

# Characterisation of the livestock production system and potential for enhancing productivity through improved feeding in Ol-Kalaou division, Kieni West district, Kenya, May 2010

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The Feed Assessment Tool (FEAST) is a systematic method to assess local feed resource availability and use. It helps in the design of intervention strategies aiming to optimize feed utilization and animal production. More information and the manual can be obtained at [www.ilri.org/feast](http://www.ilri.org/feast)

FEAST is a tool in constant development and improvement. Feedback is welcome and should be directed to [feast@cgiar.org](mailto:feast@cgiar.org). The International Livestock Research Institute (ILRI) is not responsible for the quality and validity of results obtained using the FEAST methodology.

The Feed Assessment Tool (FEAST) was used to characterize the livestock production system and in particular, the feed-related aspect of the Ol-Kalaou division, Kieni West district in Kenya. The assessment was carried out through structured group discussions and completion of short questionnaires by three key farmers/stakeholders on the 20<sup>th</sup> of May 2010. The following are the findings of the assessment and conclusions for further action.

## Overview of the production system

The farming system is primarily a subsistence based, mixed crop/livestock system. Farm sizes in the area are an average size of 2-3 hectares, of which, 1 hectare is used from cropping whilst the remaining area is used as grazing land. Households in the area grow a wide variety of food crops including; potatoes (*Solanum tuberosum*), maize (*Zea mays*), beans (*Phaseolus vulgaris*), bananas (*Musa acuminata*), sweet potatoes (*Ipomea batatas*), cabbages (*Brassica oleracea var. capitata*), tomatoes (*Solanum lycopersicum*), kales (*Brassica oleracea*), macadamia nuts (*Macadamia integrifolia*), snow peas (*Pisum sativum var. saccharatum*), carrots (*Daucus carota sativus*) and beetroot (*Beta vulgaris subsp. vulgaris.*). Many farmers also grow forage crops, such as; Lucerne (*Medicago sativa*), Napier grass (*Pennisetum purpureum*), and *Desdemonium spp*. The average area of land used for production of these crops is shown in Figure 1.

Households in the area raise a variety of livestock species for various purposes. On average every household has two or three milking cows. However, many households have 5 or more. The cows are milked on a twice daily basis to fulfil household milk requirements. Excesses are sold to the local milk co-operative. Local zebu type cattle are not popular with farmers due to their low milk production capabilities. Holstein Friesian and Ayrshire are the breeds of preference for all farmers. Sheep and goats are also raised by many families for quick sale when funds are required to cover large expenses such as school fees or medical treatment. Indigenous chickens are kept by households to meet household meat and egg requirements. Many children in the area also raise rabbits to ensure they have a means of income generation independent of their parents. Labour is generally available during times of peak need such as April-June at approximately 200 Kenyan shillings (USD\$2.20) per day. This price is considered very expensive. Rainfall levels are generally adequate to ensure cropping operations can be carried out, however, the area is prone to droughts which can severely

affect crop yields and many livestock can perish. There is not enough water in the area to warrant large scale irrigation. Irrigation is very small scale for domestic household and kitchen garden use.

Milk sales are the primary contributor to household income as shown in Figure 2. An average of 65% of all household income comes from the sale of milk. Crops, mainly potatoes also make an important contribution to household income, contributing approximately 25%. Cash crops such as; macadamia nuts, and coffee (*Coffea arabica*) also make a contribution to household income. The contribution made by these crops is considered relatively minor at 10% collectively. Some households also sell fodder material, particularly Napier grass. The contribution these sales make to household income is restricted to a small number of households and varies substantially throughout the year based on climatic conditions. During the dry season, fodder is generally more marketable and profitable. Income received from the regular sale of livestock is uncommon in the area. Sale of animals generally occurs in an ad-hoc manner when funds are required quickly or undesirable animals such as bull calves and unproductive old cows are placing a strain on feed resources. However, many farmers with larger land holdings will keep bull calves for a period of fattening prior to sale.

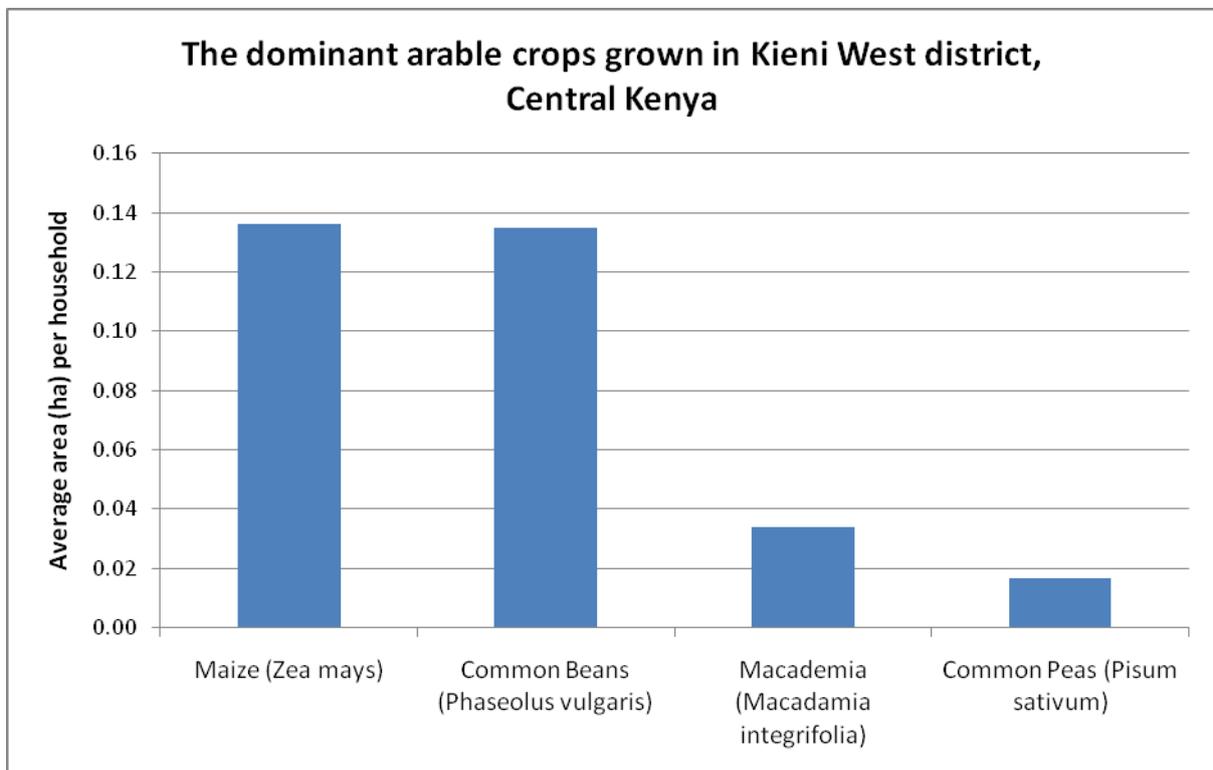


Figure 1: The average area of land utilised per household for arable crops in the Kieni West district, Central Kenya.

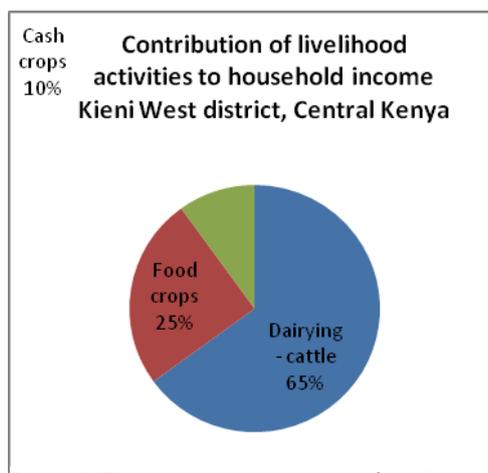


Figure 2: The average contribution of livelihood activities to household income (as a percentage) in Kieni West district Kenya.

### The livestock production system

The livestock system is focused on milk production. Improved dairy breeds, namely Holstein Friesians and Ayrshires, dominate livestock holdings as shown in Figure 3. Friesians are the most numerous breed and compose approximately 60% of cattle holdings in the area due to their high milk production capabilities. Milk produced on the farm is sold to a local co-operative at prices ranging from 18-20 Kenyan shillings (USD\$0.20-USD\$0.22) per litre. Income earned from milk sales is used to pay for necessary household expenses such as hired labour and children’s school fees. Management of the cows varies between households. Some households with larger land holdings allow cows to graze household lands during daylight hours and confine them at night for supplementary feeding. Households with smaller land holdings confine their cows in a small fenced area (sometimes with a cattle shed) and provide supplementary feed. Artificial Insemination (AI) services are readily accessible for all farmers in the area and AI is the preferred method of reproduction. Bull services are only used in very exceptional circumstances and are considered a last resort. The price of semen varies significantly. Locally produced semen can range from 700 to 1200 Kenyan shillings (USD\$ 7.77-USD\$13.32) per straw. Imported semen is worth over 2500 Kenyan shillings (USD\$ 27.75) per straw. Veterinary services are also easily accessed. The price of veterinary treatments depends largely on the nature of the problem. However, many farmers have not been happy with the service as many of the treatments have been non-effective. Veterinary treatments and AI services can be paid for with a loan from the milk co-operative against milk sales should the farmers not have enough money to pay at that point in time.

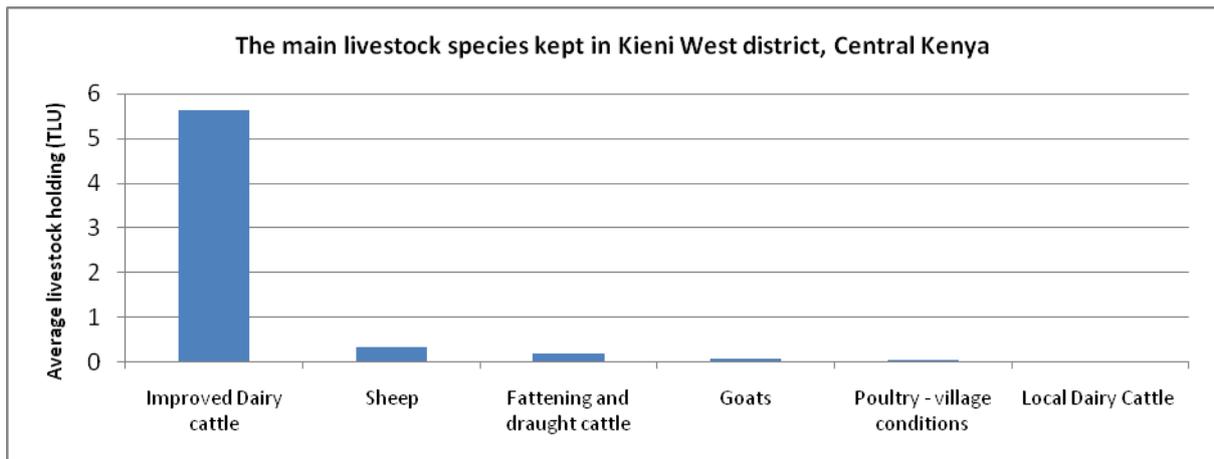


Figure 3: The average livestock holdings per household in Kieni West district, Central Kenya in Tropical Livestock Units (TLUs)

### Feed availability throughout the year

The diet is primarily composed of green forages, concentrates, and crop residues as shown in Figure 4. The contribution made by these feed sources to the diet varies throughout the year. During the main part of the wet season (May-July), green forages compose the largest part of the diet. During the dry season (December-February) conserved feeds such as crop residues, legume residues and purchased concentrated can be found in the diet in larger quantities. The majority of this feed is produced on farm with many households designating over 50% of their land to fodder production. This on-farm fodder production is particularly important as it is the primary source of metabolizable energy (ME) and crude protein (CP) for livestock in this area as shown in Figure 5. Interestingly, purchased feeds make comparatively minor contributions to the ME and CP of the diet, contributing 36% of the total ME and 38% of the total CP found in the diet, despite being the primary source of dry matter. The main feeds purchased by farmers are shown in Figure 6. The price of purchased feeds varies throughout the year based on seasonal availability. Supplements such as; field hay, Napier grass, sweet potato vine and maize stover can be purchased for 250 shillings (USD\$2.75) per bale, 1000 shillings (USD\$ 10.99) per tonne, 150 shillings (USD\$1.65) per vine, and 1000 shillings (USD\$ 10.99) per tonne respectively.

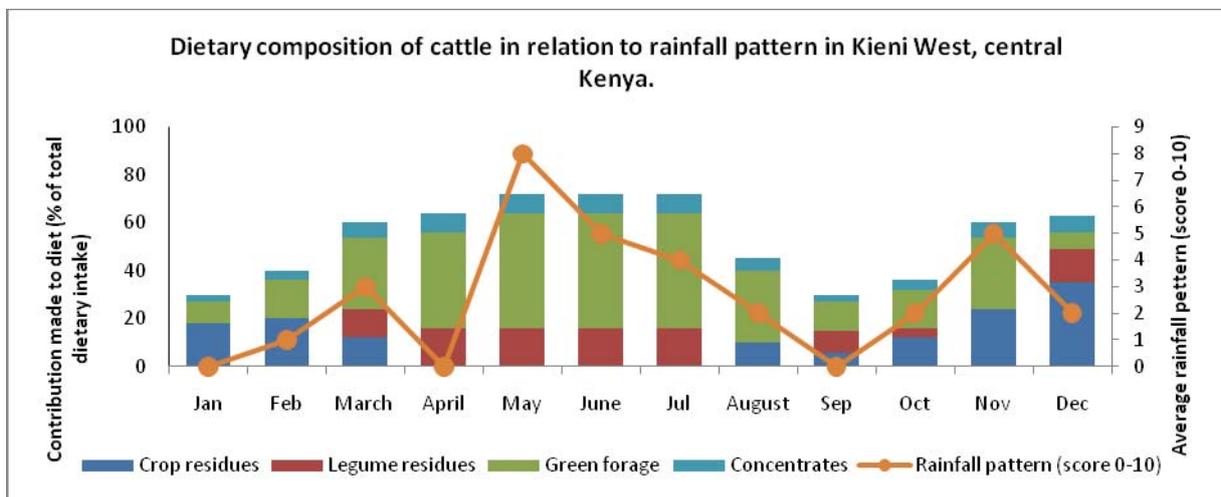


Figure 4: The composition of the diet in the Kieni West district, central Kenya throughout the year in relation to rainfall pattern.

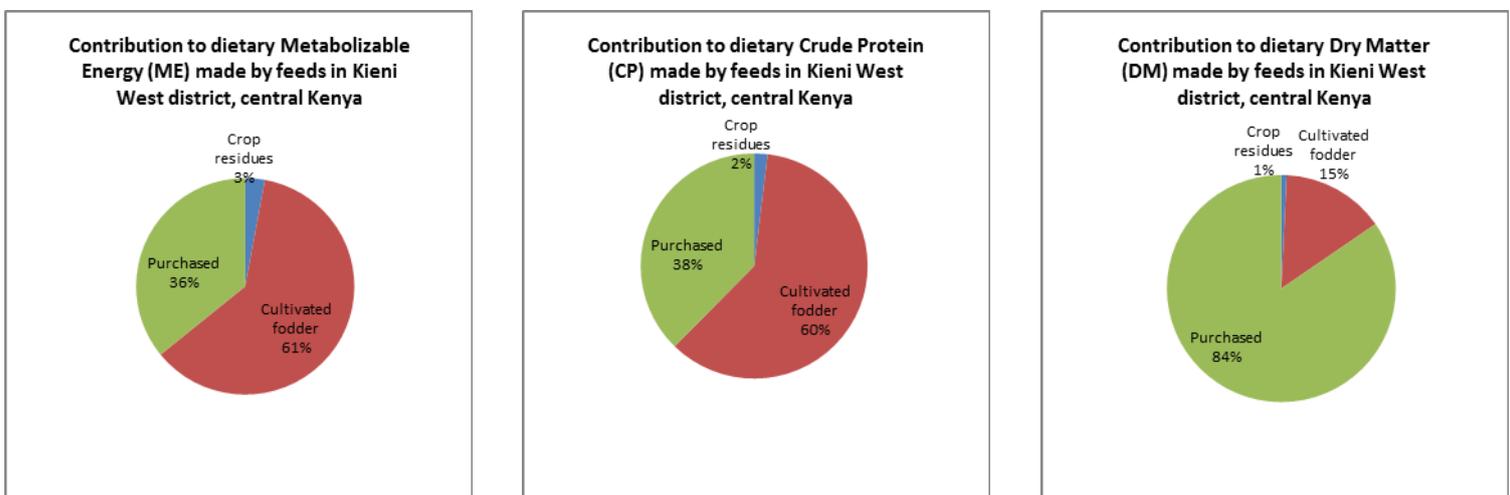
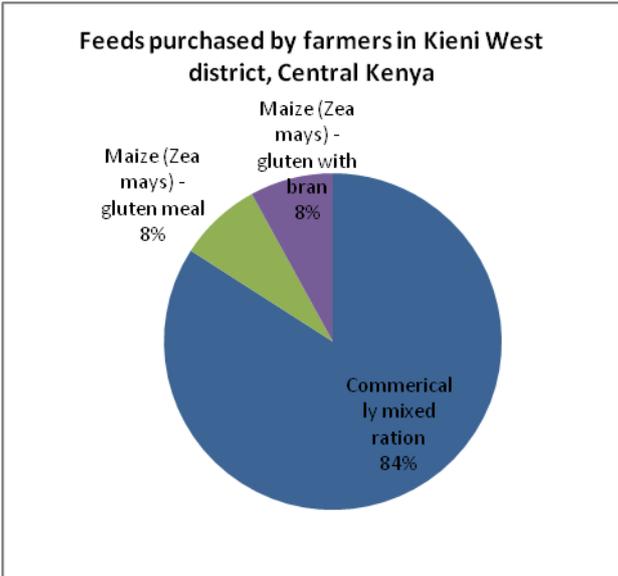


Figure 5: The contribution made by the various feedstuffs to the Metabolizable Energy (ME), Crude Protein (CP) and Dry Matter (DM) content in the diet of animals in the Kieni West District, central Kenya.



**Problems, issues and**

The main constraint to production in this area is insufficient feed. This constraint is a particular concern for many farmers during the dry season when they are forced to purchase concentrate feeds. Concentrate feeds are considered to be very expensive and the cost of milk information

**Figure 6: The feeds purchased by farmers in Kieni West district, Central Kenya.**

**opportunities**

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The main constraint to production in this area is insufficient feed. This constraint is a particular concern for many farmers during the dry season when they are forced to purchase concentrate feeds. Concentrate feeds are considered to be very expensive and the cost of milk information appropriate feeding strategies and technologies further exaggerates issues of poor feed availability as farmers are unable to comprehend concepts of quality and quantity and tend to feed whatever is available at any one time. AI services are also considered to be a constraint by farmers. Though AI services in the area are readily accessible, the price of semen is considered to be too expensive, particularly when semen from the bull they desire is unavailable. Furthermore, in the event that the cow fails to conceive the farmer is expected to pay full price for a repeat service. This makes the AI process very expensive as multiple services are often necessary due to poor conception rates in the area. There are also problems around ensuring that farmers are receiving the type of semen they are promised. The price received for milk products is also viewed as a constraint to production. At present, there is significant seasonal variation in milk prices. During the wet season milk prices are at their lowest (approximately 18 shillings (USD\$0.20) per litre), and dry season milk prices are at their highest (approximately 20 shillings (USD\$0.22) per litre). However, even the higher prices received during the dry season are believed to be too low, especially when considering the increased cost of production due to the need for purchased concentrates and the time spent collecting green forages.

**Potential interventions**

To mitigate the effects of feed constraints, it will be necessary to produce more feed biomass per hectare, improve the quality of existing feed sources, improve feed storage methods, or potentially increase the use of purchased feeds. As the majority of farmers have already dedicated large portions of their holdings to fodder crop production it is unlikely that substantially larger quantities of biomass can be produced per hectare as they are already utilising highly productive fodder species such as Napier grass, and green maize. However, the integration of fodder trees such as *Sesbania spp.* and *Leucaena spp.* around paddock edges will increase biomass production, particularly during the dry season, as their large root system will allow them to remain productive during periods of low rainfall. To improve the quality of feed currently available, the introduction of

simple feed processing technologies such as chopping (or chaffing) would be advantageous. Care must be made when introducing such technologies. The cutting of forage material will effectively increase the surface area to volume ratio of the material, making it more available for microbial decomposition in the rumen. This is advantageous as it ensures larger proportions of the feed source can be utilised by the animal, however, it also means the animal will consume more. Therefore, unless excesses occur, feed processing may not be the most appropriate intervention. In this particular situation, it appears that excesses may occur in many households during the wet season as fodder species will be experiencing maximum growth rates during this time. Thus, simple feed processing techniques may be advantageous for some producers. Attempts should also be made to conserve the excesses that occur during the wet season. Simple on farm methods of silage production should be considered. The use of polythene bags or small scale silage pits may be viable options. Additional concentrate feeds can also be purchased. However, as the price received per litre of milk is relatively low, the extra expense of additional concentrate feeds is unlikely to be off-set by the potential increases in milk yields that may be achieved with higher levels of concentrate feeding.

Improvement of AI services will require a top down approach as it is unlikely the farmers can instigate the necessary changes themselves on-farm. However, farmers can undertake steps to improve the chance of conception to decrease the need and expense associated with repeat services. Farmer training in; heat detection methodology, improved hygiene conditions during birthing to prevent uterine infections and the use of flush feeding may all help to improve conception rates. Care should also be taken when selecting bulls, particularly given the preference of farmers in the area for Holstein Friesians. Many of the more modern genotypes of this breed demonstrate very poor conception rates. Introduction of such genotypes will further compound farmer's frustrations with expensive AI services.

The variation in price received for milk indicates an oversupply of fresh milk in the area, particularly during the wet season. Improved feeding strategies (as previously mentioned) to ensure greater feed efficiency and utilisation will make producers more competitive in the marketplace as it will ensure more milk can be produced per kilogram of feed intake. Alternatively, farmers can attempt to value add their milk products through the production of cheese or butter. Farmers can also consider diversifying their system away from a reliance on milk production and into other more stable livestock commodities such as sheep and goat production that demonstrate high market demand throughout the year.

## **Conclusion**

Dairying is the main income generating activity for farmers in this subsistence based mixed/crop livestock system. Every household has at least 2-3 milking cows. The primary crops of importance are potatoes and maize. The main constraint to the further intensification and development of dairying in the area is a lack of feed. Many farmers have commenced cropping of fodder species in an attempt to mitigate these feed shortages. However, shortages during the dry season remain a problem. The introduction of fodder trees, simple feed processing strategies and methods for conserving fodder will help to alleviate dry season feed shortages. AI services are also considered a constraint due to the general expense associated with the procedure. Improved farmer training in areas important to successful AI procedures will minimise the cost of AI procedures through reducing the need for repeat services. Milk prices are generally unstable and vary throughout the

year due to an oversupply in the marketplace. To overcome this constraint, farmers will need to improve production efficiency to decrease the cost of production through improved feeding practices. Value-adding of milk products and diversification of the farming system away from milk production may also help to prevent oversupplies in the marketplace. However, to introduce all these interventions in a sustainable way, it will be necessary to improve farmer training. Without improved farmer training and ensuring farmers have access to information it will be impossible for farmers to undertake the necessary steps to mitigate the effects of these constraints. Farmers need to gain a clear understanding of key concepts to ensure the effective introduction of; improved feeding strategies, methods to improve conception rates, methods of value-adding milk products and potential diversification of their livestock system.

## **Summary**

### **Key issues**

- Lack of feed sources and information pertaining to appropriate feeding strategies and technologies.
- AI services are considered expensive, have a limited selection of bulls and are unreliable in terms of conception rates.
- The price received for milk is low and variable throughout the year.

### **Key metrics**

- Milk yield: 5475 Litres per household per year
- Meat offtake: 28.4% per household per year

### **Ways forward**

- With the use of improved farmer training, introduce a variety of interventions aimed at alleviating feed constraints such as; fodder trees, simple feed processing technologies and methods for fodder conservation.
- Improve farmer training in the methods required to increase AI conception rates including; heat detection, hygiene standards during birthing, flush feeding and bull selection.