



Assessment of *in situ* Feeding Regimen of Dairy Cattle of R.S. Pura Block of Jammu District, India

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ABSTRACT

Study was conducted with the objective of assessing the *in situ* feeding regimen of dairy cattle managed by marginal livestock farmers of R S Pura block of Jammu District. Three well inhabited villages of R S Pura block were selected. In each village, 10 dairy farmers (herd size 2-5 dairy cattle) were randomly selected as respondents for survey and for feed sample collection. Results indicated that cattle farmers are primarily agriculturist of middle age with formal education up to primary level and with land holdings of marginal or small size. Dairy cattle of respondents were mainly 2-5 years in age. Almost two-third of the surveyed animals were non-pregnant multiparous animals. More than half of the surveyed animals were medium milk producers, whereas 27.78% producing more than 10 lts per day. The feeding during post kharif period was green berseem fodder and paddy straw based, supplemented with wheat bran, cotton seed cake and/or commercially available compounded feed. Feeding regimen in post-rabi season is mainly based on maize fodder with paddy straw. Wheat bran, mustard oil cake and compounded feed are the major supplements. No farmer was providing mineral mixture to the livestock; however, all of them were supplementing diet with salt. It may be concluded that except berseem, there is dearth of leguminous fodder in dairy cattle diet of surveyed region and therefore conservation of berseem as hay needs to be encouraged to ensure year round availability and mineral supplementation needs to be increased especially in diets of high milk yielders.

Keywords: Marginal dairy farmers, feeding regimen, Jammu, dairy cattle.

Dairy farming has emerged as a major allied enterprise for supplementing the income of marginal and small farmers (Singh and Joshi, 2008). Their contribution to the national milk bowl is quite substantial (Datta, 2002) and warrants careful participatory appraisal to address limitations and develop intervention policies.

Factor with major impact over animal productivity under such conditions is demand-supply gap with respect to critical nutrients. Feeding and nutrition has repeatedly been highlighted as the major constraint in animal production systems globally (ILRI, 1995) and also sub-regionally in South-East Asia (Devendra *et al.*, 1997) and South-Asia (Devendra, 2000). Balanced nutrition at farmers' level is still a distant dream. Feedstuffs availability is mostly governed by the feed resources available at farmers disposal, which is basically due to intertwining of agriculture and livestock husbandry that

limits the type and number of feedstuffs available. Most of these limitations are region, season and farm size specific.

Majority of the participatory research conducted so far has aimed to study benefits of scientific interventions at farm level and has then extrapolated the benefits to determine the nutritional scenario prior to intervention. This approach, although scientific, fails to consider and appreciate the sustainability aspect of the traditional feeding practices of the region.

Formulating intervention programs to see tangible benefits at farm level requires a basic data set that defines the profile of livestock population, feedstuff availability and utilization pattern at local level. Critical assessment of this background data can lead us to identify the *in situ* nutritional problems and develop nutritional strategies for better resource utilization.



Present study was conducted to develop the farm level feedstuffs availability and supply data-set under peri-urban scenario.

MATERIALS AND METHODS

Location of the study

Study was conducted in R.S. Pura block of Jammu district of India (32.63°N 74.73°E and elevation of 270 meters). Three well inhabited villages of this block representing the agro eco-region in terms of soil, rainfall, crops and production system namely Kotli Shah Doula, Purana Pind and Sidhar were selected for the purpose of the study. In each village, 10 dairy farmers having a minimum herd size of 2 and maximum of 5 dairy cattle were randomly selected as respondents for survey and for sample collection.

Data collection

Selected farmers were personally interviewed using a structured interview schedule. Farmers' profile information regarding age, education, land holding and primary occupation were collected. Information pertaining to feedstuffs availability, feed processing, ration formulation were collected and animal profile information regarding age, physiological stage, milk yield and calving was also recorded.

Variables selected for the study and utilized tools of measurement are presented in the Table 1. The operational definitions, measurement and scoring pattern for selected variables are given in detail in Table 2.

Table 1. Variables and their measurement

Measurement	Variables
A	Profile of dairy cattle farmers
1. Age	Classification as per census report GOI (1981)
2. Sex	Direct Questioning
3. Education	Schedule was developed
5. Land size	Classification as per GOI (2001)
9. Occupation	Schedule was developed
10. Relevant services provided by department	Schedule was developed

B. Profile of cattle owned	
1. Age	Schedule was developed
2. Sex	Direct Questioning
3. Milk yield	Schedule was developed
4. Pregnancy status	Direct Questioning
5. Number of calving	Schedule was developed

Table 2. The operational definitions, measurement and scoring pattern for selected variables

S. No.	Variables	Measurements	Operational Definition	Categorization
A				Profile of dairy cattle farmers
1.	Age	Classification as per census report GOI 1981	The number of completed years of respondent at the time of enquiry	Young (<35 years) Middle (35-50 years) Old (>50 years)
2.	Sex	Direct Questioning	Sex referred to the type of gender of the respondents	Male Female
3.	Education	Schedule was developed	It referred to the level of formal education obtained by the respondents	Illiterate Primary Middle class High school Above High School
4.	Land size	As per GOI, 2001 classification	It referred to the size of land possessed by the livestock farmers at the time of interview	Landless Marginal (<2.5) Small (2.5-5) Medium (5-10) Large (>10)
5.	Occupation	Schedule was developed	It referred to the source of livelihood available to livestock farmers at the time of investigation.	Main occupation

B. Profile of cattle owned

1. Age	Schedule was developed	The number of completed years of animal at the time of enquiry	<2 years; 2-5 years; >5 years
2. Sex	Direct questioning	Sex referred to the type of gender of the animal	Male Female
3. Milk yield	Schedule was developed	It referred to the maximum milk production per day by the animal in the current or last lactation cycle	<5 Liters 5-10 Liters >10 Liters
4. Pregnancy status	Direct questioning	It referred to the present pregnancy status of the animal as per farmers knowledge	Pregnant Non-pregnant
5. Number of calving	Schedule was developed	It referred to the number of calving by the animal till the date of interview	Heifer 1 2 3 and above

Sample collection and processing

Samples of various feedstuffs offered by the respondent farmers were collected periodically for a total period of six months with effect from January, 2014 to June, 2014. All samples were individually collected in polyethylene bags, sealed and labelled at the site and then carried to the laboratory at the earliest for further processing and analysis. The samples of same feedstuffs were pooled, if required and then analysed. Those feedstuffs with three or less number of samples were analysed separately to get a statistically meaningful primary data. All the analysed were conducted in duplicate. The samples of various feedstuffs were analysed for proximate principles as per AOAC (1995).

Statistical analysis

The data thus collected from the respondents was analyzed and presented in the form of tables. The mean and standard error for different parameters were computed through standard statistical procedure (Snedecor and Cochran, 1994).

RESULTS AND DISCUSSION**Profile of dairy cattle farmers surveyed**

R.S. Pura region is a progressive peri-urban area that found its key growth factor in cultivation of Basmati variety of paddy (Kumar and Nain, 2012). This makes the agriculture fiscally lucrative in this area, even with reducing land holding and increasing input cost especially in the form of labour. The primary occupation of the population is therefore agriculture and is supported by livestock keeping mainly dairy cattle. However, commercial dairy farms are rare. Despite this area being located near the large city of Jammu; unlike other peri-urban areas, it does not cater to the milk supply of city population.

While keeping the study model in mind, respondents for this study were selected basically on one criterion i.e. they should be rearing 2-5 dairy cattle. This capping on the upper limit of animal number helped in avoiding professional dairy farmers, whereas keeping a minimum limit helped in preventing entry of casual cattle keepers in the data set.

A total of 30 respondents were surveyed for the purpose of the study. Profile of these farmers on the basis of the interview results is summarized as Table 3.

The survey results indicated that most of the cattle farmers are primarily agriculturist of middle age with formal education up to primary level and with land holdings of marginal or small size. The profile of respondents obtained in the present study is similar to that reported by Hamdani (2008) for Jammu dairy farmers.

Few inferences that can be drawn from this data is that young generation and persons with relatively higher education are not getting involved in dairy profession, thereby blocking the entry of progressive change and new ideas in the practices of both crop and animal farming. At the same time, the positive dimension is that at least



primary level of education of these farmers makes them open for brief calculations that may help in driving them for ration balancing.

Profile of dairy cattle reared by surveyed farmers

A total of 72 dairy cattle were being reared by the respondents at the time of the interview. Profile of these animals on the basis of the interview results is summarized as table 4.

None of the farmer was keeping any young animal, any male animal or any heifer. This basically implies that contrary to the popular belief, even small farmers are also in the practice of buying productive animals and sell away non-productive ones. Keeping only productive animals increases the profitability of the farm and gives better return over investment.

All of these animals were Holstein Friesian crossbred. Most of these animals were middle age animals (2-5 years) and thus are in their most productive years. However, in spite of these indications, the actual production by the animals was somewhat low with almost half of the animals at 5-10 lts./d production.

Table 4: Profile of dairy cattle reared by surveyed farmers

Percentage of animals belonging to each category				
Age				
<2 years	2-5 years	> 5 years		
0.00 (0)	63.89 (46)	36.11 (26)		
Physiological stage				
Pregnant	Non pregnant multiparous			
38.89 (28)	61.11 (44)			
Calving				
Heifer	One	Two	Three and more	
0.00 (0)	38.89 (28)	44.44 (32)	16.67 (12)	
Milk production				
< 5 Lts/day	5 – 10 Lts/day	Above 10 Lts/day		
16.67 (12)	55.56 (40)	27.78 (20)		

*Figures in parenthesis are number of animals out of total 72 animals.

Table 3. Profile of dairy cattle farmers surveyed

Percentage of respondents belonging to each category				
Age				
Young (<35 years)	Middle (35-50 years)	Old (> 50 years)		
3.33 (1)	73.33 (22)	23.33 (7)		
Occupation				
Dairy farming + Agriculture	Dairy farming + Job	Dairy farming + Business	Dairy farming	
96.67	0.00 (0)	0.00 (0)	3.33 (1)	
Education				
Illiterate	Primary	Middle	High School	Above high School
36.66 (11)	30.00 (9)	23.33 (7)	10.00 (3)	0.00 (0)
Land Holding				
landless	Marginal (<2.5 Acres)	Small (2.5 – 5 acres)	Medium (5-10 acres)	Large (> 10 acres)
3.33 (1)	56.67 (17)	36.66 (11)	0.00 (0)	3.33 (1)

*Figures in parenthesis are number of farmers out of 30 respondents.

Feeding regimen practiced by respondents

The information pertaining to the feedstuffs utilized, ration formulation and feed processing collected from the respondents is summarized as Table 5. The information was collected during two agronomical different time periods namely post-Kharif (January) and post-Rabi (June).

Table 5. Feeding regimen practiced by non-commercial dairy cattle farmers at R S Pura region

Attribute	Post Kharif Period*	Post Rabi Period*
Percentage of livestock farmers using a feedstuff/ following a practice		
Green Fodder		
Berseem	86.67 (26)	26.67 (8)
M P Chari	-	3.33 (1)
Oat	56.67 (17)	-
Maize	-	50.00 (15)
Wheat	-	6.66 (2)
Dry Roughage		
Wheat Straw	33.33 (10)	46.67 (14)
Paddy Straw	80.00 (24)	76.67 (23)
Concentrates		
Broken wheat	3.33 (1)	-
Wheat bran	70.00 (21)	46.67 (14)
Gram chuni	3.33 (1)	20.00 (6)
Cottonseed cake	60.00 (18)	-
Mustard oil cake	-	46.67 (14)
Compounded feed	56.67 (17)	70.00 (21)
Additives		
Mineral Mixture	0.00 (0)	0.00 (0)
Salt	100.00 (30)	100.00 (30)
Feeding Practices		
Wheat straw + Paddy straw	26.67 (8)	26.67 (8)
Protein supplementation	60.00 (18)	46.67 (14)
Green fodder	100.00 (30)	70.00 (21)
Leguminous green fodder	86.67 (26)	26.67 (8)
Sani preparation	0.00 (0)	0.00 (0)
Hay preparation	0.00 (0)	0.00 (0)
Silage preparation	0.00 (0)	0.00 (0)

*Figures in parenthesis are number of farmers out of 30 respondents.

The information pertaining to feeding regimen was satisfactorily collected only regarding type of feeds, however quantitative details were almost impossible to ascertain, especially regarding green and dry roughage. The feeding regimen and its inferences present some interesting observations that have a direct bearing over nutrient intake and utilization by the surveyed animals. Devendra (1997) reported that the feedstuffs available in and around the farm forms main component of the ration with little or no external input and the feeding regimen noted in the present study is in accordance to this statement.

Kharif season at the locale of the study is dominated by paddy interspersed with oat and followed by berseem. Feeding regimen of livestock in post kharif period is primarily berseem based along with paddy straw. The dilution for leguminous fodder is provided by oat fodder. The main source of crude protein in this period is from berseem and is supplemented by cottonseed cake.

The leguminous green fodder available during post kharif season was mainly replaced by non-leguminous maize fodder in post rabi season. Although maize is a kharif crop, here it is sown late and is available during post rabi period as a green fodder. It is a widely accepted fact that the uncertain or limited availability of good quality fodder is the single most limiting aspect in maintaining body condition and productive and reproductive performance of animals (Misra *et al.*, 2006; Rekhis *et al.*, 2007). Availability of green fodder during both the surveyed season indicates that feeding regimen of the surveyed animals seems to be optimum in this study.

Major crops of Rabi season at the locale of the study is wheat and mustard and the same is reflected from the feeding regimen, in the form of mustard oil cake making its appearance in the feeding regimen during this period and the percentage of respondents using wheat straw as a roughage increased by 13.34 percentage points. The gram chuni also found its use in the ration during this period.

It can be deduced from the scenario, that leguminous fodder berseem is mainly available in the post kharif season, with only few farmers (26.67%) having access to late last cuts of berseem during post rabi period. No other leguminous fodder was available with or utilized by the respondents making a wide gap in the leguminous fodder availability for almost six months.

Table 6: Chemical composition of feedstuffs (% DM) used as a component of dairy cattle feeding regimen at RS Pura

Feedstuffs	Parameters								
	CP	EE	CF	NFE	TA	NDF	ADF	Ca	P
Green Fodder									
Berseem (<i>T. alexandrinum</i>)	26.63 ± 4.64	2.86 ± 0.01	18.60 ± 2.49	39.41 ± 4.20	12.50 ± 3.91	32.44 ± 4.87	20.45 ± 3.01	0.92 ± 0.07	0.44 ± 0.09
MP chari (<i>S. bicolor</i>)	6.90 ± 0.26	2.32 ± 0.09	34.23 ± 2.28	48.15 ± 1.34	8.40 ± 0.03	60.97 ± 4.37	36.93 ± 2.04	0.04 ± 0.01	0.02 ± 0.003
Oat (<i>Avena sativa</i>)	8.12 ± 0.84	3.07 ± 0.09	33.06 ± 1.37	47.23 ± 1.03	8.52 ± 0.99	59.10 ± 3.10	36.97 ± 1.24	0.19 ± 0.02	0.25 ± 0.01
Maize (<i>Z. mays</i>)	8.87 ± 0.83	1.89 ± 0.04	27.53 ± 0.83	56.02 ± 1.53	5.69 ± 0.44	47.98 ± 1.39	28.63 ± 1.28	0.10 ± 0.05	0.24 ± 0.01
Wheat (<i>Triticum spp.</i>)	4.07 ± 0.09	1.39 ± 0.06	33.12 ± 1.92	54.40 ± 2.00	7.02 ± 0.46	51.92 ± 2.38	32.68 ± 2.44	0.02 ± 0.001	0.08 ± 0.02
Dry Roughage									
Wheat Straw (<i>Triticum spp.</i>)	3.67 ± 0.65	1.80 ± 0.07	27.47 ± 1.28	59.26 ± 2.46	7.80 ± 1.04	70.00 ± 4.88	54.00 ± 3.61	0.28 ± 0.01	0.14 ± 0.02
Paddy Straw (<i>O. sativa</i>)	2.91 ± 0.03	5.33 ± 0.37	28.90 ± 1.83	49.83 ± 1.71	13.03 ± 1.09	60.16 ± 3.56	42.00 ± 2.87	1.38 ± 0.26	0.50 ± 0.01
Concentrates									
Broken wheat (<i>Triticum spp.</i>)	11.12 ± 0.85	1.69 ± 0.09	3.59 ± 0.48	81.79 ± 1.04	1.72 ± 0.21	11.98 ± 0.48	3.07 ± 0.25	0.19 ± 0.01	1.18 ± 0.30
Wheat bran (<i>Triticum spp.</i>)	13.74 ± 1.27	3.89 ± 0.26	16.29 ± 1.40	60.54 ± 2.31	5.53 ± 0.67	23.60 ± 1.87	14.91 ± 1.05	0.11 ± 0.01	1.18 ± 0.21
Gram chuni (<i>C. arietinum</i>)	18.73 ± 0.94	2.05 ± 0.10	25.50 ± 1.33	50.27 ± 2.61	3.52 ± 0.60	41.65 ± 1.73	31.54 ± 2.19	0.28 ± 0.02	0.14 ± 0.01
Cottonseed cake (<i>Gossypium spp.</i>)	27.52 ± 1.30	10.18 ± 0.82	17.76 ± 1.41	39.61 ± 2.47	4.93 ± 0.91	43.31 ± 2.00	31.06 ± 1.47	0.17 ± 0.01	0.09 ± 0.001
Mustard oil cake (<i>B. juncea</i>)	37.50 ± 2.57	8.14 ± 0.94	8.52 ± 0.70	39.57 ± 2.94	6.28 ± 0.75	17.05 ± 0.82	12.49 ± 1.30	0.76 ± 0.02	1.07 ± 0.03
Compounded feed									
Pelleted feed 1	19.69 ± 0.59	4.40 ± 0.18	7.04 ± 0.23	62.31 ± 0.14	6.58 ± 0.67	18.11 ± 0.98	8.45 ± 0.13	0.95 ± 0.27	0.73 ± 0.05
Pelleted feed 2	17.74 ± 1.42	4.66 ± 0.01	11.92 ± 1.74	56.56 ± 0.25	9.13 ± 0.56	26.34 ± 1.86	15.95 ± 2.32	1.20 ± 0.04	0.75 ± 0.22
Pelleted feed 3	18.94 ± 0.96	5.43 ± 0.86	7.40 ± 0.61	59.48 ± 0.87	8.76 ± 0.33	20.43 ± 1.09	10.19 ± 1.02	1.13 ± 0.12	0.96 ± 0.08
Pelleted feed 4	18.60 ± 0.79	3.73 ± 0.47	6.40 ± 1.01	62.74 ± 1.30	8.53 ± 0.68	18.79 ± 1.47	9.76 ± 1.38	1.54 ± 0.23	0.91 ± 0.06

*All values are means of at least six observations with minimum three samples analyzed in duplicate.

Despite low availability of leguminous fodder in post rabi period, the use of oil cake as a supplement saw a decline (60.00% using cottonseed cake in post kharif period vs 46.67% using mustard oil cake in post rabi season) and this happens even though the mustard is a local produce, whereas cottonseed cake is imported from Rajasthan and Haryana state of India. The compensation is sought in the form of commercial compounded pelleted feed and gram chuni, with an increase in their use.

Critical evaluation of the situation reveals that cotton seed cake appears to be used primarily as a source of fat during winter and not for its crude protein value. The mustard cake, although available with the farmers even during post kharif period, is deliberately not included in ration due to taboos attached with its use in winter. These taboos were beyond the scope of the present study and are therefore not covered here.

Utilization of wheat bran decreased during post kharif period from 70.00% farmers using it to 46.67% farmers using it. This may be due to the fact that wheat byproducts does not come out in the market at a competitive price along with the grain. The extra energy available from non-leguminous green fodder during this period also dilutes the requirement of bran as a supplement.

The utilization of commercial pelleted feed by the farmers as a supplement and not as the exclusive concentrate source is basically an economic decision. However, its utilization despite availability of all principal ingredients with the farmers seems to be more related to peer pressure and the fear of losing production on account of some important ingredient.

Complete absence of mineral mixture from the feeding regimen indicates the failure of extension programs, however, cent per cent supplementation of diet with salt in the form of lick was a consolation. However, bottom line inference from the feeding regimen survey was that majority of the farmers were having access to green fodder during the survey period, however, leguminous fodder availability is restricted during post rabi period. There was no feed processing efforts by the farmers in terms of physical roughage processing as hay preparation, silage preparation or sani making.

Chemical composition of sampled feedstuffs

Roughage

Compositional data for analyzed feedstuffs is detailed as Table 6. Berseem, sorghum (MP Chari), oat, maize and wheat fodder were principal green fodder utilized by the respondents for livestock feeding. Berseem was found to contain $26.63 \pm 0.64\%$ CP with $32.44 \pm 1.87\%$ and $20.45 \pm 1.01\%$ NDF and ADF, respectively. Sorghum (MP Chari) was found to contain 6.90 ± 0.26 CP with 60.97 ± 4.37 and $36.93 \pm 2.04\%$ NDF and ADF, respectively. Oat, maize and wheat fodder were found to contain 8.12 ± 0.84 , 8.87 ± 0.83 and $4.07 \pm 0.09\%$ CP, respectively.

Wheat and paddy straw were the dry fodder used and were found to contain 3.67 ± 0.65 and $2.91 \pm 0.03\%$ CP, respectively. The calcium and phosphorus content of dry roughage was respectively, 0.28 ± 0.01 and 0.14 ± 0.02 per cent for wheat straw and 1.38 ± 0.26 and 0.50 ± 0.01 per cent for paddy straw.

Concentrates

The chemical composition of the analysed feedstuffs is presented in table-No-6 and it was similar to the composition reported previously (Kearl, 1982). Multiple samples of feedstuffs differing in sampling location and/or time of collection showed low variability as indicated by low standard errors for most of the compositional parameters. However, berseem was showing large variability between samples.

Commercial compounded feeds utilized by the respondents has chemical composition different from the specifications prescribed by Bureau of Indian Standards (BIS, 2009). Based on chemical composition, the sampled feeds seems to be BIS type II feeds, although there was no way to confirm it while sampling as most of the farmers purchase the pelleted feed as loose and on daily basis, rather than buying in company packaged labelled wholesale bags. The pelleted feeds were mainly deficient in CP as compared to the BIS specifications with one feed showing about 11% deficit. All the feeds were having ether extract in excess with excesses as high as 88% above standards. The reasons that may be attributed to this variation is the



high cost of nitrogenous ingredients like oil cakes and low cost of fat rich ingredients like rice polish. Further, fat rich ingredients also helps in increasing palatability, giving a better acceptability of the brand. All the feeds were satisfactory in calcium and phosphorus levels and also complies to crude fibre level restrictions.

CONCLUSION

Critical evaluation of the results indicate that feeding regimen practiced by small dairy farmers of RS Pura block is dependent on limited number of feedstuffs. Barring berseem, there is dearth of leguminous fodder in dairy cattle diet of surveyed region and therefore conservation of it as berseem hay or sowing of some other leguminous fooders like lobia, lucern needs to be encouraged to ensure year round availability of leguminous fodders. Further, it is noteworthy that feed composition is skewed in favour of energy supplements and mineral supplementation needs to be promoted, especially in diets of high milk yielders to achieve optimum health and productivity.

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