SHORT COMMUNICATION

Effects of Mineral Supplementation and Deworming on Improving Productive and Reproductive Performance of Jaffarabadi Buffaloes

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Abstract

The present study was aimed to evaluate the impact of chelated mineral mixture and calcium supplementation combined with regular deworming on the productivity, reproductive performance, and economic returns of lactating Jaffarabadi buffaloes. The experiment involved 50 buffaloes of varying parities, managed by small and marginal farmers from the six different villages in Bagasara Taluka, Amreli District, Gujarat, over the period of 3 years (2020-23) under the Farmers FIRST Programme (FFP). Daily milk yield of the buffaloes prior to the intervention served as the control and milk yield data were collected monthly basis. The treatment group received a commercially available chelated mineral mixture @ 40 g and a calcium supplement at 50 mL/buffalo/day during the first 90 days of lactation, along with deworming at three-month intervals (Fenbendazole bolus 3g). Results showed a significant improvement in milk production in the treatment group, with average daily yields increasing from 7.16 litres (control) to 8.27 litres - a 15.64 % gain due to the intervention. Economic analysis revealed an additional gross return of ₹ 53.73 per buffalo per day. After accounting for input costs, farmers achieved an additional net return of ₹ 42.99 per buffalo per day, amounting to ₹ 12896 per buffalo annually, with a benefit-cost ratio (BCR) of 1.25. Farmers reported the intervention as practical and adoptable. An impact survey further showed that the technology was being adopted by neighbouring non-participant farmers, leading to increased milk yields and income. Overall, the intervention contributed to the socio-economic up-liftment of buffalo owners in the region.

Key words: Calcium supplement, Chelated mineral mixture, Deworming, Jaffarabadi buffalo, Net return.

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Introduction

Several government programmes, policies, and schemes are currently being implemented to improve the livelihoods of people living in the most remote rural areas. While numerous technologies have been developed by research institutions and promoted for adoption by farmers, these innovations often do not align well with local conditions or the resources available to rural farmers. To address this gap, the Farmers' FIRST Project (FFP) was introduced as a participatory research initiative that emphasizes identifying and prioritizing local problems, conducting on-farm experiments, and managing interventions in door-step farmer's conditions. The focus of the programme is on Farmers, their Farms, Innovations, Resources, Science, and Technology (FIRST). Since conventional research recommendations may not always be directly applicable at the grassroots level, the FFP encourages necessary adaptations and refinements to ensure practical relevance and successful adoption. The FFP is an initiative by the Indian Council of Agricultural Research (ICAR) that goes beyond the traditional focus on productivity. It aims to support smallholder agriculture by recognizing the complex, diverse, and risk-prone realities faced by most farmers. A key feature of the programme is the strengthened farmer-scientist interface and the organization of extension activities to disseminate the latest agricultural technologies directly to farmers' fields.

In Gujarat, buffalo husbandry is a widely practiced enterprise. However, due to the lack of scientific supplementation and management, farmers often fail to realize the full milk production potential of their animals. Recognizing this gap, Junagadh Agricultural University, under the Farmers' FIRST Programme, focused on the

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buffalo-rearing communities of the Saurashtra region. Against this backdrop, the project titled "Integrated Resource Management in Agriculture and Allied Fields for Stakeholders" was launched under the FFP. It included a livestock-based module, designed with the objectives like, to strengthen the collaboration and interface between rural communities and development organizations, to ensure effective implementation of advanced technologies in animal husbandry practices, to build the capacity of beneficiary farmers through training and awareness on scientific livestock management techniques, to assess the socio-economic and demographic impact of the livestock-based module on participating farmers and to enhance farmers' income by improving productivity and reducing input costs.

The primary factors contributing to low reproductive efficiency in buffaloes are the relatively late onset of puberty and extended calving intervals. Mineral deficiencies are also a cause of poor growth rates, weakened immune function, reduced milk production, and various reproductive disorders in dairy animals (Bindari *et al.,* 2013). The gradual depletion of essential minerals in soil and cultivated fodder contributes to these deficiencies, manifesting in animals as specific mineral deficiency syndrome (Sharma *et al.,* 2009). Chelated minerals are well known for their superior bioavailability and absorption, which are administered to evaluate their effectiveness in enhancing reproductive performance (Sahu *et al.,* 2024). Hence, the present study was planned to assess the effect of chelated mineral mixture combined with calcium supplement as well as regular deworming on the productivity, reproductive performance, and economic returns of lactating Jaffarabadi buffaloes.

Materials and Methods

Under the Farmers FIRST Programme (FFP), a Livestock-Based Module was implemented over the period of 2020-21 to 2022-23, involving 50 farmer families, each owning one Jaffarabadi buffalo from a cluster of six villages: Mavjinjava, Nava Vaghaniya, Deri Pipaliya, Hadala, Ghantiyan, and Rafala located within a 4-5 km radius in Bagasara Taluka of Amreli district, Gujarat (India). The selection of participants was based on several criteria including landholding size, involvement in animal husbandry, leadership qualities, socio-economic background, perceived needs, and overall interest in adopting improved practices. The selected farmers represented a mixture of large, medium, small, and marginal landholders, and included individuals from Scheduled Castes, socially and educationally backward groups, and women farmers, ensuring inclusive participation. The region falls under the North Saurashtra Agro-Climatic Zone-VI, characterized by medium black calcareous soils and an average annual rainfall of 600-700 mm. Agriculture is the primary livelihood in this Taluka.

The feeding practices for buffaloes in the region included seasonal green fodder such as Jowar, maize, and lucerne, along with groundnut haulm, Jowar hay, and dry grass as dry fodder. Concentrate mixture was provided only to advanced pregnant and lactating buffaloes. A baseline survey conducted in the selected villages identified calcium and mineral deficiencies as well as worm infestations in Jaffarabadi buffaloes. These health issues were found to be contributing to low milk yield and poor reproductive performance. Although farmers were aware of these problems, they often lacked access to effective solutions or scientific guidance to address them.

Technology Intervened

The milk yield recorded prior to the intervention for each buffalo served as the control for comparison. The monitoring and implementation of the livestock module interventions were carried out by a dedicated team of scientists. Data collection and project evaluation were conducted annually to assess progress and impact. The team also engaged in community mobilization and awareness-building activities through campaign meetings, field visits, and personal interactions. Extension education materials including booklets, leaflets, and folders were prepared and distributed to farmers. In addition, training sessions and capacity-building programmes were organized to enhance farmers' knowledge and skills in scientific livestock management.

Statistical Analysis

Milk yield data were collected monthly, and the results were analyzed using standard statistical methods, specifically the 't' test, to evaluate the effectiveness of the intervention.

Results and Discussion

Jaffarabadi buffaloes that received mineral mixture, calcium supplement, and deworming treatment produced significantly more milk than the control group, with an average increase of 1.12 litres/buffalo/day, representing a 15.64% improvement ($p<0.05$). This enhancement in milk yield resulted in an additional gross income of ₹53.73 per buffalo per day. After accounting for input costs, farmers realized an additional net return of ₹42.99 per buffalo per day, amounting to approximately ₹12896 per buffalo annually, with benefit-cost ratio (BCR) of 1.25 (Table 1).

Various earlier scientists (Khadda *et al.,* 2016; Kantwa *et al.,* 2021; Kumar *et al.,* 2022; Kiran *et al.,* 2024; Singh *et al.,* 2025) have approached different feed supplements for improvement in productive (1.05-2.48 lit; 15.82-27.50%, as increased milk yield/day) and reproductive parameters and found better results. In present study, beyond increased

Table 1: Yield and economics of milk production in Jaffarabadi buffaloes under Farmers FIRST Programme

Coverage	Average milk yield/ buffalo/day (Litre)		Increase in milk yield/ buffalo/day (Litre)	Market price of milk (Rs/ lt)	Additional gross return/ buffalo/day (Rs.)	Additional cost of input/ buffalo/day (Rs.)	Additional net return/ buffalo/day (Rs.)	Additional net return/ buffalo/year (300 days) (Rs.)	BCR
	Control	Treatment #							
50 Farmers 50 Buffaloes	7.16 ±0.18	8.27 ±0.17	1.12*±0.06 (15.64%)	48	53.73	10.74	42.99	12896	1.25

Control: Milk yield before experiment, #Technology intervened: (1) Chelated mineral mixture: 40 g/buffalo/day, (2) Calcium supplement: 50 mL/buffalo/day, (3) Fenbendazole bolus 3g: at 3 month interval, l*Significant at p<0.05, BCR: Benefit-cost ratio.

milk production, notable improvements in reproductive health were also observed. A greater number of buffaloes exhibited clear estrus signs, and there was a reduction in cases of retained placenta and prolapse, indicating enhanced reproductive performance. These findings aligned with previous studies (Khadda *et al.,* 2016; Tanwar *et al.,* 2019; Kantwa *et al.,* 2021; Kumar *et al.,* 2022; Gupta *et al.,* 2024; Kiran *et al.,* 2024; Sahu *et al.,* 2024; Singh *et al.,* 2025), who demonstrated the positive impact of mineral supplementation on milk yield and reproductive health in buffaloes. Feedback from participating farmers confirmed that the interventions were both practical and adoptable, leading to increased milk yield and income. Additionally, impact assessments indicated that the technology has spread horizontally, with non-participating farmers beginning to adopt these practices as well.

Based on this three years of on-farm experimentation, it can be concluded that supplementing Jaffarabadi buffaloes with mineral mixture, calcium, and dewormer significantly increased milk production, improving their health and reproductive performance, leading to higher incomes. This intervention has contributed substantially to the socio-economic upliftment of rural farmers. The programme provided farmers with valuable support from researchers and extension workers, enabling them to address their challenges effectively. Additionally, farmers gained new knowledge and actively shared their buffalo-rearing experiences with their peers, fostering wider adoption. Hence, it is recommended that buffalo keepers regularly supplement their animals with adequate amounts of chelated minerals and vitamins, this practice can significantly enhance both production and reproductive performance, thereby improving the economic status of the keepers.

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