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Status of fodder production in the existing farming systems in Muzaffarnagar district of Uttar Pradesh

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Abstract
The survey was conducted to assess the status of fodder production in Muzaffarnagar district of Uttar Pradesh. Twenty households were selected randomly for the study. The information was gathered through village survey using semi structured interview schedules. The results of study revealed that, developed fodder production techniques are not adopted well by the farmers. Sugarcane based mono cropping system is being practiced resulting reduced forage availability. Fodder area with respect to land holding size was higher in marginal farmers (35.19%) and was lower in case of large farmers (8.10%). The total numbers of animals in medium farmers were highest, while lowest among the small farmers. The total milk production and consumption was higher in large farmers compared to medium, small and marginal farmers. Sale of milk was lower in marginal farmer than other categories of farmers. During scarcity period sugarcane tops is used as fodder to animals. Majority of the farmers (72%) are sowing fodder crops through broadcasting method. The green fodder yield of sorghum, bajra and Napier were highest in marginal farmers than small, medium and large farmers. On the other hand green fodder yield of cowpea was higher in small and medium farmers when compared with marginal and large farmers. Forty eight per cent of farmers reported that area under fodder production is decreasing. Most of the farmers cut their fodder crops nearly by the ground surface (5 cm height). Large number of farmers (84%) reported that they are applying urea after each cut in the fodder crops. Besides, farmers also reported that low price of fodder, poor quality seed, insects and pests are the major constraints in fodder production. Therefore, there is need of diversification of existing cropping systems to augment the fodder availability to huge livestock population.

Keywords: Cropping system, Farming system, Fodder yield, Farmers, Milk

Shortage of feed and fodder has been identified as one of the major constraints in achieving desired level of livestock productivity. The scarcity of green fodder and grazing resources in the country has made the livestock to endure continuously with malnutrition resulting in their production potentiality at sub optimal level as compared to many developed counties (Iyanar *et al*., 2015). There is always debate on the exact shortage of feed and fodder in the country, but recently it has been reported that the country faces a net deficits of green fodder (35.6%), dry fodder (26%) and concentrates (41%; Anonymous, 2013). The area under fodder crops (4.9%) has almost remained static for the last three-four decades. The availability of dry fodder, green fodder and concentrates has been forecasted at 409.4, 135.6 and 61.2 million tonnes, respectively by 2030 (Suresh *et al*., 2012). Moreover, 50-60 per cent of total cost of livestock production goes to fodder feeding and remaining goes to health and other management aspects. Thus bridging the gap between demand and supply is indeed a matter of great concern. The scenario of fodder crops is different when compared to other crops in respect of multiplicity, regional specificity and seasonality. Also due to low commercial value, the farmers are generally not attracted towards fodder crops and in most of the situations fodder cultivation is practiced even on degraded and marginal lands with very less inputs, realizing only low production. Keeping in view the above, the present investigation was conducted to assess the status of fodder production under existing farming systems in Muzaffarnagar district of Uttar Pradesh.

The study was conducted in Muzaffarnagar district of Uttar Pradesh during 2016-17. Two blocks of Muzaffarnagar district of Uttar Pradesh namely Jansath and Shahpur; and from each block three villages (Jansath block: Manphoda, Tisan and Meerapurdalpat and Shahpur block: Dinkar, Chandpur and Rasulpur Jatan). Again from each village, 20 farmers were selected

by following multi-stage random sampling technique, thereby constituting a sample size of 240 farmers respondents.

Survey was conducted to collect information on average land holding size per household, total number of livestock per household, total milk production and milk utilization in each household, area under different fodder crops *viz.,* bajra, cowpea, sorghum, berseem, oat and napier etc. Information related to constraints in availability of agriculture inputs like fodder seed, fertilizer and insecticides, use of organic and inorganic sources of plant nutrients like cow dung (farm yard manure), vermi-compost and farm compost were also collected. All the information was gathered through village survey using semi structured interview schedules (as the suggested by Bargali *et al*., 2007; Pandey *et al*., 2011) with adult members or head of the family. During the interview, each household was visited at their doorstep. The estimation of market value of fodder was derived on the basis of seasonal production and requirement of green fodder to animals. Monetary values of various farm and animal produces were calculated on the basis of buying and selling price in the village in 2016-17 (the period of study). The data were subjected to descriptive statistics and frequency analysis (Snedecor and Cochran, 1980).

The results of survey revealed that improved package of practices with new cropping systems developed for fodder production were not adopted properly by the respondents or farmers. Most of the land in Muzaffarnagar district is arable and thus there was opportunity to produce fodder under intensive forage production systems. Presently most of the farmers are adopting either sorghum-berseem-sorghum and/or sorghum-oat-sorghum, cropping systems for fodder production during all three seasons. But to increase fodder production, multiple cropping systems in which cultivation of at least three to four high yielding fodder crops on a piece of land in a calendar year is required. Such cropping systems can be adopted with an objective to achieve the high yields of green fodder. These systems will also assure regular supply of green fodder when staggered sowing and harvesting schedules are followed. Similar observations were also reported earlier (Mishra *et al*., 2007). Apart from the mentioned systems under assured irrigation facilities following multiple cropping sequences *viz*., bajra-oat-cowpea, sorghum-*Dolichos*-teosinte, cowpea- stylo- sorghum and teosinte-sorghum-*Clitoria* may be tried. These systems are better suited to manage well small holdings. Another viable option is to combining the annual and biennial forage species as it will enhance the supply of green fodder throughout the year in the area.

The survey data showed that in selected villages there were different categories of farmers *viz.,* marginal, small, medium and large (Table 1). Among the different categories of farmers, small farmers were highest (52%) and large farmers were lowest (8%). Regarding fodder area with respect to land holding size was highest in marginal farmers (35.19%) and lowest in large farmers (8.10%) (Fig 1). Similar, findings have also been reported by Thammi Raju *et al*. (2006). The number of animals with medium farmers were highest (12.5±4.7), whereas, the lowest were with small farmers (4.69±0.5). In another study, Devasena *et al*. (2015) also reported that majority of the farmers (74.3%) had less than five animals per household. Dry animals, buffaloes and crossbred cows were more with medium farmers (Table 2). The milk production in large farmers was highest (29.0±1.0), followed by medium, small and marginal farmers. Devasena et *al*. (2015) reported that, milk production was less than 10 l/d from the animals maintained by 35.8% of the families and about 49.9% of the families were producing between 10 to 20 l/d in Chitoor district of Andhra Pradesh. Milk consumption in house hold was 16.5±6.5 in large farmers followed by marginal (11.33±4.37) and least was in small farmers (Fig 2).

Table 1. Land holding and area under fodder cultivation in different categories of farmers

Farmer	Percentage (%)	Mean land holding (ha)	Area under fodder cultivation (ha)
Marginal	12	0.54±0.04	0.19±0.03
Small	52	1.62±0.08	0.32±0.02
Medium	28	2.65±0.27	0.60±0.12
Large	08	5.62±0.62	0.45±0.04

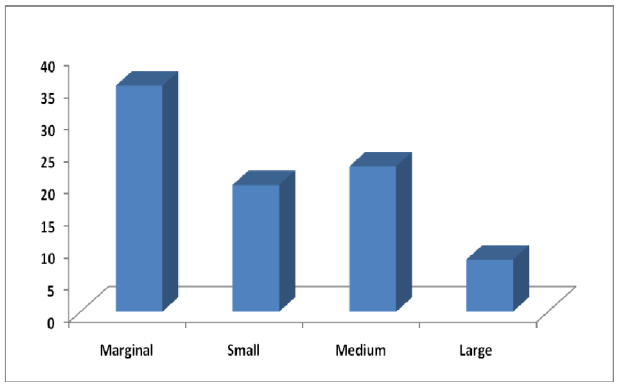

Fig 1. Percentage of fodder area with respect to land holding (%)

Table 2. Species-wise livestock number in different categories of farmers

Farmer	Total animals	Milch animals	Dry animals	Buffaloes	Crossbred cattle	Other animals*
Marginal	5.0±0.50	2.0±0.50	1.33±0.33	1.33±0.6	2.0±0.5	1.66±1.20
Small	4.69±0.5	1.92±0.26	1.23±0.25	1.07±0.28	1.53±0.18	1.76±0.28
Medium	12.5±4.7	4.57±1.06	3.14±1.35	2.85±1.35	5.14±2.5	2.85±1.35
Large	7.50±2.5	2.5±0.50	2.5±1.50	2.5±0.50	3.0±0.50	2.5±1.50

*Other animals includes calves and heifers

Sale of surplus milk was least among marginal farmers. The fodder grown in different seasons, market value of green fodder and number of cuts in fodder were also recorded. The market prices of green fodder in *kharif*, *rabi* and summer varied from Rs. 1.25 to 2.5 per kilogram. Numbers of cuttings were also different in different fodder crops due to their genetic characters. Especially during scarcity period sugarcane crop can be used as fodder to animals. Sometimes farmers use whole sugarcane plant and/or upper part can be used as fodder to animals to avoid scarcity of fodder. The yield of green fodder obtained by the farmers in different crops is shown in (Table 3). The green fodder yield of sorghum, bajra and Napier were higher in marginal farmers category. The cowpea yield was 260 and 276.6 q/ha in small and medium farmers categories, respectively. While the green fodder yield of maize was higher in medium farmers category followed by marginal farmers. Berseem green fodder yield (678.8 ± 66.4 q/ha) was higher in small farmers. However, oat yield was higher in marginal farmers. Barley green fodder yield was higher in small farmers but muckchari green fodder yield was higher in medium farmers.

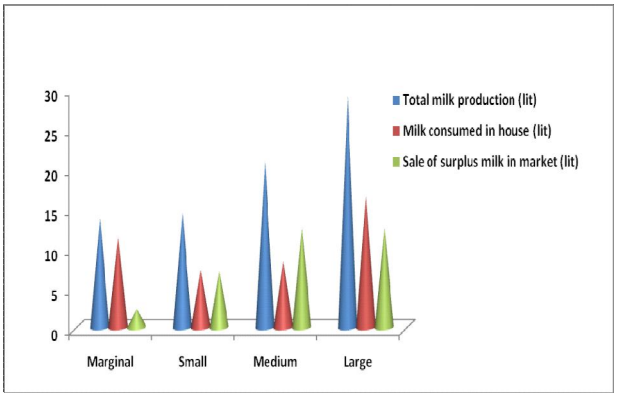

Fig 2. Milk utilization pattern among the different categories of farmers

It revealed from the survey data that 72% farmers sow their fodder crops through broadcasting method and some farmers are aware of line sowing (20%) and only 8% farmers sown their fodder crops as intercropping (Table 4). Forty eight per cent of farmers reported that area under fodder production is decreasing, while 32% farmers reported that area under fodder production is increasing and 20% farmers reported that area under fodder crops remained stable. Majority of the farmers cut fodder crops less than 5 cm height from ground surface. Large number (84%) of farmers reported that they had applied urea after each cut. Majority of the farmers (84%) do not use fungicides and insecticides for seed treatment and they purchase fertilizers from cooperative societies.

Most of the farmers of the study area are growing sugarcane + maize, sugarcane + sorghum and sugarcane + cowpea as intercropping or mixed cropping to increase the fodder availability during scarcity period (summer season). There are many options to increase the productivity of fodder crops per unit area and time. Raising of boundary plantation, mixing of fodder trees with other crops for example subabul + pearl millet (1:3), Lathyrus and Gobhi sarson can be grown as fodder crops and hydroponics technique of fodder growing can also be introduced. The cropping sequences of bajra-oat-cowpea, sorghum-*Dolichos*-teosinte, cowpea-stylo-sorghum and teosinte-sorghum-*Clitoria* may be adopted for increasing the fodder availability. Devendra and Sevilla (2002) reported that the introduction of improved forage species for ruminants can promote the sustainability of cropping systems. The potential availability of sugarcane tops has increased considerably in the Uttar Pradesh but, there is a need for efficient incorporation of sugarcane tops in the diet of livestock especially the large ruminants so as to make the livestock production system more profitable (Raju, 2013).

The fertilizer management strategies in fodder crops aim to increase the herbage production per unit area. Knowing the nutrient requirement of fodder crops, particularly the use of nitrogen through urea is comparatively higher to other nutrients which plays a significant role in increasing fodder productivity. After each cut, majority of the farmers (84%) apply urea, whereas, 16% farmers do not apply urea. Only 10% farmers were applying micronutrients in fodder cultivation. Oad *et al*. (2004) reported that the inorganic nitrogen application is

Table 3. Yield of green fodder in different farmers categories (q/ha)

Farmers	Sorghum	Bajra	Napier	Cowpea	Maize
Marginal	556.6±12.01	453.3±14.2	795±5.0	-	453.3±54.0
Small	468±16.4	435±36.0	583.3±52.0	260±13.5	391.5±29.3
Medium	462.85±27.4	397.14±36.03	675±25.	276.6±12.01	461.6±52.4
Large	512.5±37.50	295±5.0	525±25.0	-	425.0±25.0

Farmers	Berseem	Oat	Barley	Muckchari
Marginal	603.3±141	433.3±72	-	280±20
Small	678.8±66.4	412.2±15	262.5±12.5	300±22.36
Medium	501.42±35.35	365±46.4	-	356.3±55.16
Large	575±75	325±25	225±25.0	300±50.0

Table 4. Agronomical package of practices followed by farmers in fodder production

Sr. No	Particulars	Farmers (%)
1.	**Techniques of fodder crop sowing**	
a	Sole crop (pure crop)	72
b	Mixed crop	20
c	Intercrop	8
2.	**Area under fodder crops**	
a	Increasing	48
b	Decreasing	32
c	Stable	20
3.	**Cutting distance from ground surface**	
a	Less than 5cm	80
b	Above 5cm	12
c	More than 10cm	8
4.	**Application of urea after each cut**	
a	Yes	84
b	No	16
5.	**Application of micronutrient in fodder crops**	
a.	Yes	10
b.	No	90
6.	**Method of sowing**	
a	Broadcasting	80
b	Line sowing	12
c	Other	8
7.	**Type of soil**	
a	Heavy	40
b	Clay	52
c	Loam	8
8.	**Source of fodder seed availability**	
a	Local market	84
b	Govt. agencies (SAUs, KVKs and ICAR Institutes)	16
9.	**Fodder seed treated with fungicides/ Insecticides**	
a	Yes	16
b	No	84
10.	**Source of fertilizers availability**	
a	Cooperative societies	72
b	Local market	28

Table 5. Constraints in fodder production

Constraints	Percentage (%)	Rank
Low price of fodder	16	II
Insects, pests, poor quality seed and low germination	16	II
Problem of *Nilgai* and wild boars	36	I
Non- availability of inputs on time	12	III
Electricity and labour problem	8	IV
Non-availability of land for fodder cultivation (sugarcane mono cropping)	12	III

the common practice of the farmers, but addition of farmyard manure as partial substitution to fertilizers significantly increased the maize fodder yield. The integrated use of organic and inorganic fertilizers not only increase mutual efficiency but also helps in the substitution of costly chemical fertilizers (Hussain and Ahmed, 2000). Similarly, Meena *et al*. (2011) reported that integrated application of fertilizers along with sheep manure and vermicompost leads to higher fodder production with better quality.

The major constraints in fodder production as reported by the farmers were studied (Table 5). Farmers reported the wild animal's problem as major constraint in fodder production. Apart from this, other most important problems before farmers are low price of fodder, insects, pests and poor quality seed. Non-availability of good quality fodder seed is a serious problem in developing countries throughout the world (Biemond *et al*., 2012). Farmers also reported that agriculture inputs are not available on time and non-availability of agriculture land for growing fodder crops since mono cropping of sugarcane crop is the first priority due to high remuneration in the study area. Electricity and labour problems are other important constraints in fodder cultivation.

It was concluded from the present study that farmers are not adopting developed fodder production techniques. Mono cropping of sugarcane is predominant system in the study area, which is the major constraint in fodder production as more than 80% area comes under sugarcane. Therefore, there is a need for diversification of existing cropping system to augment the fodder production for livestock. Efficient forage crops for the area should be identified. Seeds and planting materials should be obtained from reliable sources. Fodder crops should be harvested at appropriate height to get adequate fresh fodder with high quality nutrients particularly the crude protein which will result better production in livestock.

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