Plant Archives Vol. 25, No. 2, 2025 pp. 1016-1020 e-ISSN:2581-6063 (online), ISSN:0972-5210

Plant Archives

Journal homepage: http://www.plantarchives.org

DOI Url : https://doi.org/10.51470/PLANTARCHIVES.2025.v25.no.2.144

ADOPTION OF RECOMMENDED GREEN FODDER CULTIVATION PRACTICES: ANALYSIS OF RESPONDENT BEHAVIOUR IN SUB-TROPICS OF JAMMU REGION OF INDIA

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(Date of Receiving-29-06-2025; Date of Acceptance-10-09-2025)

ABSTRACT

Green fodder is vital for livestock health, supplying essential nutrients that directly impact productivity in the livestock sector. This study explores the cultivation practices adopted by farmers in Jammu and Kathua districts, focusing on their adherence to recommended guidelines. These districts are key fodder-producing areas in the subtropical region of Jammu. Using a descriptive research design, the study employed purposive and multi-stage random sampling to select 160 respondents from 16 villages across four zones. Data were gathered through a semi-structured interview schedule, developed using the SKUAST-Jammu package of practices and expert consultation. The results indicate low adoption rates of recommended fodder cultivation practices with noticeable differences between irrigated and unirrigated zones. Factors contributing to this include farmers prioritizing cereal crops over fodder, insufficient knowledge of best practices and seasonal shortages of green fodder. Statistical tools, including t-tests and z-tests, revealed significant disparities in adoption levels across zones. The findings emphasize the importance of targeted extension services to raise awareness and encourage the adoption of recommended practices. Aligning recommendations with farmers' existing practices and implementing tailored interventions are crucial for overcoming fodder shortages and enhancing productivity in the region.

Key words : Adoption, Cultivation Practices, Green fodder, Sub-Tropical, Irrigated area, Un-irrigated area.

Introduction

Agriculture and animal husbandry play a vital role in sustaining India's rural economy. Agriculture contributes approximately 20 per cent to the nation's Gross Domestic Product (GDP) (MoF, 2021) and together with dairy farming provides employment to nearly 52 per cent of the workforce (Rathod and Dixit, 2019). India has witnessed substantial growth in its livestock population which increased from 292 million in 1951 to over 535 million by the 20th Livestock Census, compared to 519 million in 2012. To meet the growing fodder demand for livestock, dairy farmers utilize a combination of crop residues, grazing and cultivated forage crops (Rathod & Dixit, 2019).

However, the livestock sector faces persistent challenges in enhancing fodder production (Rathod & Dixit, 2019). In 2013-14, India's total cropped area was 200.85 million hectares, with only 9.85 million hectares (4.89%) dedicated to fodder crops (The Hindu, 2021). While the area under fodder cultivation has increased from 7.8 million hectares in 2011-12 to 9.85 million hectares in 2013-14 (MoAFW, 2016), a significant deficit remains. Estimates by the Indian Council for Agricultural Research (ICAR)-affiliated National Institute of Animal Nutrition and Physiology (NIANP) indicate a shortage in the availability of dry fodder, green fodder and concentrates by 21 per cent, 26 per cent and 34 per cent, respectively in 2015. This deficit is projected to rise to 21 per cent, 40 per cent and 38 per cent by 2025. These figures underscore the urgent need for targeted strategies to bridge the fodder deficit including expanding the area

under fodder cultivation, improving forage crop yields and adopting innovative approaches to fodder production and utilization.

In Jammu and Kashmir, the area under fodder cultivation has experienced a significant decline over the years, decreasing from 61,000 hectares in 2007-08 to 53,000 hectares in 2012-13 (Ahmad *et al*., 2016) and further reducing to approximately 37,000 hectares in 2018-19. Of this, the Jammu region accounts for about 21,000 hectares (GoJK, 2021). The total fodder production in the region stands at 8.65 million tonnes with green fodder contributing 6.14 million tonnes and dry fodder 2.51 million tonnes. Despite these figures, Jammu and Kashmir, with a livestock population exceeding 8 million i.e., 1.5 per cent of India's total livestock, which ranks 15th in livestock population and 10th in area under fodder crops nationwide (MoFAH, 2019).

Given its significance, improving fodder production could play a pivotal role in achieving the Government of India's target of doubling farmers' income by 2022. The sub-tropical regions of Jammu and Kashmir are characterized by a high percentage of the workforce engaged in dairy farming with a substantial number of households owning livestock. This highlights the critical importance of fodder crops in sustaining the rural economy and ensuring livestock productivity.

Key questions arise regarding the extent to which recommended cultivation practices are followed by fodder growers and how the production and quality of fodder can be enhanced. To address these pressing issues, the study entitled "Adoption of recommended Fodder cultivation practices in the Sub-Tropics of Jammu Region" was undertaken, focusing on adoption status of fodder crops which also contribute to sustainable livestock management.

Materials and Methods

The study was descriptive in nature and employed a purposive cum multi-stage random sampling method. The study was conducted in the subtropical regions of Jammu region (*i.e.*, Jammu and Kathua districts). These districts were specifically chosen because they have the largest area under fodder cultivation in the subtropical zone of Jammu. Within Jammu district, one rainfed subdivision (Dansal subdivision) and one irrigated subdivision (Ranbir Singh Pura subdivision) were purposively selected. From these subdivisions, Chak Hassal zone in Ranbir Singh Pura and Kishanpur Mawal zone in Dansal were randomly chosen. In Kathua district, Dayalachack subdivision was selected purposively as it is the only subdivision in the district with subtropical climatic conditions, whereas the other two subdivisions, Basohli and Billawar have mixed topography (DoAP&FW, 2021). Within Dayalachack, Marheen (irrigated) and Palli (unirrigated) zones were purposively chosen. In total, four zones were selected from the two districts.

A list of villages was prepared for each zone and four villages from each zone were randomly selected, resulting in a total of 16 villages. From each village, a list of farmers with at least 1 kanal of land under fodder cultivation was compiled and 10 farmers from each list were randomly chosen as respondents. This resulted in a total sample size of 160 respondents. Primary data were collected using a semi-structured interview schedule. The interview schedule was developed based on the SKUAST-Jammu package of practices for fodder crops with input from specialists in extension education and agronomy. Pretesting of the interview schedule was conducted to identify weaknesses and necessary modifications were made in consultation with experts. Data collection took place at farmers' homes, fields or community gathering points using the finalized interview schedule.

For adoption: the extent of farmers' use of recommended practices for different green fodder crops was measured as a percentage. Key statistical tools employed in the analysis included independent sample t-tests, paired sample t-tests, and z-tests for proportions.

Results and Discussion

The findings summarized in Table 1 highlight the adoption of recommended practices for berseem cultivation among respondents across unirrigated and irrigated areas. Regarding ploughing practices, 63 per cent of respondents in unirrigated areas and 16 per cent in irrigated areas adhered to the recommended number of ploughings, yielding a statistically significant difference between the two conditions. Overall, only 34 per cent of respondents followed the recommended ploughing guidelines. For seed rate adoption, 25 per cent and 23 per cent of respondents in unirrigated and irrigated areas, respectively, adhered to the recommendations, resulting in an overall compliance rate of just 24 per cent. Timing of sowing exhibited notable disparities i.e., 69 per cent of respondents in unirrigated areas adhered to the recommended sowing time, compared to 39 per cent in irrigated areas, with an overall compliance rate of 50 per cent. Regarding the application of farmyard manure (FYM), 90 per cent of respondents in unirrigated areas and 38 per cent in irrigated areas applied FYM, with an overall compliance rate of 58 per cent, but none of the respondents applied recommended dosage of FYM (*i.e.*,

Table 1 : Recommended berseem cultivation practices followed by respondents.

Parameters (% farmers)	n=125	Unirrigated area (n=48)	Irrigated area (n=77)	Statistics
Adoption of recommended ploughings i.e., 3-4 ploughing	34	63	16	t=7.13* **z**=5.4**
Adoption of recommended seed rate i.e., 25-30kg/ha.	24	25	23	t=5.21* z=0.3
Adoption of recommended time of sowing i.e., Mid Sept. to Last Oct.	50	69	39	**z**=3.3**
FYM applied	58	90	38	**z=5.7****
Adoption of recommended FYM dose i.e., 25t/ha.	0	0	0	t=-2.58
Urea applied	90	100	84	z=8.1**
Adoption of recommended Urea dose i.e., 92.5kg/ha.	0	0	0	t= -0.18
DAP applied	94	90	97	z=1.6
Adoption of recommended DAP dose i.e., 107.5kg/ha.	1	0	1	t=-2.29*
Adoption of recommended irrigation practices	31	21	38	
Adoption of recommended practices harvesting.	36	27	42	z=1.7
Average yield (t/ha)	81.90(31.33)	73(31.04)	87.8(30.25)	t=-2.70**

Figures in parentheses are standard deviations, *Significant at p<0.05, ** Significant at p <0.01

Table 2 : Cultivation practices followed by respondents for Oats cultivation.

Parameters (%farmers)	Unirrigated area (n=8)
Adoption of recommended seed rate i.e., 25-30kg/ha.	38
Adoption of recommended time of sowing i.e., Mid Oct. to First week of Nov.	63
FYM applied	75
Urea applied	100
DAP applied	75
Adoption of recommended practices i.e., first cut after 60-70 days.	25
Average yield (t/ha)	25(14.94)

Figures in parentheses are standard deviations.

25 t/ha). The average FYM application was approximately 29 t/ha, distributed as 24 t/ha in unirrigated areas and 35 t/ha in irrigated areas.

A high proportion of respondents (94%) applied di-ammonium phosphate (DAP) with 100 per cent compliance in unirrigated areas and 84 per cent in irrigated areas, but again none of the respondents applied recommended dosage of DAP (*i.e.*, 107.5 kg/ha). The average DAP application was 86 kg/ha, divided into 75 kg/ha in unirrigated areas and 93 kg/ha in irrigated areas. Likewise, majority of respondents applied Urea as well as MOP also, but none of them applied recommended dose of urea and MOP.

In terms of irrigation, 31 per cent of respondents adhered to recommended irrigation practices with compliance rates of 27 per cent in unirrigated areas and 42 per cent in irrigated areas. Harvesting practices were followed by 36 per cent of respondents overall, with 27 per cent compliance in unirrigated areas and 42 per cent in irrigated areas. Finally, the average yield of berseem was significantly higher in irrigated areas (88 t/ha) compared to unirrigated areas (73 t/ha), resulting in an overall average yield of 82 t/ha. The results were in conformity with the findings of (Suman *et al*., 2020)

These results underscore significant differences in the adoption of recommended practices between unirrigated and irrigated areas, highlighting the need for tailored extension strategies to improve compliance and enhance productivity.

The findings presented in Table 2 outline the cultivation practices adopted by respondents for oats production. The data reveal that only 38 per cent of respondents adhered to the recommended seed rate, while 63 per cent followed the suggested sowing time. Among the growers, 75 per cent applied farmyard manure (FYM) and di-ammonium phosphate (DAP) during cultivation

Table 3 : Cultivation practices followed by respondents for Sorghum cultivation.

Parameters (% farmers)	n=60	Unirrigated area (n=28)	Irrigated area(n=32)	Statistics
Adoption of recommended seed rate i.e., 50-60kg/ha.	42	68	19	z=3.8**
Adoption of recommended sowing practice i.e., Broadcasting	100	100	100	
Adoption of recommended time of sowing i.e., Last April to Mid. July.	92	93	91	z=0.3
FYM applied	60	89	34	
Adoption of recommended FYM dose i.e., 7.5-15 t/ha.	13	7	19	z=1.4
Urea applied	98	100	97	z=6.8**
DAP applied	82	82	81	z=0.1
Average yield (t/ha)	38.83(24.37)	35.57(28.28)	41.69(20.40)	t= -0.94

Figures in parentheses are standard deviations, *Significant at p <0.05, **Significant at p <0.01

Table 4 : Cultivation practices followed by respondents for Bajra cultivation.

Parameters (% farmers)	N=40	Unirrigated area (n=36)	Irrigated area (n=4)
Adoption of recommended number of ploughings i.e., 2-3 ploughings.	60	58	75
Adoption of recommended sowing method i.e., Broadcasting	100	100	100
Adoption of recommended time of sowing i.e., End April to Mid. July.	95	94	100
FYM applied	83	92	0
Adoption of recommended FYM dose i.e., 3-4 t/ha.	8	8	0
Average yield (t/ha)	18(7.74)	17.50(6.02)	24.50(17.23)

Note: Figures in parentheses are standard deviations.

with average application rates of 22 kg/ha and 106 kg/ha, respectively. Furthermore, all respondents applied urea, with an average application rate of 99 kg/ha. However, none of the growers applied the recommended dosages for FYM, DAP and urea.

Regarding harvesting, only 25 per cent of respondents adopted the recommended practices. The average fodder yield reported by growers was 25 t/ha, reflecting the potential for productivity improvements through enhanced compliance with recommended practices. These results highlight significant gaps in the adoption of best practices, emphasizing the need for targeted extension efforts to promote adherence to scientifically backed guidelines and improve overall yield outcomes in oats cultivation.

The data summarized in Table 3 highlight the cultivation practices adopted by respondents for fodder sorghum production across unirrigated and irrigated areas. Adoption of the recommended seed rate was reported by 69 per cent of respondents in unirrigated areas and 19 per cent in irrigated areas, with an overall compliance rate of 42 per cent. Notably, all respondents used the recommended method of sowing *i.e.*, broadcasting. Regarding the timing of sowing, 93 per cent of respondents in unirrigated areas followed the recommended schedule compared to 39 per cent in irrigated areas, resulting in an overall adoption rate of 92 per cent.

For farmyard manure (FYM) application, 89 per cent of respondents in unirrigated areas and 34 per cent in irrigated areas used FYM with an overall compliance rate of 60 per cent. The average FYM application was 26 t/ha, distributed as 28 t/ha in unirrigated areas and 22 t/ha in irrigated areas. However, only 13 per cent of respondents applied the recommended dosage of FYM, with adoption rates of 7 per cent in unirrigated areas and 19 per cent in irrigated areas.

In terms of chemical fertilizers, 98 per cent of respondents applied urea and 82 per cent applied di-ammonium phosphate (DAP), but none of the respondents adhered to the recommended dosages. The average fodder sorghum yield was 39 t/ha with yields averaging 36 t/ha in unirrigated areas and 42 t/ha in irrigated areas. These findings reveal significant disparities in practice adoption and adherence to recommendations, particularly between unirrigated and irrigated regions. Addressing these gaps through targeted extension interventions and training programs could enhance productivity and resource

efficiency in fodder sorghum cultivation.

The data in Table 4 outlines the practices followed by respondents in the cultivation of fodder bajra. In total, 60 per cent of respondents adhered to the recommended number of ploughings with 58 per cent in the unirrigated area and 75 per cent in the irrigated area. All respondents employed the broadcasting method for sowing seeds. Regarding the timing of sowing, 94 per cent of respondents in the unirrigated area followed the recommended schedule, while 100 per cent of those in the irrigated area did the same. Overall, 95 per cent of respondents adhered to the recommended sowing time. Only 8 per cent of respondents who applied farmyard manure (FYM) followed the recommended application rate. In terms of fertilization, all respondents applied average 68 kg/ha of urea and 75 per cent applied average 55 kg/ha of DAP in the unirrigated area. However, none of the respondents followed the recommended dosage of average 32.5 kg/ha. The average yield for all respondents was approximately 18 t/ha with the unirrigated area yielding around 18 t/ha and the irrigated area producing 25 t/ha.

None of the respondents in the study area had fully implemented the recommended practices for any crop. This observation aligns with the findings of Javeed *et al*. (2020) and Suman *et al*. (2020), who noted that most farmers do not adopt the recommended practices for cultivating green fodder. One possible explanation is that, the respondents in this study prioritized cereal crops over fodder crops, as the latter were not considered their primary focus. The average yields of green fodder crops such as berseem, oats, sorghum and bajra were recorded at 82 t/ha, 25 t/ha, 39 t/ha and 18 t/ha, respectively. These figures are lower than those reported by Aulakh *et al*. (2012) and Charak *et al*. (2016). The reduced production of green fodder crops may be attributed to the low adoption rates of recommended cultivation practices.

Conclusion

Berseem was identified as the primary green fodder crop cultivated in the study area during the rabi season under both irrigated and unirrigated conditions. During the kharif season, sorghum was the predominant fodder crop in irrigated areas, while bajra was more commonly grown in unirrigated areas. None of the respondents in either region fully adopted the recommended practices for cultivating green fodder crops. Furthermore, none of the respondents followed the SKUAST-Jammu guidelines for green fodder crop mixtures to ensure year-round availability. Respondents in unirrigated areas reported a shortage of green fodder from mid-June to mid-July, whereas those in irrigated areas experienced scarcity from mid-October to mid-November. Feeding tree leaves as green fodder was a common practice in unirrigated areas during the rabi season.

To address these gaps, extension agencies should focus on promoting recommended fodder practices more effectively. Additionally, the practices currently adopted by fodder growers should be communicated to researchers so that existing recommendations can be revised to align with local practices.

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