



INITIATIVE ON  
Sustainable Animal  
Productivity

## Better use of crop residues for animal feed in Nepal: Capacity development visit of national partners to India

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#### **About SAPLING**

CGIAR's Sustainable Animal Productivity for Livelihoods, Nutrition and Gender inclusion (SAPLING) is working in seven countries focusing on livestock value chains to package and scale out tried-and-tested, as well as new, innovations in livestock health, genetics, feed and market systems. SAPLING aims to demonstrate that improvements in livestock productivity can offer a triple win: generating improved livelihoods and nutritional outcomes; contributing to women's empowerment; and reducing impacts on climate and the environment. Its seven focus countries are Ethiopia, Kenya, Mali, Nepal, Tanzania, Uganda and Vietnam.

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## Background

A learning workshop was organized by the International Livestock Research Institute (ILRI) in Nepal to expose key national partners to experiences in India of techniques used by feed industries and research organizations to improve quality of crop residues as animal feed. The participants included representatives from research institutes, development organizations and feed industries in Nepal accompanied by ILRI senior scientists from Nepal and Ethiopia (see full list in Annex 1).

The delegates visited the Total Mixed Ration (TMR) feed plant in Kolhapur Milk Union (Gokul), Maharashtra (16 June 2023), and Vishwa Agrotech in Nizamabad, Telangana (18 June 2022). The team also interacted with scientists from the Indian Institute of Chemical Technology and S&S Technomark (17 June 2023) in Hyderabad.

## Summary of the mission

### Visit to TMR Feed Factory, Kolhapur

The TMR feed factory in Kolhapur uses crop residues, mainly of soybean, pulses and maize as the roughage component (60%). The chopped residue is procured from various places (200/300 km radius) through vendors and is ground in the factory using a 10 HP grinder. This is then mixed with ground concentrates (40%) including 8% molasses in a vertical TMR mixture. The mixed TMR is then compressed using a hydraulic press to form TMR blocks (18 x 12 x 6 inches) weighing 15 kg or bagged as mash (15 kg). It has 90% dry matter (DM), 11% crude protein (CP) and 50–60% total digestible nutrients (TDN). The price per kg is INR 16.00 (0.19 USD). They also produce TMR pellets (10 mm size in 40 kg bags) for which the roughage concentrate ratio is changed to 40:60 and the price per kg is INR 19.00.

The TMR plant was commissioned in 2019 and has a capacity of 50 tons/day. It is reported that the demand of TMR is increasing every year, especially during dry periods and they face no problem in marketing as the manufactured feed is sold through member dairy cooperatives throughout the year.

For already existing feed factories, additional investment required to produce TMR is for a grinder to grind the dry roughage. If rice straw is the main dry roughage, the throughput will be lower and wear and tear of the grinder will be higher because of sand and silica content in rice straw. To avoid this, straw can be shredded using a fodder shredder, which is reported to break the rice straw cell wall substantially.

### Visit to Vishwa Agrotech, Nizamabad

Vishwa Agrotech is a private limited company in Nizamabad producing TMR, silage and biofertilizers. Here, TMR is produced in mash form from legume haulms and concentrates in definite proportion. TMR is of two different qualities – one with 12% CP, 75% TDN (priced at INR 14.00 per kg) and the second with 18% CP, 75% TDN (priced at INR 21.00 per kg). Presently the total sale from this company is 200 tons per year and the demand is reported to be increasing.

Silage is also produced by the company using maize (full plant with cob at milk stage) in two different forms: 70 kg and 400 kg bales. Maize is harvested from contracted farmers' fields (40 tons per ha), dried for 12 hours and carried to the factory. It is then chopped, mixed with lactobacillus (100 g per 100 tonne mixed with water and sprayed) and baled using ultraviolet protected film. The silage has 35% DM. Farmers are advised to include 50% TMR and 50% silage in the daily diet of animals during dry periods in two equal splits (morning and

evening). Presently the total sale of silage is 10,000 tons per year and the demand is reported to be increasing.

## Discussion with Indian Institute of Chemical Technology

The meeting organized at ILRI Hyderabad to discuss about the work on treatment of crop residue to improve its nutritional quality was participated by scientists from the Indian Institute of Chemical Technology (IICT) (P. Anand, Siddartha Moulik), S&S Technomark (K. Ravindranath, Y. P. Sarathy), ILRI (Padmakumar, Bayissa) and the Nepal delegation. In the meeting ILRI's Padmakumar gave a presentation on the ILRI work on multidimensional crop improvement and deconstruction of lignocellulose biomass. Discussions then followed on the future course of action on treatment (steam and two-chemical combination treatment [2CCT]) of crop residues in general and rice straw in particular.

The work initiated under an ILRI-IICT collaboration on steam and 2CCT treatments shall be continued with a pilot plant to try out different engineering options and chemical combinations to optimize the process. The data generated will be useful to commercialize the operation. Towards this, ILRI and IICT will jointly identify potential donors including the Bill & Melinda Gates Foundation (BMGF) which has expressed interest on improvement of crop residues. In this context, IICT will explore the process of patenting the 2CCT technology by revisiting the process started early last year. IICT also expressed interest in producing processed (shredded) rice straw supplemented with molasses and minerals for animal performance trial, if organized in ILRI Hyderabad on par with the same in Nepal.

## Summary of decisions

1. Upgradation of rice straw by shredding and supplementing it with 10% molasses and deficit minerals (to be marketed as processed enriched straw /PES) in mash form is the simple and straightforward method suggested for implementing in Nepal. Farmers can replace plain straw with PES and supplement PES with concentrates, which they generally use. Being a new concept, industries need financial resources to invest in new machinery, especially the fodder shredders. Then it becomes viable for commercial industries to co-invest in associated human resources and inventories.
2. ILRI will explore with Shreenagar, Nimbus and DDC, the modalities for producing PES for an animal performance trial (about 2 tonnes), which will be carried out as part of SAPLING, the Heifer funded 'climate smart dairy project' and the CGIAR Nexus Gains Initiative. The trial will assess impact on productivity, methane emission, water productivity and cost benefits. Based on the trial results and economic analysis, the industries can continue to produce PES on a commercial basis. ILRI will facilitate its promotion and marketing through SAPLING farmer cooperatives. The National Agriculture Research Council (NARC) will be a knowledge partner in the whole venture and National Animal Feed and Livestock Quality Management Lab under the Department of Livestock Services, and the Ministry of Agriculture and Livestock Development (MoALD) will provide analytical and policy support.
3. ILRI and IICT will explore with BMGF and other donors on continuing the research on crop residue upgradation using 2CCT technology with a view to generate data to support commercial production of treated residues in different forms.

## Next steps

1. Discussion with Shreenagar and Nimbus on production of processed enriched straw for dairy performance trial scheduled at NARC cattle farm in Rampur (Action: Padmakumar, ILRI).



2. Discussion with BMGF (Donald Nkrumah) on crop residue upgradation (Action: Chris, Bayissa, Padmakumar).
3. Feedback on 2CCT patent application for processing by IICT (Action: Padmakumar, ILRI).

## Photos



## Annex 1: List of participants

<b>Name</b>	<b>Gender</b>	<b>Organization</b>
Surya Paudel	Male	Department of Livestock Services
Mukesh G.C.	Male	Dairy Development Corporation
Luma Nidhi Pandey	Male	NARC
Giriraj Khanal	Male	Shreenagar
Nirmal Bista	Male	Nimbus
Barley G.G.	Male	Shreenagar
Bayissa Hatew	Male	ILRI Ethiopia
Padmakumar Varijakshapanicker	Male	ILRI Nepal



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