

# ZUR no. 15

ZEF-UNESCO Rivojlanishlari\*

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Science brief from the ZEF-UNESCO project on Sustainable Management of Land and Water Resources in Khorezm, Uzbekistan

## Tree foliage: a potential diet supplement for dairy cattle in Uzbekistan

*An increasing scarcity and a poor quality of fodder hinder milk production in arid Khorezm. In many other arid regions worldwide, nitrogen-rich tree foliage is used as a supplement to ruminant diets that are low in crude proteins. Such practices could also be introduced to the livestock rearing farms and households in the irrigated lowlands in Uzbekistan: the ZEF/UNESCO project conducted research on the nutritive value of foliage from regional tree species.*

### Protein-poor feed in Khorezm

The present diet of dairy cows in the Khorezm region includes alfalfa hay, senescent grasses, dried stems of maize and sorghum, as well as wheat and rice straw. Except for alfalfa hay, cottonseed cake and – periodically – wheat straw, the feeds available in Khorezm are protein-poor. However, they are relatively rich in metabolizable energy, which is a measure of useful energy in a feed, which can be used, among others, for digestion. The ratio between crude proteins (CP) and metabolizable energy (ME) is scientifically abbreviated as the CP:ME ratio. Poor protein and high metabolizable energy results in a low CP:ME ratio, characterizing a low feed quality (Figure 1). The lack of quality feed is one of the reasons for a poor production of milk per cow per day (appr. 6 liter) in the region of Khorezm.

A common practice worldwide to increase the cattle diet quality is to supplement roughage-based diets with protein-rich feeds. This is also the case in Uzbekistan, where cottonseed cake or even nitrogen containing fertilizers such as urea is being applied. However, these supplements are expensive and not readily available to rural households, being the main livestock keepers. Producing forage crops is another option, but there is a lack of land to satisfy the household needs. Consequently, agricultural fallow lands with sparse salt-tolerant vegetation and natural pastures are presently used for grazing. Forests are therefore under a high grazing pressure.

Recent findings of agroforestry research in Khorezm show that fodder trees (suitable as feed) can be planted on degraded cropland (see ZUR 3) and that several tree species are able to produce significant amounts of foliage on highly saline soil. The observed concentrations of crude protein in the analyzed tree foliage are highly superior to those in sorghum and rice straw (Figure 1). Therefore, tree foliage can be used as a supplement to improve the CP:ME ratio of the roughage-based diet. In this feed mix, the tree foliage enriches the quality of feed, whereas the straw supplies the metabolizable energy needed to digest the proteins. The importance of tree foliage as feed supplement can increase during the dry, feed deficient periods and years, since well-adapted tree species are able to utilize the groundwater and sustain their growth under non-irrigated conditions.



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## Exploring the feed bonanza

Mixing the cheap tree leaves in the daily diets can reduce the dependency on common feedstuff as well as the feed costs for the daily production of milk. Depending on the varying quality of the tree leaves, the use of protein-rich tree foliage can decrease the feed costs by about a half at the season-onset and by about one third at the mid and end of the season.

Regarding suitable tree species, the leaves of Russian olive, and Siberian elm showed medium-to-good feed quality for supplementation. The black locust also showed to be of good feed quality, although its leaves contained higher amount of tannins, which could compromise palatability. The foliage of Euphrates poplar, although produced in large quantities, was less suitable.

When considering the fodder prices over the entire year, the cheapest dairy feed ration would consist of cottonseed cake, wheat bran and tree leaves. As far as the quantity of fodder is concerned, the end of the growing season is the best period to collect tree foliage. Labor costs for planting, maintaining, and harvesting fodder trees have to be balanced by the land users against the opportunity costs of labor.

Recognizing the value of nutritional foliage can help dairy cow owners in determining the economically and nutritionally most attractive period for harvesting, especially when facing land deficit for fodder cultivation and livestock grazing. Long-term investments in tree plantations on low-yielding or abandoned croplands have substantial prospects for improving the income of farmers via enriched livestock diets at lower costs. Additionally, tree plantations provide other non-timber products such as fruits and fuelwood that may be marketed or used in the households.

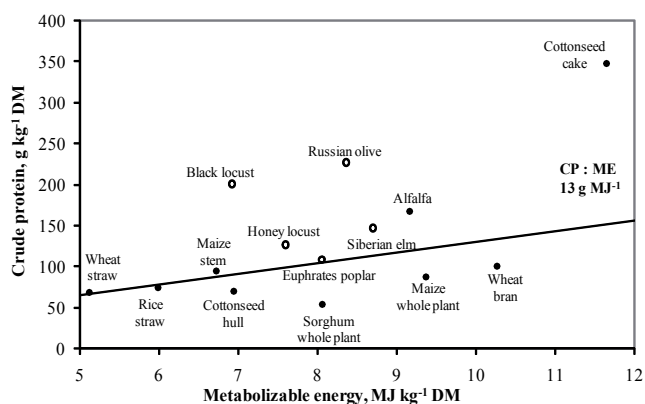


Figure 1: Crude protein and metabolizable energy contents in traditional feedstuff (black dots) and in leaves of various tree species (open dots) in Khorezm.

## Facts & figures

The foliage of the tree species examined contained 90–150 g of crude protein (CP) per kg of dry matter (DM) at the end of the growing season. During the growing season, the concentration of crude protein in tree leaves reached and exceeded 240 g CP kg<sup>-1</sup> DM.

A well-balanced diet for milk production demands a CP:ME ratio of about 13 g MJ<sup>-1</sup> in the feed diet. For a planned milk production of 10–15 liters per day or more, the diet should contain at least 130 g CP kg<sup>-1</sup> DM and about 10–11 MJ kg<sup>-1</sup> DM of metabolizable energy (ME), which gives a good digestibility of at least 70%. Assuming that in Khorezm a lactating cow with a weight of ca. 400 kg produces about 6 kg of 3.5% fat milk per day and considering a zero daily weight gain, the daily feed diet would require ca. 75 MJ of

ME and about 845 g of CP. Given that wheat stalks contain 46 g CP kg<sup>-1</sup> DM, over 18 kg of this straw would be required daily. This amount could not be digested by a cow in one day. Mixing this daily amount of straw however with 2.5 kg of leaves from Russian olive, containing on average 185 g CP kg<sup>-1</sup> DM, would result in a daily need of 8.3 kg of straw in the feed ration. For the entire 300-day lactation period, a total of 750 kg dried Russian olive leaves would be needed, which could be met with about 625 of three-year-old trees. Such number of trees can be grown on about one tenth of a hectare (ten sotkas) of land. For the feed-deficient winter period, only 375 trees occupying a plot of about 6–7 sotkas could suffice to achieve the required feeding ration. Thus an annual foliage production by Russian olive of about 6.8 t DM ha<sup>-1</sup> with an average CP content of 185 g kg<sup>-1</sup> DM, in 6 months would satisfy feeding about 9 lactating cows with a weight of 400 kg and a daily milk production of 6 liters (3.5% fat), but at a zero weight gain.



Dairy cows eating tree leaves.

## Recommended for further reading:

Djumaeva, D., Djanibekov, N., Vlek, P.L.G., Martius, C. and Lamers, J.P.A, 2009. Options for optimizing dairy feed rations with foliage of trees grown in the irrigated drylands of Central Asia. *Research Journal of Agriculture and Biological Sciences*, 5(5): 698–708.

## IMPRINT

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