar (2021). Grazing of milch animals, above 3 months old calves and dry animals took 379.80 ± 15.56 ,

315.84 ± 16.17 and 1756.57 ± 43.58 man-minutes per day or 9.50 ± 0.39 , 4.51 ± 0.23 and 16.57 ± 0.41 man-minutes per animal per day respectively. The mean time taken for feeding of milch animals, 7 days to 3 months old calves, 3 to 6 months old calves, above 6 months old animals, dry animals and pregnant animals was 0.66 ± 0.01 , 0.36 ± 0.02 , 0.74 ± 0.02 , 0.12 ± 0.00 , 0.11 ± 0.00 and 0.57 ± 0.02 minutes per animal per day, respectively. These results were similar to those of Bara (2012) and Deming *et al.* (2018). However, these results were lower than those reported by Sreedhar (1999). The higher values of Sreedhar (1999) might be due to the inclusion of time taken for weighing of feed and soaking of feed in feeding time.

The daily cleaning activity took 11.55 ± 1.12 , 2.69 ± 0.14 , 3.60 ± 0.19 , 1.85 ± 0.16 , 4.27 ± 0.24 , 18.29 ± 1.78 and 4.35 ± 0.35 man-minutes per animal per day or 0.36 ± 0.05 , 0.21 ± 0.01 , 0.21 ± 0.01 , 0.33 ± 0.03 , 0.39 ± 0.02 , 0.32 ± 0.03 and 0.40 ± 0.03 man-minutes per square metres of floor, respectively in case of milch animals, 7 days to 3 months old calves, 3 to 6 months old calves, above 6 months old calves, dry animals, pregnant animals and teaser bull. These results concurred with the findings of Sharma *et al.* (2006), Sreedhar and Ranganadham (2009), Gupta and Joshi (2010) and Bara (2012).

The mean time required for washing of milch animals, 7 days to 3 months old calves, 3 to 6 months old calves, above 6 months old calves, dry animals, pregnant animals and teaser bull was 1.15 ± 0.08 , 0.26 ± 0.01 , 0.84 ± 0.01 , 1.05 ± 0.04 , 0.73 ± 0.01 , 0.99 ± 0.06 and 8.17 ± 0.19 man-minutes per animal, respectively. Except for the teaser bull, the results of the present study were lower than those reported by Sreedhar and Ranganadham (2009). The higher value for the teaser bull in the present study might be due to the considerable distance from its shed to the washing area and scrubbing of the body with a sponge, while the lower values for other categories might be due to group washing of animals and less distance between sheds and washing area. The result for milch animals in the present study was higher than that reported by Deming *et al.* (2018), which might be due to the use of more efficient washing equipment.

Table 1. Mean time (man-minutes per animal per day) required for the management of various categories of animals on the farm

Category	Milking operations	Grazing	Feeding	Cleaning	Washing	Other activities
	Mean \pm S.E.					
Milch animals	24.02 \pm 0.58	9.50 \pm 0.39	0.66 \pm 0.01	11.55 \pm 1.12	1.15 \pm 0.08	0.84 \pm 0.06
7 days to 3 months old calves	---	---	0.36 \pm 0.02	2.69 \pm 0.14	---	0.62 \pm 0.02
3 to 6 months old calves	---	2.03 \pm 0.08	0.74 \pm 0.02	3.60 \pm 0.19	---	0.35 \pm 0.04
Above 6 months old calves	---	7.46 \pm 0.31	0.12 \pm 0.00	1.85 \pm 0.16	---	0.30 \pm 0.01
Dry animals	---	16.57 \pm 0.41	0.11 \pm 0.00	4.27 \pm 0.24	---	0.45 \pm 0.05
Pregnant animals	---	---	0.57 \pm 0.02	18.29 \pm 1.78	---	2.65 \pm 0.12
Teaser bull	---	---	5.35 \pm 0.22	4.35 \pm 0.35	---	0.08 \pm 0.02

Table 2. Overall time (man-minutes per day) spent on different activities for management of various categories of animals in a day

Category	Milking operations	Grazing	Feeding	Cleaning	Washing	Other activities	Total time taken for the category
Milch animals	877.75 (48.13)	379.80 (20.83)	20.20 (1.11)	469.03 (25.72)	43.01 (2.36)	33.77 (1.85)	1823.56 (37.31)
7 days to 3 months old calves	---	---	6.34 (7.66)	61.93 (74.85)	---	14.47 (17.49)	82.74 (1.69)
3 to 6 months old calves	---	67.68 (49.92)	8.68 (6.40)	54.01 (39.84)	---	5.20 (3.84)	135.57 (2.77)
Above 6 months old calves	---	248.16 (66.49)	6.84 (1.83)	101.73 (27.26)	---	16.50 (4.42)	373.23 (7.64)
Dry animals	---	1756.57 (77.43)	12.10 (0.53)	452.44 (19.94)	---	47.47 (2.09)	2268.58 (46.41)
Pregnant animals	---	---	5.12 (2.63)	164.64 (84.64)	---	24.76 (12.73)	194.52 (3.98)
Teaser bull	---	---	5.35 (54.70)	4.35 (44.48)	---	0.08 (0.82)	9.78 (0.20)
Total time taken for the activity	877.75 (17.96)	2452.21 (50.17)	64.63 (1.32)	1308.13 (26.76)	43.01 (0.88)	142.25 (2.91)	4887.98 (100.00)

(Figures in parentheses indicate percentages to the total)

Milch animals, 7 days to 3 months old calves, 3 to 6 months old calves, above 6 months old calves, dry animals, pregnant animals and teaser bull required 0.84 ± 0.06 , 0.62 ± 0.02 , 0.35 ± 0.04 , 0.30 ± 0.01 , 0.45 ± 0.05 , 2.65 ± 0.12 and 0.08 ± 0.02 man-minutes per animal per day, respectively, for other management activities. The requirement was highest for pregnant animals due to various activities specific to pregnant animal shed.

Milking operations were the most time-consuming activities, accounting for 48.13 per cent of the total labour requirement

per day for milch animals. Overall, the milking operations accounted for 17.96 per cent of total labour time in a day. These findings were consistent with those of Devarajulu and Naidu (1989), Sreedhar (1999) and Bhinda *et al.* (2017). The various activities in the descending order of labour time consumption in a day was grazing (50.17 per cent), cleaning of sheds (26.76 per cent), milking operations (17.96 per cent), other management activities (2.91 per cent), feeding (1.32 per cent) and washing of milch animals (0.88 per cent). These results were in contrast to the findings of Sreedhar

(1999) who reported that washing of animals (21.85 per cent), feeding (20.60 per cent), cleaning of sheds (16.58 per cent), milking (12.83 per cent), watering (8.03 per cent) and miscellaneous activities (7.52 per cent) was the descending order and to the findings of Bhinda *et al.* (2017) who reported that feeding (35.82 per cent), cleaning (30.54 per cent), milking (23.54 per cent) and miscellaneous activities (10.10 per cent) was the descending order. This dissimilarity might be due to practice of grazing in the farm under present study.

The present study revealed that management of milch animals took 37.31 per cent of the labour time in a day which coincided with the findings of Sreedhar (1999). The various categories in the descending order of labour time consumption in a day was dry animals (46.41 per cent), milch animals (37.31 per cent), above 6 months old calves (7.64 per cent), pregnant animals (3.98 per cent), 3-6 months old calves (2.77 per cent), 7 days to 3 months old calves (1.69 per cent) and teaser bull (0.20 per cent). These results were in contrast to the findings of Sreedhar (1999) who documented the descending order of labour requirements in milch animals (34.77 per cent), heifers (24.41 per cent), dry animals (17.71 per cent), calves (11.07 per cent), bullocks (3.04 per cent) and bulls (2.97 per cent). Bhinda *et al.* (2017) reported that milch animals (59.36 per cent), heifers (13.67 per cent), bulls and bullock (8.35 per cent), pregnant animals (7.86 per cent), calves (6.98 per cent) and dry animals (3.77 per cent) to be the descending order of labour requirement. The dissimilarity might be due to practice of grazing and variation in herd strength among the farms.

Fodder production

The mean time taken for activities of land preparation as a whole was 7.69 ± 0.18 tractor-hours per acre (Table 3) which was higher than that of Sreedhar (1999). The higher value of the present study might be due to inclusion of time taken for levelling and seed bed preparation. However, the result was lower than that of Singh (1981) probably due to variation in nature of land. The activities of sowing as a whole required 35.68 ± 1.02 man-hours per acre

(Table 4) which was higher than the findings of Sreedhar (1999). The higher values of present study might be due to inclusion of time taken for harvesting of planting material and a higher plant density. The mean time recorded for irrigation in the present study (8.32 ± 0.31 man-hours per acre) was in line with that of Guru and Mukherjee (2020). However, the result of the present study was lower than that of Sreedhar (1999), which might be due to various factors such as capacity of motor, type of soil etc., The mean time required for application of fertilizer (0.51 ± 0.04 man-hours per acre) was lower than that reported by Sreedhar (1999) which might be due to differences in procedure of fertilizer application and quantity of fertilizer applied. The application of adjusted cultivator required 0.68 ± 0.06 tractor hours per acre, and the weeding required 100.60 ± 8.09 man-hours per acre.

The mean time required for harvesting of fodder was 95.31 ± 8.42 man-hours per acre or 5.79 ± 0.29 man-hours per ton (Table 5). The results were similar to those of Sreedhar (1999). However, the mean time recorded in the present study was higher than that of De Lucia and Assennato (1994) and Zaman *et al.* (2006) which might be due to species difference. The mean time required for loading of fodder was 31.65 ± 3.43 man-hours per acre or 1.89 ± 0.09 man-hours per ton which was lower than that reported by Sreedhar (1999) who had included the time taken for baling the fodder into bundles in the loading time. Transport of fodder from the field required 0.26 ± 0.01 tractor hours per km per two tons or 13.06 ± 0.01 tractor hours per km per annual yield from an acre. The mean time required for chaffing of fodder was 15.96 ± 2.10 man-hours per acre or 0.94 ± 0.07 man-hours per ton. The findings were consistent with those of Gupta and Joshi (2010) and Naik (2016).

Performing one cycle of all the activities of fodder production required about 309.46 hours per acre. Among the fodder production activities, some activities such as harvesting, loading, transport and chaffing need to be performed daily, which collectively required 8.88 hours per ton.

Table 3. Mean time spent on activities of land preparation

The activity of land preparation (n = 10 for each activity)	Time required (tractor hours per acre)
	Mean \pm S.E.
Application of plough	2.01 \pm 0.15
Application of cultivator	0.69 \pm 0.07
Application of rotavator	0.81 \pm 0.06
Application of leveller	2.28 \pm 0.10
Application of bund former	1.69 \pm 0.04
Total	7.69 \pm 0.18

n = sample size

Table 4. Mean time spent on activities of sowing

Sowing activity (n = 15 for each activity)	Time required (man hours per acre)
	Mean \pm S.E.
Harvesting of planting material	3.95 \pm 0.40
Preparation of stem cuttings	16.53 \pm 0.64
Distribution of stem cuttings on seed bed	6.35 \pm 0.47
Planting of stem cuttings	10.14 \pm 0.59
Total	35.68 \pm 1.02

n = sample size

Table 5. Mean time spent on harvesting, loading and chaffing of fodder

Activity (n = 20 for each activity)	Time spent	
	Man-hours per acre (Mean \pm S.E.)	Man-hours per ton (Mean \pm S.E.)
Harvesting	95.31 \pm 8.42	5.79 \pm 0.29
Loading	31.65 \pm 3.43	1.89 \pm 0.09
Chaffing	15.96 \pm 2.10	0.94 \pm 0.07

n = sample size

Conclusion

Based on the results of the present study, it could be concluded that one person working for six hours a day (excluding idle time) is required to manage seven milch animals or 102 calves of 7 days to 3 months of age or 40 calves of 3 to 6 months age or 54 calves of above 6 months age or 17 dry animals or 17 pregnant animals, or can perform daily fodder production activities required for 0.67 tons of chaffed green fodder.

Conflict of interest

The authors declare that they have no conflict of interest.

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