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Using the Techfit tool to prioritize feed technologies in Bekafa, Doyogena District, Southern Ethiopia

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Introduction

Livestock keeping is one of the most important, complex, and diverse subsectors of world agriculture and a primary means of escaping poverty in rural areas. The very poor often do not keep animals, but many would likely do so given the opportunity. Livestock development is an integral and important component of the agricultural sector in Ethiopia. Although Ethiopia has the largest population of livestock in Africa, its productivity both per capita and total is the low and this is the main reason for its very small (18%) contribution to the national GDP. This sector also provides wide and year-round employment opportunities for surplus family labour in rural Ethiopia. Cash income from livestock production is especially important for the poor and landless Ethiopian households, particularly women, as is also true in many other developing countries.

The poor performance of the livestock sector in the country is due to different reasons such as large livestock numbers, poor quality of breeds, insufficient amount of good quality feeds and seasonal variation in there availability, poor health of livestock and inadequate health services, inefficient management of livestock, poor infrastructure, poor marketing and credit facilities, inadequate knowledge of integrated mixed farming system, inability of the farmer to exploit this resources due to different priorities. Among the aforementioned problems, feed scarcity is often cited as the primary and major constraint to livestock productivity in crop-livestock mixed farming systems.

During a feed assessment (FEAST) study in Bekafa *kebele,* feed scarcity was ranked as the second most important problem in livestock production. A number of important feed technologies have been generated by the research systems over the last four to five decades, costing substantial amount of efforts and resources. However, adoption rate of the technologies has been very poor due to lack of suitable mechanisms for filtering and prioritizing the available feed technologies for specific locations and situations. In order to fill this gap, the International Livestock Research Institute (ILRI) has recently developed a simple tool known as TechFit for prioritization of feed technology options to enable better targeted interventions to address livestock feed problems in specific locations. Thus this study was carried out with objectives of prioritizing suitable feed technologies from a basket of options for Bekafa district of Doyogena district using TechFit. The TechFit study was conducted from 26 - 30 December 2013 by researchers from Areka Agricultural Research Center with backstopping from International Center for Agricultural Research in the Dry Areas (ICARDA).

The study areas

Doyogena district is found in Kembata Tembaro zone. The district is situated 258 km south from Addis Ababa. The altitude of the district ranges from 1900 ma.s.l to 2300 ma.s.l. Agro ecologies of the area are classified as midlands (30%) and highlands (70%). The annual rainfall varies between 1200-1600mm. The mean temperature varies from 10-16^{0}C. The district comprises 14 *kebeles* and 17,260 hectares of area coverage. Among this, 86% is used for crop cultivation, forest and bushes occupy 11.8%, 2% is grazing land, and 0.2% is degraded land. The district has a livestock population of cattle 46,703 cattle, 13,822 sheep, goat 1,444 goats, 6,343 equines and 27,253 poultry.

The major crops produced in the area include enset, wheat, potato and faba bean. Farmers also rear different types of animals. They keep cattle, sheep, goat, equine and poultry. About 60% of the household income sources are from crop production and the remaining 40% from livestock production. From the 40% of livestock income, 30% comes from small ruminants and 10% from others.

Selection of *kebeles*, farmers and context attribute scoring

Farmers for the study were selected based on gender, age and wealth criteria. Both male and female farmers were involved, elders and youths to address age issue was also considered. To get all wealth groups of farmers, size of landholding was considered. Thus, farmers from small, medium and large land size were involved. A total of 19 farmers (15 male and 4 female) farmers participated in the study. The Techfit group discussion was made after assessing feed resource availability using the FEAST tool using a Participatory Rural Appraisal approach. The participants were selected with the help of the sub-district administration and development workers using the pre-set criteria mentioned above.

Data collection methods

A checklist was used to collect information about the context attributes of the feed technologies. Using the checklist, farmers were asked to give scores from 1 to 4 for availability of or access to land, labour, credit/cash, input delivery and farmer's knowledge and skill. Highest availability of attribute scored a value of 4 whereas lowest availability scored 1.

Data analysis

Feed technologies were pre-filtered from the list of the technology options based on their context relevance and impact potential of each technology in addressing feed problem issues. The filtered and the selected technologies were passed to the main filter to be evaluated by farmers for their context attribute (availability of land, labour, cash/credit, material input and knowledge) and the context attribute scoring of technologies were done with value of 1-4 (1 for lowest attribute and 4 for the highest attribute). The data on the context attribute was entered into the Techfit excel template to get the total score. This formed the basis on which prioritization of technologies was made.

Results and discussions

Farmers' context score

The farmers gave a score for the context attribute with a justification. Table 1 below shows context attribute scores (scores for availability of land, labour, cash/credit, inputs delivery, and knowledge) for Bekafa *kebele*. The lowest score was given for cash/credit service. Land, labour and knowledge got the same and highest score of 3.

Table 1: Farmers' context attributes scores (1-4) for the different attributes in the Bekafa sub-district

Attributes (1- 4 scale)*	**Score**	**Justifications given by farmers**
Land	3	Even though land for farming is in shortage, the size of the land available to use for any land demanding technology is fairly available
Labour	3	Farmers believe there labour is not a problem in the area, because average family size in the *kebele* is large.
Cash/credit	1	Farmers are no adequate capital of their own or from credit services
Inputs	2	Even though farmers do not have agricultural inputs, the supply of inputs is adequate
Knowledge/skill	3	Farmers believe that they have no limitations in knowledge and skills because they get advice from Development Agents

*1 = lowest and 4 = highest

Technology screening at pre-filtering stage

A total of 40 feed technologies categorized under different groups were screened based on their context relevance and impact potential for the area at pre- filtering stage. 18 technologies with lower relevance and impact potential for the area to address issues of feed problems were dropped (Table 2), whereas 22 technologies that got higher total scores were carried forward for further evaluation at main filtering stage using scores for technology attributes, farmers' context attributes and scope for improvement.

Table 2: List of dropped technologies at pre-filtering stage with justifications

Technology	Reason for dropping
Improvements of crop residues	
Machine chopping of residues	Experience is limited and the technology not available
Feeding of bought in legume residues	There are no crop residues sold
Supplementation	
Supplement with home-produced local brewers waste	Use of such supplementation is not experienced in the rural areas, it is most common in the cities
Supplement with bought in local brewers waste	Local brewers commercialization is not common
Use leaves and/or pods of farm trees (e.g. Acacias, Milletia etc)	In the area such trees do not grow
Commercial dairy supplements	In the area commercial dairy supplement is not available
Use of oats grain and hulls for supplementary feeding	The feed technology is not known by farmers. Moreover, grain production of oat is not common
Poultry litter	Commercial poultry farm is not available in the area
Feed conservation	
Making hay from cultivated perennial fodder with specialist seed (e.g. alfalfa, Rhodes)	Due to land shortage allocation of land for perennial fodders is relatively difficult
Buying baled day (e.g. oats/vetch, rhodes grass, meadow etc.)	The feed technology is not available
Feed conservation (SILAGE)	It is labour demanding, new to the area, needs investment
Fodder tree leaf meal	The technology is new , difficult for adoption and it is land demanding
Improved forages	
Fodder beet for cooler highlands	Agro-ecological limitation and it occupy the limited land the farmers have
Use of improved perennial grass-legume mixture (e.g. rhodes-alfalfa forage or hay)	Allocation of land for production of perennial feed is not possible
Feeds from cropping systems	
Thinning (e.g. maize and/or sorghum - cutting green at knee height)	Agro-ecological limitation. Production of maize is not common, maize and sorghum are not produced in the area
Use of tops, leaf strips (e.g. maize or sorghum)	Agro-ecological limitation. Maize and sorghum are not grown in the areas
Crop/forage intercropping (sorghum/cowpea for dry areas and maize/lablab for wetter areas)	Intercropping of forage with crops is not common and adoption would be difficult
Balancing feeds	
Complete feed-TMR (mash, block, pellet)	The feed is not available in the area

Prioritization of potential feed technologies at main filtering stage

At the main filter stage, out of the 22 technologies 12 top ranking technologies were selected for Bekafa based on context attribute, technology attribute and scope for improvement (Table 3). Technologies with lower requirement for land, labour, cash/credit, input and knowledge had higher probability of being selected. Hence, most prioritized technologies as a remedy to the problems of feeds in quality, quantity and seasonality for the study area were those which demand less land, labour, cash, input and knowledge.

The selected technologies for Bekafa include crop residues improvement (feeding of home grown legume residues, hand chopping of residues, and rethreshing and mixing of crop residues before storage and feeding and generous feeding of crop residues), improved forages (fodder trees, use of improved annual grass-legume mixture, and improved forage grasses), supplementation (supplement with agro-industrial by-products, and supplement with urea molasses mineral blocks), feeds from cropping systems (use of weeds, cut grass, tree leaves) and feed conservation of private natural pasture (surplus). Feeding of home grown legume residues got highest total score followed by hand chopping residues and use of weeds, cut grass, tree leaves. On the other hand improved forage grasses and making hay from cultivated annual fodder with readily available seed (e.g. oats/vetch) got the lowest score.

Table 3: List of feed technologies prioritized using the TechFit Tool for Bekafa *Kebele*, Lemo District

List of feed technologies	Total score	Rank
Feeding of home grown legume residues	**42**	**1**
Hand chopping of residues	**40**	**2**
Use of weeds, cut grass, tree leaves	**39**	**3**
Rethreshing and mixing of crop residues before storage and feeding	**38**	**4**
Generous feeding of crop residues	**38**	**4**
Supplement with agro-industrial by-products (wheat bran, wheat middlings, oilseed cakes, pulse crop milling by-products such as lentil bran and hulls, etc.)	**35**	**5**
Supplement with UMMB	**33**	**6**
Smart feeding (targeted use of bought-in concentrates to target productive animals)	**31**	**7**
Fodder trees (sesbania, leucaena, tagasaste, gliricidia)	**30**	**8**
Use of improved annual grass-legume mixture (e.g. oat-vetch forage or hay)	**30**	**8**
Improved forage grasses (napier grass, rhodes grass)	**27**	**9**
Feed conservation of private natural pasture (surplus hay)	**26**	**10**

Conclusions

The farmers in Bekafa were very practical about the technologies that are appropriate in the *kebele*. Technologies related to crop residues are likely to be taken up readily, therefore concerted efforts should be made to strengthen existing technologies related to crop residues and introduce technologies that would increase the quantity and improve the nutritive quality of crop residues.