RESEARCH ARTICLE Bhartiya Krishi Anusandhan Patrika, Volume 40 Issue 3-4: 352-358 (September and December 2025)

Empowering Small Farmers with the 10- Cent Multi-cut Fodder Model

G. Vijaya Ragjni[1], K. Sailaja[1]

10.18805/BKAP873

ABSTRACT

Background: The profitability of ruminant production hinges on the reliable availability of top-quality fodder. Nevertheless, a concerning issue is emerging: a substantial gap between the supply and demand of fodder. This imbalance predominantly affects small and marginal dairy farmers, who possess limited land. These farmers prioritize cash crop cultivation on their available land while dedicating only minimal space to fodder production. The rising cost of external feed supplements further intensifies the burden, affecting both milk yield and animal health. Inadequate fodder leads to nutritional deficiencies, reduced reproductive efficiency and increased susceptibility to diseases. Ensuring year-round access to diverse, nutrient-rich green fodder is, therefore, essential for improving livestock productivity and farmer income. Integrated fodder production models that maximize yield even in limited spaces can serve as a sustainable solution. Empowering farmers with low-cost, space-efficient techniques for cultivating multiple fodder types can significantly bridge the gap and support resilient dairy farming systems.

Methods: In this regard, to address the prevailing fodder scarcity challenge, Bhagavatula Charitable Trust–Krishi Vigyan Kendra (BCT-KVK), Anakapalli, has been actively demonstrating a multi-cut fodder production model in a compact area of 10 cents. This model is specifically designed to enable small to medium-scale dairy farmers to access a consistent and diverse supply of green fodder throughout the year in its operational villages across the Anakapalli district. The demonstration plot incorporates a strategic mix of high-biomass-yielding grasses like Super Napier, cereal fodders (such as fodder maize and sorghum) and leguminous fodders (like cowpea and hedge lucerne) thereby ensuring a balanced nutritional profile for ruminants. In addition, tree fodders such as Subabul, Sesbania, Moringa and Glyricidia are planted around the boundaries to serve as a perennial source of green fodder and to provide essential vitamins and minerals. This integrated approach contrasts with the conventional practice of feeding carbohydrate-dominant grasses alone, which often leads to poor nutrient balance, reduced milk productivity and subclinical deficiencies. The model is designed for continuous harvesting and re-growth, ensuring sustainable fodder availability and minimizing the dependency on purchased feed resources.

Result: With the multi-cut fodder production model, farmers obtained average milk yields of 2,500-3,000 litres per lactation in crossbred HF cows. The average milk fat and SNF content were consistently above 4% and 8%, respectively. This improvement is attributed to the year-round availability of nutritious green fodder, which enhanced rumen function, digestion and overall animal health. The inclusion of leguminous and tree fodders helped bridge nutrient gaps, leading to better metabolic efficiency and sustained lactation performance. Farmers also reported reduced dependency on commercial feed and improved profitability per animal due to better feed conversion efficiency and reduced health-related issues.

Key words: Fodder, Livestock, Nutrition, Productivity, Sustainability.

INTRODUCTION

India is a complex and vibrant society where cultural, religious and economic systems are intricately interwoven with agriculture and animal husbandry. Since ancient times, livestock rearing and crop cultivation have been practiced together in a complementary manner, enabling efficient utilization of crop residues and by-products. This integration continues to play a pivotal role in rural livelihoods and towards their nutritional security. India's total livestock population has reached an impressive 535.82 million, reflecting a 4.6% increase from the 2012 census. The country now holds 57.3% of the global buffalo and 14.7% of the world's cattle population (GoI, 2019). India is also the largest milk-producing nation, yet the average milk yield remains low at 1538 kg per year, which is far below the global average of 2238 kg/year (Vijay *et al*., 2018). This productivity gap can be attributed to multiple factors including low genetic potential, disease prevalence, suboptimal management and most critically nutritional deficiencies resulting from inadequate availability of balanced feed and quality fodder.

Malnutrition and negative energy balance among livestock is a persistent issue that directly affects productivity, reproductive performance and immunity. This is primarily due to the lack of quality feed resources.

[1]Bhagavatula Charitable Trust- Krishi Vigyan Kendra, Haripuram, Visakhapatnam-530 001, Andhra Pradesh, India.

Corresponding Author: G. Vijaya Ragjni, Bhagavatula Charitable Trust- Krishi Vigyan Kendra, Haripuram, Visakhapatnam-530 001, Andhra Pradesh, India. Email: gragjni@gmail.com

How to cite this article: Ragjni, G.V. and Sailaja, K. (2025). Empowering Small Farmers with the 10-Cent Multi-cut Fodder Model. *Bhartiya Krishi Anusandhan Patrika.* **40(3-4):** 352-358. doi: 10.18805/BKAP873.

Submitted: 01-08-2025 **Accepted:** 13-12-2025 **Online:** 30-12-2025

The major components of animal feed in India include cultivated fodder grasses, crop residues such as paddy and wheat straw (both fine and coarse), legume haulms, sugarcane tops, tree fodders and some agro-industrial by-products. However, cultivated green fodder contributes only about 4% of total feed resources, whereas crop residues make up nearly 47% and the remaining comes from common grazing lands (Kumar *et al*., 2019). This over-dependence on low-nutrient feed materials is particularly inadequate for high-yielding crossbred dairy animals, resulting in suboptimal productivity and compromised animal health. The sustainability of the dairy industry largely depends on a consistent, year-round supply of high-quality green fodder. Unfortunately, the current availability remains insufficient due to several challenges, including limited farmer awareness, poor access to certified fodder seeds, lack of adoption of high-yielding multi-cut fodder varieties, increasing water scarcity and most importantly the prioritization of cultivating commercial food and cash crops over fodder crops (Kumar *et al*., 2017). This imbalance threatens the long-term viability of livestock-based rural livelihoods and calls for immediate corrective action.

Nationally, green fodder faces an 11.2% deficit, while Andhra Pradesh alone contributing a staggering 62.9% to this shortage (Roy *et al*., 2019). In several districts of Andhra Pradesh, cropping patterns are dominated by paddy and commercial crops, leaving little to no space for dedicated fodder plots. Even when cultivated, fodder production is often seasonal and inconsistent, leading to acute shortages during lean periods (Gracia *et al*., 2006). Furthermore, the evolving impacts of climate change have intensified the challenges associated with fodder cultivation. Unpredictable rainfall, prolonged dry spells and increasing pest and disease incidence have made conventional fodder sources less reliable (ICAR, 2012). In addition, there is growing concern over the rapid degradation of common grazing lands. These lands, once central to livestock feeding in rural India, are now shrinking due to encroachment, overgrazing and deforestation.

To address these challenges, there is an urgent need to enhance fodder production within existing agricultural land (Khan *et al.,* 2007). This includes not only increasing the area under fodder crops but also improving varietal diversity, adopting nutritionally rich and high-yielding varieties and promoting cropping systems such as intercropping and sequential cropping along with increasing the productivity/yield of fodder crops per unit land area (Hill *et al.,* 2023). These integrated approaches can ensure year-round availability of green fodder, mitigate seasonal shortages and significantly boost livestock productivity (Bisht *et al.,* 2020). Traditional feed resources are often deficient in crude protein and digestible energy, resulting in a negative energy balance in lactating animals. This impacts their health, milk production and fertility. Hence, it becomes essential to promote sustainable fodder production systems that optimize land use and increase forage yield per unit area. A well-designed fodder production model diversified, efficient and year-round can empower dairy farmers to improve animal health and farm profitability (Thangadurai *et al.,* 2021). Hence, there is a critical need to develop and promote fodder production models that allow multiple types of high-yielding fodder crops to be cultivated together on small landholdings, ensuring year-round green fodder availability and enhanced forage output per unit area (Kamala *et al*., 2017).

MATERIALS AND METHODS

The present study, multi cut fodder production in 10 cents for year round supply, was conducted from June 2021 to February 2024 as a front-line demonstration by Bhagavatula Charitable Trust- Krishi Vigyan Kendra located at Haripuram village of Rambilli Mandal, Anakapalli district andhra Pradesh. This model or technology was primarily released by Tamil Nadu Veterinary and Animal Sciences University in 2019 but is modified by BCT-KVK to meet the needs of local dairy farmers in its operational area. Fodder seeds for African tall maize (*Zea mays L*), Coimbatore Fodder Sorghum (CoFS) Variety- 29 (*Sorghum bicolor*), Cowpea (*Vigna unguiculata*) and Hedge lucerne (*Desmanthus virgatus*) were procured from Krishi Vigyan Kendra-Namakkal and Villupuram, while Super Napier (*Pennisetum purpureum* × *Pennisetum glaucum*) slips, Sesbania (*Sesbania grandiflora*), Glyricidia (*Gliricidia sepium*), Subabul (*Leucaena leucocephala*) and Moringa (*Moringa oleifera*) seeds were sourced locally. One dairy farmer with small land holding (<2 hectares) was purposively selected possessing only 2 milch cattle in either first or second lactation from 9 random villages namely from Rambilli, S Rayavaram and Yelamanchili mandals, 3 villages from each (Fig 1). A demonstration plot is also maintained at BCT-KVK farm during the study period. The farmers were initially trained about fodder production practices and the importance of feeding various types of fodder to livestock and a demonstration of the 10-cent multi-cut fodder production plot was given at the KVK demo unit to them. The farmers were provided with 700 number of Super Napier slips, 750 gms of fodder Maize seeds, 30 gms of fodder Sorghum seeds (CoFS-29), 100 gms of cowpea seeds, 100 gms of Hedge Lucerne seeds and 20 number of tree fodder saplings of Sesbania, Subabul, Glyricidia and Moringa each. The farmers were advised to cultivate fodder as demonstrated (Fig 2).

The selected farmers were advised to feed their cattle with the fodder harvested from the 10-cent plot along with concentrate feed and hay. The average yields from various types of fodder were collected per each harvest. The costs of milk production per litre per day per cow, average milk yield per day per cow, average fat percentage and average SNF percentage per litre of milk before and after the demonstration of the 10-cent fodder plot were recorded during the study.

RESULTS AND DISCUSSION

The average yield of different fodder varieties in different fields were given in the Table 1. The yield of Super Napier (Fig 3) ranged from 976 to 1136 (kg) per harvest, which is similar to where 100 tonnes of Super Napier was harvested per acre per annum (Rao *et al*., 2024). Fodder Sorghum-CoFS-29 (Fig 4) ranged from 150 to 265 (kg) per harvest, fodder African Tall Maize (Fig 5) 135- 170 (kg) per harvest which is similar to the results of (Reddy *et al.,* 2022).While legume fodders like fodder cowpea (Fig 6) yielded 140-178 (kg) and fodder Hedge Lucerne (Fig 7) yielded 55-75 (kg) per harvest. The tree fodders grown on borders provided a yield ranging from 78-95 (kg) per harvest during lean periods. The farmers are annually harvesting

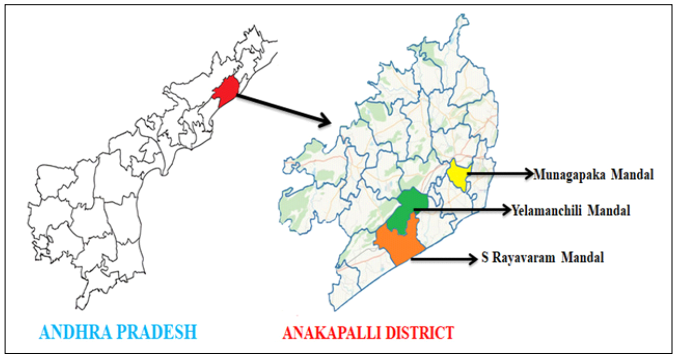


Fig 1: Map showing study area in Anakapalli district of Andhra Pradesh.

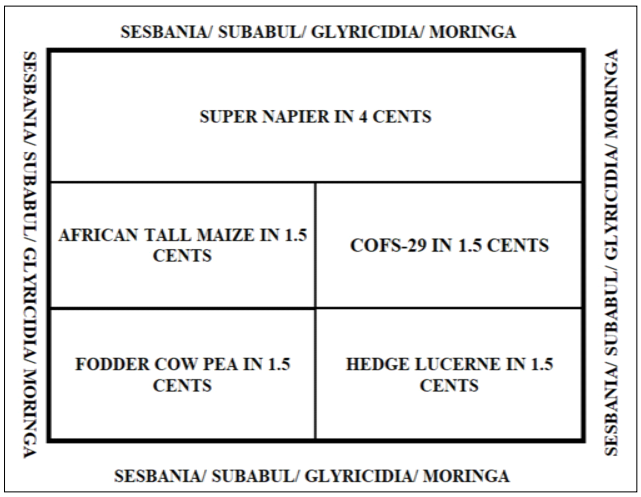


Fig 2: Multi cut fodder production in 10 cents plot pictorial depiction (TANUVAS TECHNOLOGY 2019 modified by BCT-KVK, Anakapalli).

Table 1: Yield of various fodders cultivated in 10 cents per harvest.

10 Cent fodder fields	Yield per harvest (Kg)					
	Super napier (4 cents)	CoFS-29 (1.5 cents)	Fodder maize (1.5 cents)	Fodder cow Pea (1.5 cents)	Hedge lucerne (1.5 cents)	Tree fodders on borders
Field-1	1050	251	145	160	65	80
Field-2	976	250	135	155	72	82
Field-3	1040	228	135	155	70	91
Field-4	1125	258	155	165	55	90
Field-5	1030	235	160	164	60	85
Field-6	1090	150	155	140	65	83
Field-7	1076	243	162	158	52	78
Field-8	1050	250	155	155	55	90
Field-9	1136	245	145	162	55	92
BCT-KVK demo field-10	1340	265	170	178	75	95
Mean yield (Kg)	1091.3	237.5	151.7	159.2	62.4	86.6

approximately 10,743 kgs of green fodder (7 harvest/year), which is around 25-30 Kgs of fodder harvest per day. These results are on par with the results interpreted by (Manobhavan *et al*., 2021) in his study.

The average daily milk yield of dairy cattle before the implementation of the ten-cent multi-cut fodder production model was 9.35 litres, with a milk fat content of 3.26% and solids-not-fat (SNF) at 7.7%. After the intervention, the average milk yield increased to an average of 10.48 litres per day, with notable improvements in milk quality parameters-fat content rose to 4.06% and SNF to 8.0% (Table 2). This improvement in milk yield and quality is attributed to the feeding of nutritionally superior fodder varieties introduced through the demonstration. Farmers cultivated and fed leguminous fodders such as *Hedge Lucerne* and *Cowpea* which are rich in protein, along with



Fig 3: Fodder Super Napier growing in 4 cents in Multi cut fodder production in 10 cents plot model.



Fig 4: Fodder maize growing in 1.5 cents in multi cut fodder production in 10 cents plot model.



Fig 6: Fodder Cowpea growing in in 1.5 cents in Multi cut fodder production in 10 cents plot model.



Fig 5: Fodder CoFS-29 growing in 1.5 cents in Multi cut fodder production in 10 cents plot model.



Fig 7: Fodder Hedge Lucerne growing in 1.5 cents in Multi cut fodder production in 10 cents plot model.

tree fodders like *Subabul*, *Gliricidia, Moringa* and *Sesbania* known for their mineral content (Karangiya *et al.,* 2025). These fodders were not commonly grown or utilized in traditional feeding practices. Their inclusion likely helped address sub-clinical deficiencies, particularly of protein and trace minerals, thereby improving rumen function and overall animal metabolism. The results suggest that incorporating a diverse and balanced fodder plan, even within a limited land area; can significantly enhance milk productivity and quality in smallholder dairy systems (Hossain *et al.,* 2017).

The cost of milk production depends on cost of concentrate feed, labour, health condition of the animal, fodder production cost, area, season *etc*. (Feroze *et al.,* 2016). As the study was conducted in the same district and on same breed of animals with similar lactation, all the other factors are considered as same except cost of fodder feeding. Cost of milk production was worked for a period of six months, in all the fields to assess the influence of fodder. Average cost of production for a litre of milk per day per cow is ranged from Rs 22.02 to Rs 26.49 and the reduction of cost was observed from Rs 3.84 to Rs 7.8 (Table 3). The results were similar to (Agarwal, 2021) and (Jayalalitha *et al*., 2023) where the cost of milk production ranged from Rs 24.85 to Rs 25.86 per litre. Before demonstration farmers used to feed 4-5 kgs of concentrate feed to the cattle with an average milk production of 6-8 litres per day as there is no or less fodder available in their land along with dry fodder, but after intervention the farmers have fed

Table 2: Average yield of milk, fat percentage and SNF percentage per litre per day per cow in one lactation.

10 cent fodder plot- Village	Average milk yield per day (lit) per cow		Average fat per day (%) per litre of milk per cow		Average SNF per day (%) per litre of milk per cow	
	Before demonstration	After demonstration	Before demonstration	After demonstration	Before demonstration	After demonstration
Field-1	10.5	10.5	3.5	4.1	7.1	8.1
Field-2	8.5	9.5	3.0	3.6	8.1	8.0
Field-3	9	10.6	3.3	4.6	8.0	7.9
Field-4	8.5	9.6	3.4	3.6	8.1	8.1
Field-5	10.5	10.5	3.6	4.2	7.6	8.0
Field-6	11	13.5	2.5	3.3	7.5	8.1
Field-7	9.5	10.5	2.8	4.4	7.6	7.8
Field-8	7.5	9.5	3.4	4.4	7.0	7.9
Field-9	6	8.5	3.2	4.1	7.9	7.9
BCT-KVK-demo field	9.5	12.1	3.9	4.3	8.1	8.2
Average	9.35	10.48	3.26	4.06	7.7	8.0

Table 3: Average cost of production for a litre of milk per day (Rs) er cow for 6 months.

10 cent fodder plot-village average	Before demonstration (Rs)	After demonstration (Rs)
Field-1	32.51	26.09
Field-2	32.29	25.69
Field-3	29.08	24.93
Field-4	28.09	24.08
Field-5	28.49	26.33
Field-6	27.69	24.93
Field-7	27.65	25.68
Field-8	25.22	22.78
Field-9	25.86	22.02
BCT-KVK demo field	34.29	26.49
Mean cost (Rs)	29.11	25.0

Table 4: Economics (costs, returns and benefit cost ratios) of milk production for 6 months.

Particulars	Average gross cost (Rs)	Average gross income (Rs)	Average net returns (Rs)	Average BCR
Before demonstration of multi cut fodder in 10 cents	12233	28175	15942	2.30
After demonstration of multi cut fodder in 10 cents	13600	55760	42160	4.1

the cattle with the ample amount of fodder and have reduced feeding of concentrate which eventually reflected in reduction of cost of production between Rs 3.84 to Rs 7.8. The cost and return measures of the milk production per lactation shows average net returns of Rs 42160 after demonstration of 10 cent model of fodder production with a BCR of 4.1 compared to Rs 15942 of net returns and 2.3 of BCR before the demonstration (Table 4). Increased net returns result from enhanced milk production coupled with higher milk fat and solid non-fat (SNF) content, thereby raising the cost per litre of milk within the dairy cooperative to approximately Rs 4 to Rs 6 from the previous cost (Marykutty *et al*., 2015).

CONCLUSION

The ten-cent multi-cut fodder model developed by BCT-KVK clearly demonstrates how even farmers with very limited land can produce a reliable, year-round supply of green fodder for their dairy animals. The fodder production in 10 cents of land is particularly valuable for its practical mix of grasses, cereals, legumes and nutrient rich tree fodders, which together ensure that cattle receive a balanced supply of green fodder every day. Tree species such as Subabul, Moringa, Sesbania and Gliricidia are equally important in this system because they grow well with minimal care can be harvested repeatedly and serve as a dependable reserve during dry periods when regular fodder crops may not survive. Their leaves are packed with essential nutrients like calcium, iron and vitamin A, helping to address the sub-clinical deficiencies that often lead to weak calves, low milk yield, slow growth and poor fertility in dairy animals. By incorporating tree fodders along the edges of the plot and combining short-duration and long-duration fodder crops, farmers can make the most of limited land while also improving soil health and reducing erosion. The model is easy to adopt, requires very little investment and significantly cuts down the need to purchase fodder from outside, making it highly suitable for small and marginal farmers. This approach not only improves the nutritional status and productivity of livestock but also reduces feed costs and enhances farm-level sustainability. Its simplicity, adaptability across agro-ecological zones and ease of implementation make it highly suitable for replication. This model can be even demonstrated in larger areas by simply expanding the areas of various fodders according to the land available with simple calculations. For broader adoption, the model can be taken up and promoted by institutions and agencies working in the farming and livestock sectors, including Krishi Vigyan Kendras (KVKs), NGOs, Farmer Producer Organizations (FPOs), dairy cooperatives, local panchayats and state animal husbandry departments. Setting up demonstration plots at strategic locations such as village entrances or roadside points can visually engage farmers and encourage them to adopt the practice. Further, integration into farmer training programs, method demonstrations, fodder cafeterias and extension advisory services can amplify its impact. Embedding this model into community-level fodder initiatives and livestock development schemes holds strong potential for improving fodder security, enhancing livestock productivity and supporting the long-term sustainability of rural livelihoods.

ACKNOWLEDGEMENT

The present study was undertaken as a part of Frontline Demonstration activities at BCT-Krishi Vigyan Kendra, Visakhapatnam, with financial support from the Agricultural Technology Application Research Institute (ATARI) - Zone X, Hyderabad, during the period 2021 to 2023. I express my sincere gratitude to the Chairman and to the Senior Scientist and Head of BCT-KVK, for their constant encouragement, valuable guidance and unwavering support throughout the course of this study.

Disclaimers

The views and conclusions expressed in this article are solely those of the authors and do not necessarily represent the views of their affiliated institutions. The authors are responsible for the accuracy and completeness of the information provided, but do not accept any liability for any direct or indirect losses resulting from the use of this content.

Informed consent

All animal procedures for experiments were approved by the Committee of Experimental Animal Care and handling techniques were approved by the University of Animal Care Committee.

Conflict of interest

The authors declare that there are no conflicts of interest regarding the publication of this article. No funding or sponsorship influenced the design of the study, data collection, analysis, decision to publish or preparation of the manuscript.

REFERENCES

Agrawal, A. and Raju, R. (2021). Economics of milk production in Malwa and Kymore zones of Madhya Pradesh. *Haryana Veterinarian.* **60(2):** 170-175.

Bisht, I.S., Rana, J.C. and Pal Ahlawat, S. (2020). The future of smallholder farming in India: Some sustainability considerations. *Sustainability.* **12(9):** 3751.

Feroze, S.M., Ram, S. and Smita, S. (2019). Economics of milk production and factors affecting milk yield in Meghalaya: Estimating the seasonal effect. *Indian Journal of Dairy Science.* **72(3):** 328-335.

García, O., Saha, A., Mahmood, K., Ndambi, A. and Hemme, T. (2006). Dairy development programs in Andhra Pradesh, India: Impacts and risk for small-scale dairy farms (Pro-poor Livestock Policy Initiative Working Paper No. 38). Food and Agriculture Organization of the United Nations. http://www.fao.org/ag/AGAinfo/projects/en/pplpi/docarc/wp38pdf.

Government of India. (2019). 20th Livestock Census - 2019: All India report. Department of Animal Husbandry and Dairying, Ministry of Fisheries, Animal Husbandry and Dairying, Krishi Bhawan, New Delhi.

Hilli, J.H., Kapoor, R., Amandeep. (2023). Forage production in India: Bottlenecks and opportunities by opening up new way with an increase in fodder oats demand: A review. *Asian Journal of Dairy and Food Research*. **42(3):** 275-285. doi: 10.18805/ajdfr.DR-2050.

Hossain, S.A., Sherasia, P.L., Phondba, B.T., Pathan, F.K. and Garg, M.R. (2017). Effect of feeding green fodder-based diet in lactating buffaloes: Milk production, economics and methane emission. *Indian Journal of Dairy Science*. **70(6):** 767-773.

Indian Council of Agricultural Research (ICAR). (2012). Forage Crops and Grasses. In: Handbook of Agriculture (6th ed.). New Delhi, India: ICAR.

Jayalalitha, V. and Thomas, K. S. (2023). Role of ten cent fodder plot in small dairy farmer's income in Tiruchirapalli district. *International Journal of Agriculture, Environment and Biotechnology.* **16(1):** 31-34.

Kamala, B.S., Nagaraj, K.H., Ali, S., Ranganath, S.C. and Rayudu, B.T. (2017). Performance and dissemination of multicut fodder crops in Ramanagara district, Karnataka state, India. *International Journal of Current Microbiology and Applied Sciences.* **10:** 4918-4923.

Karangiya, V.K., Parmar, M.R., Chavda, M.R., Bhavsar, M.Y., Ribadiya, N.K., Chavda, J.A. *et al*. (2025). To study the effects of hedge Lucerne (*Desmanthus Virgatus*) grass on digestibility of nutrients, body weight and return over feed cost in gir cattle. *International Journal of Veterinary Sciences and Animal Husbandry.* **10(2):**169-1171.

Khan, S.H., Khan, A.G., Sarwar, M. and Azim, A. (2007). Effect of maturity on production efficiency, nutritive value and *in situ* nutrients digestibility of three cereal fodders. *International Journal of Agricultural Research.* **2:** 900-909.

Kumar, A., Kadam, S., Yadav, R.P., Singh, S. and Surendra. (2019). Tree fodder as an alternate land use option for sustaining forage security in India. *International Journal of Chemical Studies.* **7(2):** 202-207.

Kumar, S., Machiwal, D., Dayal, D. and Mishra, A.K. (2017). Enhanced quality fodder production through grass-legume intercropping under arid eco-system of Kachchh, Gujarat. *Legume Research.* **40(5):** 896-900. doi: 10.18805/lr.v0i0.7596.

Manobhavan, M., Meenakshi Sundaram, S., Rajkumar, K., Muthuramalingam, T. and Venkatramanan, R. (2021). Validation of ten-cent model fodder plot for sustainable ruminant production. *Indian Journal of Veterinary and Animal Sciences Research.* **50(1):** 10-16.

Marykutty, T. and Sasidharan, M. (2015). Factors affecting milk fat percentage and solids-not-fat percentage and milk price of dairy cattle in humid tropics. *Advances in Applied Agriculture Space.* **3(1):** 11-17.

Rao, M.V.D., Nageswara, R.B., Pandu Ranga, R.P. and Manjula, R.S.G. (2024). Estimation of land and manpower needs for year-round supply of green fodder (*Super Napier*) to dairy cattle through time studies and crop cutting experiments. *Journal of Scientific Agriculture.* **8(1):** 1-6.

Reddy, M.A., Kumari, R.C., Reddy, S.B., Reddy, R.B. (2022). Productivity and quality of fodder crops under Late-sown conditions in Semi-arid tropics of India. *Indian Journal of Agricultural Research.* **56(6):** 660-665. doi: 10.18805/IJARe.A-6005.

Roy, A.K., Agrawal, R.K., Bhardwaj, N.R., Mishra, A.K. and Mahanta, S.K. (2019). Revisiting national forage demand and availability scenario. In Indian Fodder Scenario: Redefining State Wise Status. ICAR-AICRP on Forage Crops and Utilization- Jhansi, India. (pp. 1-21).

Thangadurai, K., Monisha, S., Rengaraj, S., Jeevanandhan, S. and Sivakumar, C. (2021). Multicut ten cent fodder production for addressing fodder shortage in small and marginal farmer. *Biotica Research Today.* **3(8):** 700-702.

Vijay, D., Gupta, C.K. and Malaviya, D.R. (2018). Innovative technologies for quality seed production and vegetative multiplication in forage grasses. *Current Science.* **114:** 148-154.