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Comparison of feed based intensification with conventional feeding practice in dairy cattle in Tumkur (Karnataka) and Yavatmal (Maharashtra)

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March 2019



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The Program thanks all donors and organizations who globally supported its work through their contributions to the [CGIAR Trust Fund](#).



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Editing, design and layout— ILRI

Citation: Padmakumar, V.P., Khan, A.A., Reddy, Y.R., Blümmel, M., Mahesh, M., Pawan, M.B., Karol, A., Ravi, D. and Prasad, K.V.S.V. 2019. *Comparison of feed based intensification with conventional feeding practice in dairy cattle in Tumkur (Karnataka) and Yavatmal (Maharashtra)*. Nairobi, Kenya: ILRI.

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Introduction

Feed based intensification consists of a combination of three specific interventions: using crop cultivars with higher fodder quality, reducing the size/physical form of dry/green roughages and nutrient balancing. This is claimed to double the milk production in dairy animals in crop livestock based mixed farming system. A feeding trial was conducted to field test this approach in two districts, one each in Karnataka (Tumkur district) and Maharashtra (Yavatmal), which are in the semi-arid belt of India. As cultivar selection involves longer period, the interventions in this trial were limited to feed processing (chopping) and nutrient balancing.

Materials and methods

Crossbred dairy cows (multiple crosses of HF and Jersey with varying levels of exotic inheritance) within 2–3 months of lactation were fed total mixed ration (TMR) produced locally at farmer premises by chopping roughages and mixing it with concentrates. The TMR formula was developed based on calculation of the nutritional gap between current supply of nutrients through feed (estimated through measuring daily intake of various feed stuffs and assessment of their quality using NIRS prediction model) and that required for attainable milk production (ICAR, 2013), assumed to be 20% more than the current milk production. Feed ingredients used in the TMR were almost the same fed by farmers before but were offered in chopped form, supplemented with additional quantity of concentrates, forming the TMR. Body weight of the experimental animals (375–400 kg in Tumkur and 300–350 kg in Yavatmal) was estimated using girth measurements and intake recorded, both in the treatment and control groups. The animals were milked twice a day and daily milk yields and fat content were noted.

In Tumkur, there were six dairy cows both in the treatment and control groups. Whereas in Yavatmal the treatment and control groups had nine milking cows. The TMR formula used in both the locations is given in Table I.

Table I: TMR formula in Tumkur (Karnataka) and Yavatmal (Maharashtra)

Tumkur		Yavatmal	
Feed ingredient	DM%	Feed ingredient	DM%
Maize green fodder	04.0	Natural grass	11.0
Paddy straw	28.8	Soya haulms	44.0
Ragi straw	30.7	Cotton cake	26.0
Wheat bran	24.0	Maize grain	17.0
Ground cake	11.0		
Mineral mix	01.0	Mineral mixture	01.0
Salt	00.5	Salt	01.0
Total	100	Total	100
ME (MJ/kg DM)	8.07	ME (MJ/kg DM)	8.00

The selected farmers were given an orientation prior to the trial and asked them to chop the roughage portion of the TMR required for the entire trial period in batches depending on storage facility. The concentrate portion was mixed well with salt and mineral mixture and stored in separate bags. On the day of feeding, both were mixed and offered to the animal *ad lib*. Refusal was collected everyday morning and quantity noted. As far as the control group is concerned, the farmers were asked to continue to feed the animals without any change.

Here also the intake and refusal of different types of feeds offered were recorded and samples analyzed for nutritional quality. The total trial period was 35 days with milk yield measured during the last 25 days (ten days adaptation period) in both treatment and control group of animals. Difference between the treatment and control group were analyzed using t-tests (Tumkur) and paired t-tests (Yavatmal) in SAS (2012).

Results and discussion

Conventional feeding in Tumkur shows that the feeds offered to animals included straws of rice and ragi, wheat bran, groundnut cake, maize powder and compounded feed (KMF brand), apart from grazing for 4–5 hrs. Nutritional gap assessment revealed that there is shortage of protein (about 800–900 g/animal/day) as well as energy. This shortage was corrected in TMR by including appropriate feed ingredients (Table 1). Though costly, ground nut cake was included (Tumkur) as other cheap protein sources were not locally available.

In Yavatmal, the type of feeds offered to animals included natural and cultivated grass, sorghum green and haulms of soybean, pigeon pea and chick pea, besides 4–5 hrs of grazing in the morning. It is found that here the energy availability for the animals is substantially lower than required (about 13 MJ of ME per animal per day short). This was compensated by adding crushed maize in TMR, bought in bulk from nearby district head quarter (Amravati).

Table 2 presents the impact of TMR in terms of additional milk yield and profit margin. As we can see, in both the cases the dry matter intake (DMI) has increased considerably, possibly due to chopping and balancing of nutrients. While the milk yield was increased by 2.56 l in Tumkur, it increased only by 1.7 l in Yavatmal. In the case of treatment group, fed with TMR, the net benefit (total milk price – total feed cost) per cow per day was about INR 124.7 in Tumkur and INR 91.4 in Yavatmal (in the control group it was only INR 90.5 and INR 70.4, respectively). The additional benefit per animal per day in the treatment group compared to control was INR 34.2 in Tumkur and 21.0 in Yavatmal. This profit can be increased further, if the extra concentrates (ground nut cake in Tumkur and crushed maize in Yavatmal) used can either be procured at a cheaper rate through bulk purchase or replaced with a cheaper source.

In Tumkur there was significant difference (t-test was used) between treatment and control in DM intake (P=0.02) but milk yield (P=0.27) and milk price (P=0.27) did not show any significant difference. Statistically significant difference was found in Yavatmal (using t-test) between treatment and control in DM intake (P<0.0001), but no significant difference was found in milk yield (P=0.2) and milk price (P=0.12).

Table 2: Comparison of TMR with conventional feeding in Tumkur and Yavatmal

Parameters	Tumkur		Yavatmal	
	TMR	Control	TMR	Control
DMI/cow/d (kg)	11.54	8.20	12.22	6.89
Milk yield/cow/d (kg)	11.01	7.69	6.78	5.08
Total feed cost/cow/d (INR)	150.51	101.73	111.98	71.79
Total milk price/cow/d (INR)	275.25	192.25	203.38	142.18
Net benefit/cow/d (INR)	124.74	90.52	91.40	70.39
Additional benefit/cow/d (INR)	34.2		21.0	

Considering the additional dry matter intake due to chopping and better quality (3.34 kg in Tumkur and 5.33 kg in Yavatmal), ME value of TMR (8 MJ/kg DM) and energy required to produce a litre of milk (5 MJ), theoretically the animals should produce much more additional milk (5.3 l in Tumkur and 8.5 l in Yavatmal) than what has been produced (3.3 l in Tumkur and 1.7 l in Yavatmal). This may be because the animals might have been under nutrient restriction due to drier environment, especially in Yavatmal and when TMR was offered, they used part of the additional nutrients for body repair.

Results of the present study are encouraging as a smallholder farmer keeping an average of two milking dairy cows is likely to get a substantial increase in income by adopting the practice of simple chopping and feed balancing. The benefit will further be enhanced significantly, if farmers can replace the present crop cultivars of paddy, ragi and soybean with those having superior fodder quality. Various studies show that considerable variation in crop residue fodder quality exists, that can be exploited for improving livestock production (Sharma et al., 2010) and a 1% increase in digestibility can increase productivity by 6% (Kristjansson and Zerbini, 1999).

Recommendation and conclusion

It can be concluded that feed based intensification consisting of chopping of roughages, nutrient balancing and use of superior cultivars can be promoted extensively among farmers to reduce yield gap and increase income from dairying. As successful scaling requires scaling of both 'technologies' as well as 'processes' that led to the success of those technologies, a strong support system should be put in place, wherever feed based intensification is promoted. Dairy or farmer based organisations, for instance can easily put in a support system, which can provide a service provider for chopping (if labour is a constraint), advisory service on feed balancing, arrange supply of inputs (seeds of superior crop cultivars, supplementary feed) and provide credit service, based on need. Therefore, in the smallholder context wherever mixed farming is practiced, feed based intensification can dramatically improve productivity of dairy animals and earn additional income for the farmers.

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