

## Fodder trees for more milk and income

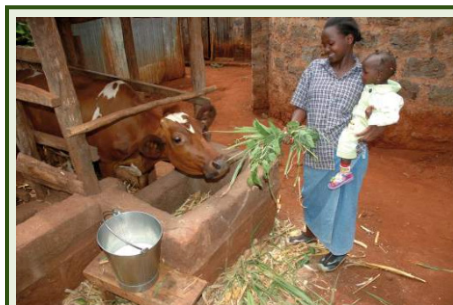
### Key fact:

**Introduction of low cost, easy to grow fodder trees, to a quarter of a million farmers across East Africa, for feeding to livestock, has boosted milk yields and incomes, and reduced the need for expensive dairy feed concentrates.**

### Summary:

Fodder trees are highly nutritious, easy to grow and, by fixing atmospheric nitrogen, improve soil fertility. Relatively easy to manage, fodder trees do not compete with food crops, can be intercropped and, once mature, can be fed to livestock (dairy cows and goats) for up to 20 years. Fodder trees (also known as fodder shrubs) can be harvested year-round, providing fodder even during the dry season.

In collaboration with the International Livestock Research Institute, the Oxford Forestry Institute, and national partners, the World Agroforestry Centre (ICRAF) has helped to introduce a variety of leguminous fodder trees, including calliandra, leucena and mulberry, to over 200,000 farmers across East Africa. As a result of increased availability of fodder, milk yields have increased, raising incomes of rural smallholders by some US\$30-120 per household per year depending on the level of adoption. Women too have taken to the technology with a significant proportion of fodder trees being planted by women, in both male and female-headed households.



**Feeding fresh fodder trees for milk**  
*(World Agroforestry Centre)*

### Facts & figures<sup>1</sup>

- ❖ Fodder tree adoption has spread throughout East Africa from 6,000 farmers in 1995 to over 200,000 in 2005.
- ❖ Organisations in East Africa promoting fodder trees include more than 300 local farmer groups, 87 NGOs, 69 community-based organisations, 32 private companies, 13 national research institutes and universities, 12 governmental units, and 8 advanced research institutes.
- ❖ Women farmers comprise 50% of those planting fodder trees at project sites, in both male and female-headed households.
- ❖ Nine fodder tree species - including two indigenous to East Africa - are now available for farmers to grow in different ecosystems, from hot, humid coastal lowlands to mountainous highlands, as high as 3,000 meters.
- ❖ Over a three-year period after planting, a typical farmer adopting fodder trees has, on average, shared seeds with six other farmers, promoting vital farmer-to-farmer dissemination.
- ❖ Farmers spend about US\$11 raising and transplanting 500 seedlings in the first year. In subsequent years, they can earn up to US\$95-120 net of costs from increased milk production from the use of the trees. However, in reality, many farmers do not plant as many trees so average gains are around US\$34 net of costs.
- ❖ In Kenya, in 2005, 86,000 farmers earned about US\$2.8 million from increased dairy production.
- ❖ Between 1993 and 2008, Kenya's economic benefit from fodder trees is estimated at US\$22.9 million.

## Fodder trees for more milk and income

In the highlands of Uganda, Rwanda, northern Tanzania and especially Kenya, most farmers must cut and carry feed to their confined dairy cows or goats, and finding enough good quality fodder is a key issue. Napier grass is the most common dairy feed in the region, but its protein content is not high enough to sustain adequate milk yields. Difficult to transport, high protein commercial dairy meal is also expensive for the majority of East Africa's smallholder dairy farmers. Planting inexpensive fodder trees on-farm is helping to improve the productivity of dairy animals and increase incomes for farmers.

Fodder trees are easy to grow and, by fixing atmospheric nitrogen, improve soil fertility. They can withstand repeated pruning and do not compete with food crops. The plants mature in about 12 months, after which they can be pruned and fed to livestock (dairy cows and goats) for up to 20 years. The trees also provide fuelwood, stakes for supporting tomatoes, bananas and climbing beans, and their flowers provide forage to the bees for honey production. In addition, planting trees on field contours helps prevent soil erosion.

Research into fodder trees began in the late 1980s, when the International Livestock Research Institute (ILRI) established trials in the coastal areas of Kenya. Around the same time, the World Agroforestry Centre set up a regional research programme across five East African countries in collaboration with national partners. The first on-farm trials in the East African highlands were established in Embu, Kenya through a joint project of the World Agroforestry Centre, the Kenya Agricultural Research Institute, and the Kenya Forestry Research Institute. The trials tested three potentially promising leguminous species: *Calliandra*, *Sesbania sesban*, and *Leucaena leucocephala* from 1991.



**Calliandra fodder tree**  
(World Agroforestry Centre)



**Harvesting calliandra** (WRENmedia)

Once fodder trees began to be planted on-farm, the technology spread rapidly throughout the region, as farmers quickly realised the nutritional benefits of feeding fresh leaves to their cows. Recent field studies have confirmed the results of earlier feeding trials: that feeding around six kilogrammes of fresh leaves yields an additional 0.7-1.6 litres of milk a day depending on the productivity of the cow and other factors. By 2005, a World Agroforestry Centre survey revealed that just over 200,000 smallholder dairy farmers were planting fodder trees, up from just a few thousand a decade

earlier. Since then, additional dissemination efforts, including farmer-to-farmer transfer of the technology, has added to these numbers. Women too have taken to the technology with a significant proportion (40-50 per cent depending on the area) of fodder trees being planted by women, in both male and female-headed households.

According to the World Agroforestry Centre, farmers in the first year spend about US\$11 on raising and transplanting seedlings. Once the trees have matured, those who have planted the recommended number of 500 trees per cow earn around US\$100 annually from increased milk production. Although the technology requires some technical training, fodder trees are particularly appreciated by the poorer dairy farmers as they require no cash investment. Also, they do not require farmers to set land aside that could be used to grow

crops, and the only inputs needed are seed and modest amounts of labour. Farmers can also earn additional income by selling fodder shrub seeds to neighbouring farmers.

Fodder trees also provide a solution for milk producers who traditionally struggle to provide feed for their cattle during the dry season. Because the trees are deep-rooted, they provide nutritious feed throughout the dry season, thereby helping farmers stabilise production and take advantage of the higher dry-season milk prices. With higher milk yields, children in the households are drinking more milk, thus improving their nutrition. With increased incomes, farmers are able to pay group membership fees and buy additional household items.

Nine fodder tree species are now available for smallholders in East Africa who farm in zones ranging from the humid coastal lowlands and dry semi-arid farmland to the cool highlands at 3,000 m above sea level. Whilst smallscale dairy producers are the principal beneficiaries of the new varieties, dairy processors, milk collectors and seed dealers are also profiting. For example, seed dealers and nursery workers have formed their own associations to improve the quality and availability of planting material, thus expanding an important market for smallholder seed and plant producers.



Research is continuing into increasing the number of available fodder tree species by screening new indigenous and exotic varieties. Efforts are also being made to investigate the potential of leaf meal made from fodder trees. In northeast Tanzania, farmers already produce and sell leaf meal to traders who on-sell it to urban dairy farmers. The Bayslick Company, Tanzania's third largest producer of dairy cow mineral supplements, also includes leaf meal made from fodder trees, sourced from local women's groups, in its processed feed products. Ongoing research is exploring means of facilitating the spread of leaf meal processing to other areas, and assessing the feasibility of using leaf meal in other feed products.

### Testimonials:

- **Magwagwa focal area agroforestry group member, Kenya:** "We used to give fodder tree seedlings to our customers free of charge to create awareness, today we are selling to them at 3 shillings each."
- **Regina, woman farmer, Kenya:** "From the extra income from my cows because of feeding fodder, I can contribute money to my group and buy household items, maize, sugar and other things to improve my kitchen. And even if we do not have enough food to eat, my children always have a cup of milk to drink to keep them healthy for the day."
- **Susan, woman farmer, Kenya:** "These trees help us in providing fodder for our animals. It also provides us with firewood, which saves time for going to fetch it from afar, and we also sell the seeds from the same trees. From the money we earn we can buy household items and also contribute money to the group."

## Additional case study information

### Cost and benefits:<sup>2</sup>

World Agroforestry Centre's research costs on fodder trees in East African over a 16-year period were approx US\$4.71 million (not taking into account total amount of funding to other partners). Applying a conservative annual net impact of \$34 for each adopting household, this adds up to a nominal (undiscounted) benefit of US\$22.9 million dollars for Kenya alone.

### DFID contribution to research:

- The DFID-funded project on fodder (No. R6549) comprised two phases, running from 1996 to 2006. In the first phase, key factors affecting the nutritive value of *Calliandra calothyrsus* as fodder for ruminants were assessed.
- The second phase promoted the spread of calliandra and other fodder trees in East Africa to ensure the research outputs from phase one were widely disseminated.
- DFID provides ongoing core-funding to the World Agroforestry Centre.

### Research milestones:

- 1986 ICRAF sets up the East and Central African Agroforestry Network (AFRENA) with national partners in Burundi, Kenya, Rwanda, Uganda and Tanzania to start research on agroforestry trees.
- 1991 The first on-farm fodder tree trials in the Embu area, Kenya are initiated by National Agroforestry Research Project (NAFRP) scientists, testing three promising species: *calliandra*, *Sesbania sesban*, and *Leucaena leucocephala*.
- 2001 DFID-funded fodder project (R6549) compares calliandra provenances, assesses the effects of different pruning frequency, and determines the effect of drying calliandra on fodder quality.
- 1999/2001 A project implemented through CGIAR System-wide Livestock Program (SLP) helps farmers plant fodder trees across seven districts of central Kenya.
- 2005/6 A major USAID-funded project is launched to upscale fodder trees in central Kenya (*3.8 tons of seed and 500,000 seedlings of all fodder species were estimated to have been marketed/distributed*).
- 2008-2012 East Africa Dairy Development Project is financed by the Bill and Melinda Gates Foundation. The project aims to introduce improved feeds, including fodder trees, to 179,000 farmers in Kenya, Uganda, and Rwanda.

### Photo credits:

WRENmedia: For high res images contact Susanna Thorp ([s.thorp@wrenmedia.co.uk](mailto:s.thorp@wrenmedia.co.uk))

World Agroforestry Centre: For high res images contact Michael Hailu ([m.hailu@cgiar.org](mailto:m.hailu@cgiar.org))

### Multi-media material:

New Agriculturist picture feature

<http://www.new-ag.info/picture/feature.php?a=1404>

Fodder shrubs: milking success

Esther Karanja, ICRAF explains how opportunities for women have opened up following the introduction of low cost, easy to grow fodder trees for cattle feed, boosting milk yields and increasing household incomes by US\$30-120 annually

<http://www.youtube.com/wrenmedia#p/a/u/0/yzCylAugN8s>

### Main reference:

Place, F., R. Roothaert, L. Maina, S. Franzel, J. Sinja, and J. Wanjiku, (2009) *The Impact of fodder shrubs on milk production and income among smallholder dairy farmers in East Africa and the role of research undertaken by the World Agroforestry Centre*. Occasional Paper 12, World Agroforestry Centre, Nairobi, Kenya.

### Other key references:

Academy for International Development (AED), (2008) *Transforming the dairy feeds system to improve farmer productivity and livelihoods*. AED, Washington, DC

Franzel, S., and C. Wambugu, (2007) The uptake of fodder trees among smallholders in East Africa: Key elements that facilitate widespread adoption. In Hare, M.D. and K. Wongpichet, (eds) (2007) *Forages: A pathway to prosperity for smallholder farmers*. Proceedings of an International Symposium, Faculty of Agriculture, Ubon Ratchathani University, Thailand. 203-222

Franzel, S., C. Wambugu, H. Arimi, and J. Stewart, (2008) Fodder trees for improving livestock productivity and sustainable land management in East Africa. In World Bank, *Sustainable land management sourcebook*. Agriculture and Rural Development Department, Washington DC 88-94.

Franzel, S., C. Wambugu, P. Tuwei, and G. Karanja, (2003) The adoption and scaling up of the use of fodder trees in central Kenya. *Tropical Grasslands*, 37: 239-250

Nyeko, P., J. Stewart, S. Franzel, and Barklund, (2004) *Farmers' experiences in the management and utilisation of Calliandra calothyrsus, in Uganda*. Agricultural Research and Network (AGREN) Series Paper. No. 140. Overseas Development Institute, London, UK

Wambugu, C., S. Franzel J. Cordero, and J. Stewart, (2006) *Fodder trees for dairy farmers in East Africa: making extension decisions and putting them into practice*. Nairobi: World Agroforestry Centre and Oxford Forestry Institute.

### Contacts for further information:

**Steven Franzel**, World Agroforestry Centre, Nairobi, Kenya, [s.franzel@cgiar.org](mailto:s.franzel@cgiar.org)

**Esther Karanja**, East Africa Dairy Development Project, Nakuru, Kenya, [e.karanja@cgiar.org](mailto:e.karanja@cgiar.org)

**Frank Place**, World Agroforestry Centre, Nairobi, Kenya, [f.place@cgiar.org](mailto:f.place@cgiar.org)

---

<sup>1</sup> Facts and figures sourced from: Place, F., R. Roothaert, L. Maina, S. Franzel, J. Sinja, and J. Wanjiku, (2009) *The Impact of fodder shrubs on milk production and income among smallholder dairy farmers in East Africa and the role of research undertaken by the World Agroforestry Centre*. Occasional Paper 12, World Agroforestry Centre, Nairobi, Kenya

<sup>2</sup> Place, F., R. Roothaert, L. Maina, S. Franzel, J. Sinja, and J. Wanjiku, (2009) *The Impact of fodder shrubs on milk production and income among smallholder dairy farmers in East Africa and the role of research undertaken by the World Agroforestry Centre*. Occasional Paper 12, World Agroforestry Centre, Nairobi, Kenya



DFID, the Department of International Development, is the part of the UK government that manages Britain's aid to poor countries and works to get rid of extreme poverty.



This case study has been commissioned by DFID and produced by WRENmedia, as part of a series demonstrating the impact of DFID's funding to agricultural research. The views expressed do not necessarily reflect the Department's official policies.

© Crown copyright 2010

Copyright in the typographical arrangement and design rests with the Crown. The materials contained within this case study (excluding the logos and photos) may be reproduced free of charge in any format provided that it is reproduced accurately and not used in a misleading context. The material must be acknowledged as Crown copyright with the title and source of the publication specified.