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Strategic interventions for enhancing livestock productivity in Bundelkhand region of India

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Abstract

The paper identifies various issues and problems related to livestock development, and strategies to address them. For Bundelkhand region of India a project was developed under NATP, financed by World Bank. Based on farmer's participation and their preferences, interventions were identified and implemented. The mineral mixture supplementation @ 40-50 g/day to the lactating dairy animals resulted in significant improvement in milk yield. There was 67 % increase in cow and 25 % increase in buffaloes milk yield after 15 weeks. To control the anoestrus problem in dairy animals mineral mixture supplementation @ 40-50 g/day for one month with estrus inducing capsules in single dose resulted in conception rate of 93 % in buffaloes. The deworming treatment of calf and adult animals twice a year was found almost 100 % effective. To control ecto-parasite, spray of ectoparasiticidals twice in a year killed all visible ecto parasites. These low cost strategic interventions related to nutrition and health have been found to be very helpful in improving the productivity. As these interventions are easy to follow, there is great potential of their adoption by farmers because farmers ranked them medium to high in terms of level of confidence of using the technologies independently.

Key words : Bundelkhand, IVLP, Livelihood, Livestock, Productivity

Introduction

In the economy of India, livestock contribute about 6.7 per cent of the GDP in various ways. It contributes about 27 per cent to the GDP from agriculture and allied activities providing livelihood to 70 million households'. In the arid and semi-arid regions, the contribution of livestock to agricultural GDP is as high as 70 per cent and 40 per cent, respectively (http://indiabudget.nic.in/es2006-07/chapt2007/chap88.pdf). The livestock density is 0.3 and 2.63 per ha for holding above 10 ha and below 1 ha respectively (Mangurkar, 2001). As productivity of milch animals is a major constraints in resource poor areas, target oriented research programmes are needed in the area of (a) breeding and management (b) physiological manipulation for augmenting reproduction and lactation (c) augmentation of nutritional aspects of advanced growth, lactation and reproduction and (d) biotechnological application in dairy production (Mudgal, 2000). A livelihood based approach to livestock development is more likely to have an impact on poverty than approaches that focus on increasing national food supplies and/or raising livestock GDP.

Bundelkhand is a geopolitical area in Madhya Pradesh and Uttar Pradesh of Central India, which typifies semiarid rainfed region. The animal density is 1.16 ± 0.056 animal / hectare. Fodder is grown on *one* per cent area (Gomez *et al*., 1998). Locally adapted breeds are low producer *i.e.* 1-2 kg milk / day (cow) and 4-5 kg milk / day (buffaloes). Annapratha, the practice of free grazing practice, is followed in this region (Tyagi, 1997). The livestock: land ratio (Adult Cattle Unit (ACU) / ha) was 3.45 (small), 1.77 (medium) and 0.88 (large) in Bundelkhand region (Saran *et al.,* 2000). In order to make significant dent in technological diffusion, a World Bank funded project entitled "Technology Assessment and Refinement through Institution Village Linkage Programme for Nutritive- Cereal Based Rainfed Agro Eco-System for Bundelkhand Region (M.P.) (TAR-IVLP) " under NATP, was implemented by IGFRI, Jhansi in six villages of Bundelkhand region near Jhansi (India) with the following objectives:

- To assess the needs and identify potentials of various technologies by understanding local agricultural and environmental perceptions and knowledge on production system basis in semi-arid rain fed ecosystem.

- To assess and refine the livestock production technologies with focus on to sustain higher productivity and profitability

Methodology

A field study was conducted to assess the penetration and impact of this project. The representative villages of Bundelkhand region namely, Algi, Sanora and its hamlets-Rajpur, Varondi and Daberdahi, Garera and its hamlet-Dhobia in Shivpuri/ and Datia districts of Madhya Pradesh (India) were selected where the IVLP project was in operation. Various tools and techniques of Participatory Rural Appraisal were used. For identifying the problems of the villages related to dairy animals, six key informants were selected and asked about the general problems faced by the farmers. After making a list of problem identified by the key informants, they were asked to rank these problems. Later thirty farmers were selected by snowball sampling technique and all the problems identified by the key informants were ranked according to their own perception. In this way "Low productivity of dairy animals" was the top most problem existing in the study area. With the involvement and support of farmers, scientists and appropriate technical field specialists interventions were identified. The production problems according to the micro-farming situations were identified, prioritized and problem cause analysis was done for identification of intervention points through farmer scientist interface meetings. The possible solutions for each intervention point were called out and the appropriate ones were selected for technology intervention. Then they were detailed including the economic parameters like the total cost of intervention, return per rupee spent along with criteria for technical feasibility and farmers' perception as well as refined suggestions for revival. On the basis of problem prioritization, the interventions were selected. The appropriate solutions for each intervention point were identified and were implemented from April 2000 to March 2004 at farmers' site. The critical inputs along with technical knowledge were provided to the farmers. The impact analysis in terms of economic gain, increase in knowledge and adoption along with farmers' perception on each intervention was done using pre-tested interview schedule. The knowledge and adoption of the respondents was measured with the help of interview schedule by personal interview method after six month of completing the interventions.

$$\text{Extent of knowledge} = \frac{\text{Obtained score} \times 100}{\text{Maximum possible score}}$$

The adoption level of respondents was measured on three point continuum scale *i.e.* full adoption (3), partial adoption (2) and no adoption (1).

Results and Discussion

Livestock holding: The number of cows per family was one while the number of buffaloes were about 1.5 per family. The majority of farmers were rearing buffaloes for their livelihood. The buffaloes were generally nondescript and few *Murrah* type buffaloes were also found. The milk yield of nondescript and *Murrah* type buffaloes was on an average 2-3 and 4 to 5 litre per day per animal, respectively, whereas, non-descript cows were yielding 1-2 litre of milk per day.

Baseline knowledge level of farmers: Prior to introduction of the project, most of the farmers (86 %) were not aware about low cost scientific interventions. There was absence of regular prophylactic vaccination. The mineral supplementation was not done. Due to drinking of pond water and poor hygiene, there was high parasitic load and the treatment was mainly done by traditional practices or by village quacks. All there were resulting in poor yield.

Livelihood analysis : The main sources of income of large, medium and small farmers were crop (36 %) and dairy farming (28 %). The marginal and landless farmers were dependent on wages (27 %), crop (25 %) and small ruminants (22%). However, overall livelihood pattern indicates that major source of income in descending order were crop (30.5 %), dairy farming (22.5%), wages (17.5 %) and small ruminants (17%). The main items of expenditure were crop (25%), food (19.5%), and animals (19%). Expenditure pattern among large, medium and small farmers' was similar, whereas marginal and landless farmers' were spending mainly on crop (26%), animals (24%) and food (16%).

Interventions details

1. Response of mineral supplements for anoestrus in cows / buffaloes: Forty one animals were treated (14 with mineral mixture supplementation and 27 mineral mixture supplementation + Sajni/ Prajana heat inducing capsules). Out of 27 animals given Mineral Mixture + Sajni/ Prajana estrus inducing capsule, 25 animals had conceived. In case of only mineral mixture feeding, two animals had conceived. Regarding farmers' perception (Table 1) 80.77, 57.69, 53.85, 96.31 & 80.77 per cent farmers' preserved it as very good in terms of effect on reproductive performance, intensity of estrus symptoms, compatibility with the existing needs, extent of concentrate reduced by mineral mixture and level of easiness

Table 1: Farmers' perception on response of mineral supplements for anoestrus in buffalo (%)

Parameters	Low	Medium	High
Effect on reproductive performance	11.53	7.69	80.77
Intensity of estrus symptoms	7.69	34.61	57.69
Compatibility with the existing needs	15.38	30.77	53.85
Confidence in using the chemical	3.84	65.38	30.77
Consistency with the past experiences	3.84	76.92	19.23
Improvement in health status	100.00	0.00	0.00
Increase in milk yield	7.69	76.92	15.38
Improvement in taste of Milk	26.92	61.54	0.00
Increase in favorable smell of milk	53.84	46.15	0.00
Cost effectiveness of the treatment	38.46	46.15	15.38
Extent of concentrate reduced by mineral mixture	38.46	57.69	11.53
Level of easiness in using mineral supplementation	3.84	3.84	96.31
Effect on reproductive performance	7.69	11.54	80.77

Table 2: Farmers' perception on control of endo and ecto parasite in young and adult dairy animals (%)

Parameters	Endo-parasites			Ecto-parasites		
	Low	Medium	High	Low	Medium	High
Extent of parasite killed	0.00	46.87	53.12	0.00	9.30	88.37
Confidence in using the chemical safely and independently	3.12	71.87	25.00	0.00	60.46	39.53
Consistency with existing values	0.00	59.37	40.62	4.65	76.74	18.60
Consistency with the past experiences	40.62	56.25	3.12	58.14	76.21	4.65
Improvement in health status	28.12	25.00	46.87	0.00	58.14	41.86
Intensity of re-attack of parasite	43.75	0.00	3.12	2.32	37.21	60.46
Cost effectiveness of the treatment	0.00	56.25	43.75	0.00	25.58	74.42
Level of complexity in the use of chemical	9.37	15.62	75.00	2.32	16.28	81.39
Extent of parasite killed	0.00	46.87	53.12	3.33	9.30	88.37

Table 3: Farmers' perception on response of mineral mixture supplementation in lactating cows and buffaloes (percent)

Parameters	Low	Medium	High
Effect on reproductive performance	0.00	36.66	46.66
Intensity of estrus symptoms	3.33	38.33	58.33
Compatibility with the existing needs	5.00	38.33	56.66
Confidence in using the chemical	1.66	53.33	45.00
Consistency with the past experiences	3.33	26.66	70.00
Improvement in health status	0.00	91.66	8.33
Increase in milk yield	16.67	46.66	36.66
Increase in taste of Milk	10.00	61.66	28.33
Increase in favourable smell of milk	15.00	40.00	45.00
Cost of effectiveness of the treatment	15.00	71.66	13.33
Extent of Concentrate reduced by mineral mixture	0.00	30.00	70.00
Level of easiness in using mineral supplementation	0.00	26.66	73.33
Effect on reproductive performance	0.00	1.66	98.33

respectively. The economic gains showed the net gain of Rs. 1851.85 buffalo (Table 4). The knowledge of farmers regarding treatment of sub-fertile animals was 45.08 per cent (Table 5). Farmers having full, partial and non-adoption were 42.89, 42.89% and 14.29% respectively (Table 6).

2. Control of ecto parasite (Ticks / Mites) in young and adult dairy animals: Sixty eight animals comprising of cows, buffaloes and calves were treated and with almost 100 per cent success. Regarding over all farmers' perception 88.37, 39.53, 18.60, 41.86, 60.46, 74.42 and 81.39 percent reported very good reaction in terms of extent of parasite killed, confidence in using the chemical safely and independently, consistency with existing values, improvement in health status, intensity of re-attack of parasite, cost effectiveness of the treatment and level of complexity in the use of chemical respectively (Table 2).

The economic gains show the net gain of Rs. 554.80 and Rs. 1517.00 for each cow and buffalo, respectively (Table 4). The extent of knowledge of farmers regarding control of ecto-parasite was 55.24 per cent (Table 5). Full adoption, partial adoption and non-adoption was observed in 47.67%, 38.10% and 14.29% respectively (Table 6).

3. Control of endo parasite (Round worms) in young and adult dairy animals : 68 animals comprising of cows, buffaloes and calves were treated for endo-parasites and farmers have reported almost 100 per cent success. Regarding over all farmers' perception 53.12, 25.00, 40.62, 46.87, 3.12, 43.75, 75.00 percent reported very good reaction in terms of extent of parasite killed, confidence in using the chemical safely and independently, consistency with existing values, improvement in health status, intensity of re-attack of parasite, cost effectiveness of the treatment and level of complexity in the use of chemical respectively (Table 2). The economic gains show the net gain of Rs. 1377 and Rs. 3783 for each cow and buffalo, respectively (Table 4). The knowledge of farmers regarding control of endo-parasite was 50.79 per cent (Table 5). Full adoption, partial adoption and non-adoption was observed in 38.10%, 42.89% and 19.05% respectively (Table 6).

4. Response of mineral mixture supplementation in lactating cows/ buffaloes: 124 cows and buffaloes were fed mineral mixture for 15 consecutive weeks. Average milk yield per cow *i.e.* from 2.47 to 4.13 represent substantial increase. Similarly in case of buffaloes, 15 consecutive weeks' average milk yield (5.42 to 6.76) show the gradual increase in milk yield over the weeks. Regarding farmers' perception (Table 3) 46.66, 58.33, 56.66, 70.00, 70.00, 73.33 and 98.33 percent farmers' perception was very good in terms of effect on reproductive performance, intensity of estrus symptoms, compatibility with the existing needs, confidence in using the chemical, cost effectiveness of the treatment, extent of concentrate reduced by mineral mixture and level of easiness in using mineral supplementation respectively. The economic gains show the net gain of Rs. 15.50 and Rs. 48.62 for each cow and buffalo, respectively (Table 4). The knowledge regarding mineral mixture supplementation for lactating cow/buffaloes was 44.44 per cent (Table 5). 33.33 per cent farmers were having full adoption *i.e.* implementing complete package of practice. 47.62 per cent farmers were having partial adoption *i.e.* implementing parts of complete package of practice. 19.05 per cent were not adopting the technology (Table 6).

5. Control of FMD, HS & BQ in cows and buffaloes: About 900 adult animals were vaccinated for Foot and Mouth Disease (FMD), Haemorrhagil Septicaemia (HS) and Black Quarter (BQ). Due to vaccination, in spite of widespread FMD infection; these diseases in IVLP villages were confined to left over animals such as advance pregnancy at the time of vaccination or due to refusal of owner. In near by villages, the incidence of FMD was 35 to 50 per cent animals in year 2001. The economic gains show the net gain of Rs. 657.80 and Rs. 1525 for each cow and buffalo, respectively (Table 4). The knowledge of farmers regarding vaccination of animals was 58.41 per cent (Table 5). It was observed that the vaccination of animal was fully and partially adopted by all the beneficiary farmers of IVLP villages (Table 6).

6. Enrichment of low-grade roughages: About 30 quintals of wheat straw for one month feeding of 10 animals were treated at three farmers' field. Farmers told that treatment of straw with urea was complex and time consuming process and it was very difficult to treat the

Table 4: Economic gains of interventions*

Particulars	Ectoparasite control	Endoparasite control	Minerals for anoestrus	Mineral mixture for lactating	FMD vaccination
Cow (per animal)					
Average yield /lactation (litres)	593	593		592.80	593
Loss in yield (litres)	59	148		67 %	69
Cost of treatment (Rs.)	38	105		26	35
Net gain (Rs.)	555	1377		16	658
Buffalo (per animal)					
Average yield /lactation (litres)	1296	1296	1296	1296	1296
Loss in yield (litres)	130	324	114 litre/cycle	25 %	130
Cost of treatment (Rs.)	38	105	144	33	35
Net gain (Rs.)	1517	3783	1852	49	1525

*Estimates arrived from PRA interactions with stakeholders

- Rate of cow milk Rs. 10 / litre.
- Rate of buffalo milk Rs. 12 / litre.

low graded roughages without presence of scientist. Out of three, in two cases active rejection was observed due to fear of danger to animal by urea and smell of treated straw (Table 6).

Knowledge and adoption of interventions

Extent of knowledge: The farmers were having 47.20 per cent knowledge regarding animal production technologies, introduced by IGFRI, Jhansi under technology assessment and refinement project (Table 5).

Table 5 : Extent of knowledge related to animal production technologies

Technologies	Knowledge (%)
Treatment of sub fertile animals	45.08
Control of ecto-parasite	55.24
Control of endo-parasite	50.79
Mineral Mixture supplementation in lactating cow/buffaloes	44.44
Vaccination programme	58.41
Enrichment of low grade roughages	29.21
Over all	47.20

N=63

Level of adoption: Out of six animal production technologies, 35.73 per cent farmers fully adopted, 36.52 per cent farmers partially adopted and 27.78 per cent farmers did not adopted the technologies. TAR-IVLP was an innovative project in the agricultural development and all the farmers associated with the project were highly benefited. The participatory mode of the project has ensured a strong positive attitude formation among the farmers. The overall mean attitude score of the farmers towards TAR-IVLP was 4.00 and it was 4.35 for the officials. It clearly reflected that all the farmers and officials had strong positive attitude towards the project (Kumar *et al*. 2006).

Post Implementation scenario

The project team identified following strategy to enhance the spread of technologies:

- Emphasize micro farming situation analysis and specific strategy.
- Encourage bottom up approach.
- Involve stakeholders in project formulation and implementation.
- Promote low cost technologies such as mineral mixture supplementation, endo-parasite control, ecto-parasite control, vaccination, crop residue enrichment in present case
- Also promote no cost technologies such as timely insemination, proper proportion of ingredients in concentrate mixture and timely feeding of colostrums to calves etc.
- Provide only critical inputs, associate farmers' by taking other inputs.
- Sufficient emphasis is needed to improve knowledge of farmers.
- Purchasing power of farmers is important criteria in adoption of technology in post implementation phase.
- Trainings and exposure visits of progressive farmers are also quite beneficial.
- A simple and effective crop residue enrichment technique is needed.
- Promote important ITKs (Indigenous Technical Knowledge).

Table 6 : Adoption of animal production technologies

S. No.	Technologies	Full adoption	Partial adoption	No adoption
1	Treatment of sub fertile animals	27	27	9
		(42.89)	(42.89)	(14.29)
2	Control of ecto-parasite	30	24	9
		(47.67)	(38.10)	(14.29)
3	Control of endo-parasite	24	27	4
		(38.10)	(42.89)	(19.05)
4	Mineral Mixture supplementation in lactating cow/buffaloes	21	30	4
		(33.33)	(47.62)	(19.05)
5	Vaccination programme	33	30	0
		(52.38)	(47.62)	(0.00)
6	Enrichment of low grade roughages	0	0	63
		(0.00)	(0.00)	(0.00)
	Over all	(35.73)	(36.52)	(27.78)

N=63 (Figure in parenthesis indicate percentage)

Conclusion and outlook

Nutritional deficiencies and shortage of the preventive veterinary care are the major limiting factors in realizing the genetic potential of the dairy animals. The technologies such as mineral supplements for anoestrus in cows / buffaloes, control of ecto and endo parasite in young and adult dairy animals, mineral mixture supplementation in lactating cows/ buffaloes, control of FMD, HS & BQ in cows and buffaloes and enrichment of low-grade roughages can help in enhancing animal productivity.

These easy to follow and low cost interventions have shown potential to increase profitability and are easy to learn and adopt. Efforts should be made to popularize such type of interventions through livestock development programs and farmer's education. Access of farmer's to qualified veterinarian need to be improved, Although, the inputs for improved technologies are available in nearby markets, but farmers were not aware.

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