Mobile App-Based Feeding Support Tool to Optimize Dairy Animal Productivity

Research Team & Methods

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Research Location: Palpa, Arghakhanchi, and Kapilbastu districts in the Western region of Nepal
Research Methods:
- Rapid assessment of dairy animal (cow and buffalo) feeding system in 55 households using feed assessment tool (FEAST) developed by the International Livestock Research Institute (ILRI)
- Laboratory analysis of feed nutrients (summer and winter) – crop residues, grasses (cultivated and non-cultivated), fodder tree leaves, commercial concentrates, grains and agro industrial byproducts
- Developing a mobile-based Feeding Support Tool (FST) to determine nutrient requirements with the least cost combinations
- Recording of body weight, milk production, milk fat and protein percentage, stage of pregnancy, and stage of lactation

Mr. Bhola Shrestha

Innovation Description

Innovation Name: Mobile App-Based Feeding Support Tool to optimize Dairy Animal Productivity
Innovation Description: The innovation is an application to formulate the least cost, nutritionally balanced rations for dairy cattle and buffalo and to predict milk yield.
Technology Package Components:
- Analyze existing dairy animal feeding practices and identify major areas for improvement
- Develop and utilize a mobile-based FST (English and Nepali) to enhance dairy animal productivity
- Strengthen the capacity of the frontline livestock extension workers and smallholder dairy animal farmers on dairy animal feeding management.
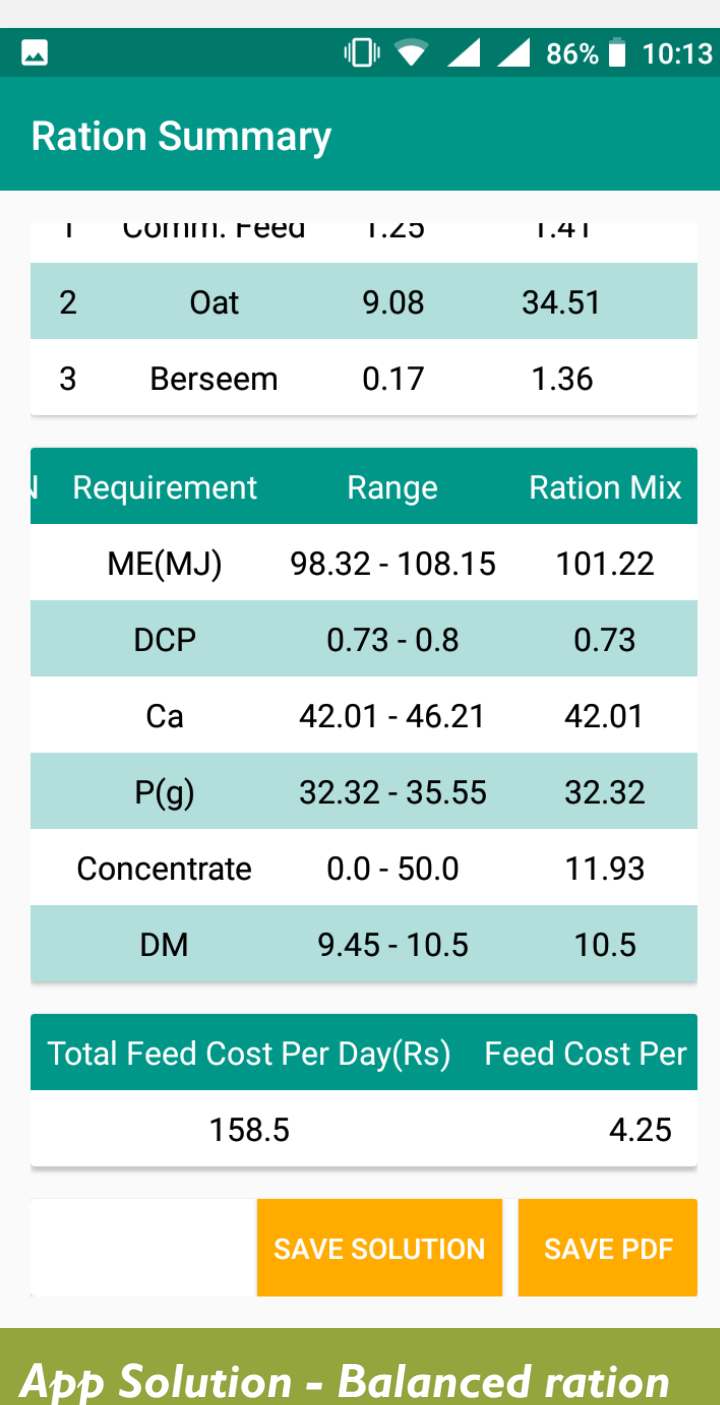**Intended End Users**: Extension workers and dairy animal farmers
Summary of Benefits:

Short-term	Long-term
- Reduced cost of production - Improved body condition and reproductive efficiency of dairy animals - Reduced veterinary health costs - Increased knowledge of ration balancing	- Support the national target of self-sufficiency in milk and milk products - Positive environmental impact due to reduced methane gas emission* - Increase production - Increase farmer income

*Not measured by the project, but a similar intervention reported 12% reduction in emission [NDDB India].

Problem Addressed

	Content Feed	1.25	1.41
2	Oat	9.08	34.51
3	Berseem	0.17	1.36

Requirement	Range	Ration Mix
ME(MJ)	98.32 - 108.15	101.22
DCP	0.73 - 0.8	0.73
Ca	42.01 - 46.21	42.01
P(g)	32.32 - 35.55	32.32
Concentrate	0.0 - 50.0	11.93
DM	9.45 - 10.5	10.5

Total Feed Cost Per Day(Rs)	Feed Cost Per
158.5	4.25

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App Solution - Balanced ration

In Nepal, the dairy sector contributes 8% to the Gross Domestic Product, but average dairy animal milk yield is one-third of that of many developing countries. This is because of inadequate feeding, poor genetics, and diseases. The Agricultural Development Strategy (ADS) assessment report revealed that dairy is one of the most promising agriculture sub-sectors that is a high priority for the Nepalese economy, having the potential of increasing productivity from nearly 900 liters (current) to 3,000 liters/year (ADS, 2015).
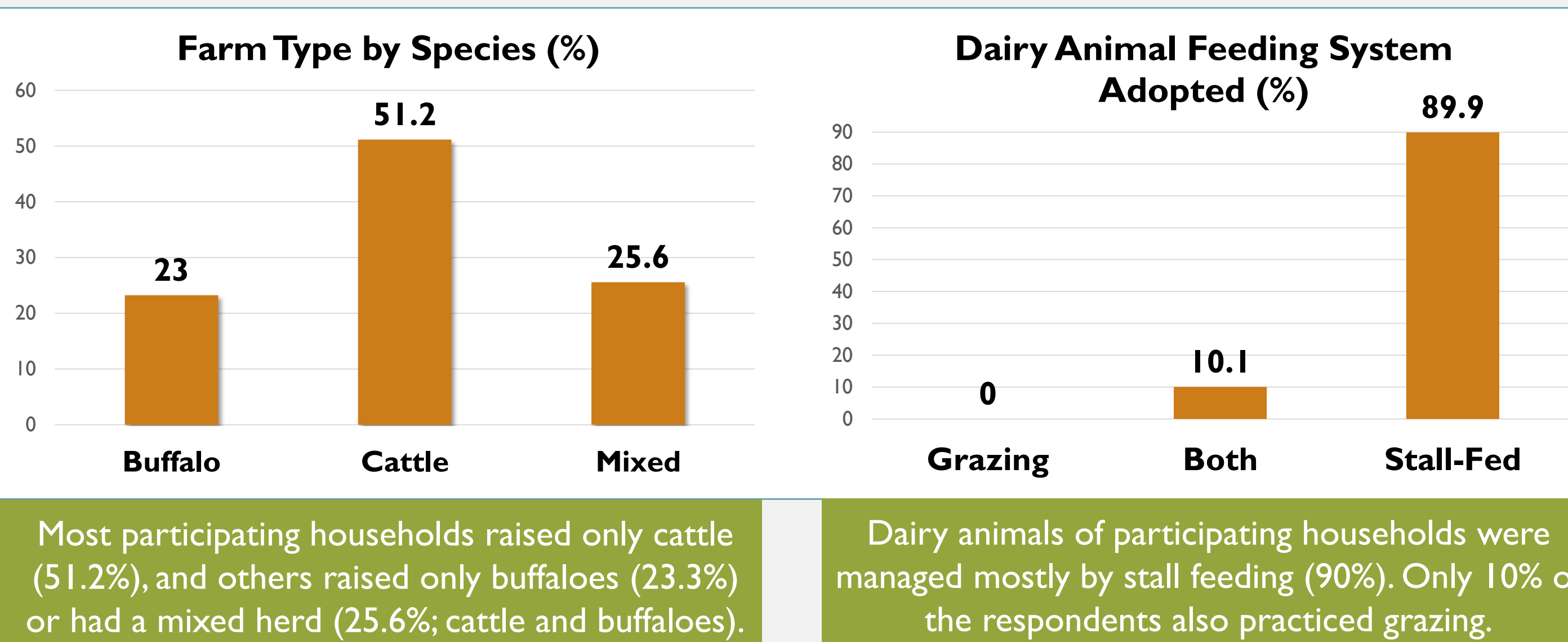
In Nepal, the most critical factor associated with low productivity is improper (inadequate and unbalanced) feeding. In the Terai belt of Nepal, feeding is largely based on rice straw and other crop residues, wild grasses, and herbs. The availability and distribution of green grasses varies according to season and land utilization pattern. Thus, the milk supply drops drastically in the winter green-feed scarcity period (Yadav and Devkota, 2005).

Credibility of the Innovation

The overall research goal was to increase the income and livelihoods of smallholder dairy farmers through improvement of dairy animal productivity, particularly through feeding management improvement.
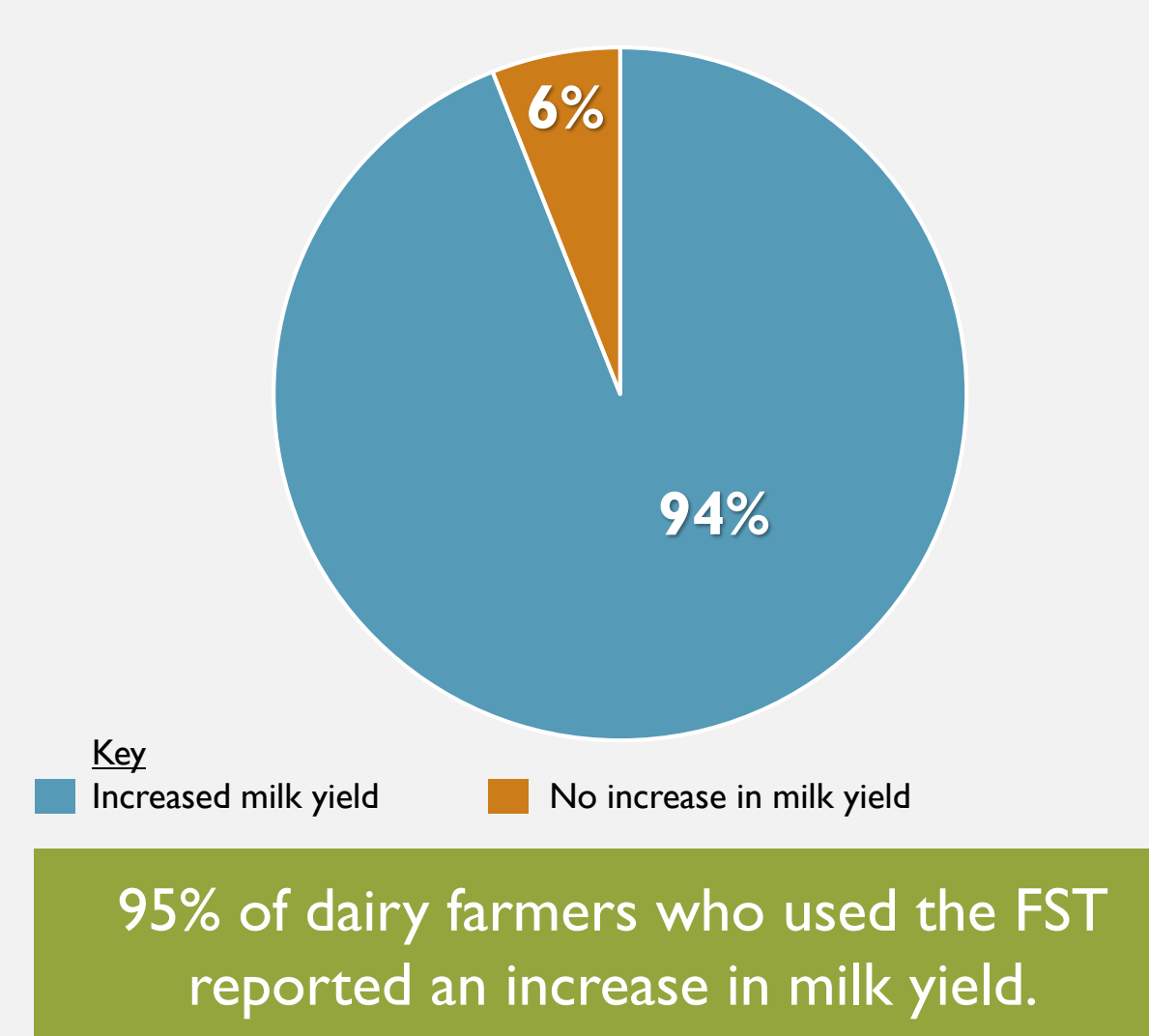
Farm Type by Species (%)
- Buffalo: 23
- Cattle: 51.2
- Mixed: 25.6

Most participating households raised only cattle (51.2%), and others raised only buffaloes (23.3%) or had a mixed herd (25.6%; cattle and buffaloes).

Dairy Animal Feeding System Adopted (%)
- Grazing: 0
- Both: 10.1
- Stall-Fed: 89.9

Dairy animals of participating households were managed mostly by stall feeding (90%). Only 10% of the respondents also practiced grazing.

Animal Feeding Trials: Trials were conducted to examine the efficacy of the app. The data analyzed as ANCOVA (Initial Milk Yield as a linear covariate and Treatment as a categorical predictor) showed that using the FST increased milk yield. For cows, controlling the covariate (i.e., differences in initial milk yield), as compared to the control group, milk yield in the treatment group increases by 0.9937 (~1 L). This shows a positive effect of treatment on milk yield in cows. For Buffaloes, controlling the covariate (i.e., differences in initial milk yield), as compared to the control group, milk yield in the treatment group increases by 0.4155 (~0.5 L). This shows a positive effect of treatment on milk yield in buffaloes.

Heifer International Nepal, Department of Livestock Services (DLS) and NDDB are working on scaling the FST to all DLS technicians and 1,600 dairy cooperatives in Nepal

Feeding Trial Results: Milk Yields				
Group	Est.[1]	Std. Error	t-value	Pr (>|t|)
Cattle				
Intercept	-1.8489	0.9740	-1.898	0.0771
Initial Milk Yield	1.2316	0.1723	7.147	3.352e-06 ***
Treatment	0.4155	0.3058	1.359	0.1944
Buffalo				
Intercept	1.250	2.2538	0.555	0.58704
Initial Milk Yield	0.8349	0.2262	3.692	0.00218 **
Treatment	0.9937	1.1179	0.889	0.38809

[1] Est. = Estimate

Pie chart:
- Increased milk yield: 94%
- No increase in milk yield: 6%

Key
- Increased milk yield
- No increase in milk yield

95% of dairy farmers who used the FST reported an increase in milk yield.

Drivers & Enabling Conditions

- Productivity enhancement with reduced cost of production through adoption of innovation
- Government output-based subsidies on milk (Rupees per unit of milk sold in the cooperatives): drives farmers to increase farm and animal level productivity
- Government commitment for making nation self sufficient in dairy products (conducive environment for dairy sector development in the country)

Partnerships

- Primary Milk Producers' Cooperatives scattered throughout the country in major dairy pocket areas
- Local government bodies with livestock development section
- National and International nongovernmental organizations working in dairy sector
- National Research Organizations, for updating nutrient content database and developing national feeding standards for dairy animals
- National Dairy Development Board

Changes Needed for Adoption

- Make the tool available on Google Play.
- Train grass-root level technicians (Government organizations/Non-governmental organizations/Private sector) on the use of the tool.
- Train dairy cooperative staff to advise farmers that contribute to the milk at collection centers.
- Incorporate application of the tool in the training curriculum of institutions.
- Research institutions to update and adapt the tool to fit with the local context.
- Farmer willingness to pay for inputs (feed materials, scales, etc.) and participate in trainings.
- Interest from and participation by local technicians, to inform farmers how much feed they should give to the cows and buffalo.
- Control wide variation in nutrient content of feeding resources: maturity, soil is a limitation.

1. Farmers trained on dairy animal nutrition; 2. Livestock body weight measurement; 3. Technician advising farmers on dairy animal feeding management

Financial Sustainability

- The financial resources needed for the scaling up of the innovation is only for training of the grassroots level extension workers, cooperative staff and lead dairy farmers on use of ration balancing mobile app.
- Small funds might be required for body weight measurement tape at farm level or at cluster level.
- Additional funds might be required for analysis of feeding resources, particularly the forages during different seasons and at different physiological stages of growth.

References

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