agrodok

Crop Residues for Animal Feed

Especially in stall-feeding

53

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Foreword and acknowledgements

The idea for this booklet on straw feeding emerged some years ago during a meeting, while discussing an Agrodok on dairy cattle husbandry. That Agrodok was to have a chapter on animal feed, especially fodders such as grasses and crop residues. However, this would have meant squeezing too much information into a few pages, which would not have done justice to the vast amount of information available on feeding straws. A separate Agrodok was needed on the subject.

Pressure on grazing lands continues to increase and in many parts of the world livestock will continue to provide an important supplementary source of income for many resource-poor farmers. In addition, straws play an important role in the sustainable management of the soil.

It is even more likely that competition between the various ways in which straws are used will increase as urban demand for energy, packaging and roofing materials continues to grow, resulting in a decrease of the amount of straw available for animal feeding.

Crop residues for animal feed emphasises the different ways of using a wide variety of straws, especially for stall-feeding. It is based on information collected by Hans Schiere from farmers and researchers in different parts of the world, as well as on practical experience and on a large body of scientific literature.

Adri Vink
Wageningen, 2015

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1 Introduction

1.1 Crop by-products

Farm crops are grown for one or more main product: for example grain, pulse, sugar and oil. Straw and crop leftovers after harvesting and after processing are 'by-products' of the main crop. Whether left in the field or harvested, these by-products have value and farmers have traditionally used them in many ways. Sometimes the by-product is even more important than the crop itself, especially for mixed crop-livestock farmers in semi-arid regions.

'Crop by-products' is a general term used to refer to both fibrous by-products (e.g. straws, mature grass and tree leaves) and crop residues that are richer in nutrients, such as broken grain, bran, oil and seed cakes.

1.2 Straws

Fibrous crop by-products – also referred to as crop left-overs or crop residues – come in different forms and have different names. Grain crops yield either slender straws (barley, rice, rye and wheat) or coarse straws (maize, millet and sorghums). But sugar cane tops may also serve as animal feed, as can banana leaves and bean 'straws', all of which are also fibrous crop by-

products. In some countries maize, sorghum or soybean stalks are referred to as 'stover'. The stalks or stems left over from peas, beans or potatoes are known as 'haulms'.

For the sake of simplicity this Agrodok uses the word 'straws' for all fibrous crop by-products, defining them as *fibrous parts of crop biomass, excluding the roots but including the weeds and immature or fallen grain from failed harvests, as well as spontaneous crop re-growth (ratoon).*

Common traditional uses of straw include:
- Mulch: straw left in the field to protect the soil and reduce wind and water erosion.
- Compost: crop leftovers turned into compost to maintain or improve the soil, in the household garden or in the field.
- Thatching, roofing and building material: for example sorghum stalks for shelter or chopped straw in mud bricks.
- Cooking fuel: if firewood is scarce and other kitchen fuels are unaffordable.
- Animal bedding: straw in pens used to keep cows, buffaloes, goats or sheep.
- Animal feed: the topic of this Agrodok.

More recent uses of straw/crop leftovers include:
- packaging and/or papermaking
- bio-fuel
- digesters for biogas production
- raw material for synthetic fuels.

Using straw in rural areas saves money in local communities: it helps maintain and improve soil quality, and enables farmers to reduce expenditure on external animal feed, roofing materials and so on. Selling straw to urban areas, as animal feed or for modern uses, gives quick cash returns but removes valuable materials from the rural areas. Thus short-term cash gains may come at the expense of long-term sustainability in farming areas.

Burning is an easy way to dispose of straw but the idea that burning adds nutrients to the soil is wrong. What actually happens is that organic matter and valuable nutrients such as nitrogen and sulphur go up in smoke. Not burning straw can thus save money on fertiliser (Chapter 7). Burning crop leftovers in the field, a traditional practice in some farming communities, should be strongly discouraged.

1.3 Straws as animal feed

Not all farm animals are able to digest straw fully. Farm animals with just one stomach (monogastrics), such as pigs, poultry, donkeys, horses, rabbits and guinea pigs, cannot digest straws as well as ruminants, such as buffaloes, cows, goats and sheep. Ruminants have four specialised stomachs, enabling them to extract more nutrients from low-quality feed. Straw as feed for ruminants in stall-feeding is the main topic of this Agrodok, though some information on grazing is included.

1.4 The structure of this guide

Chapter 2 discusses definitions and provides basic information on animal nutrition and crop by-products, including their nutritive value.
Chapter 3 describes straw types, straw availability and storage, as well as ways in which farmers can restructure their farms to optimize their crop and animal farming.
Chapter 4 discusses using straws ‘as they are’ for feed, with and without supplementation.
Chapter 5 describes methods to improve digestibility and/or the nutritive value of straws.
Chapter 6 gives a brief review of straw-based grazing systems.
Chapter 7 discusses the economics and sustainability of the different ways of using straw. The advantages and disadvantages of using straws as feed or as composting material are briefly described here, as well as the greenhouse gas emissions caused by using straw.

In the appendices you will find a glossary, a list of useful addresses and suggestions for further reading.

Straw has been used for feed and other purposes around the world for as long as humans have kept animals and grown crops. Straw is still important for many farmers, especially those who have few resources. At the same time, growing urban demand for raw materials and fuel is putting pressure on the demand for straw and the various ways it is used in rural areas. This Agrodok Crop residues for animal feed is intended for extension workers, advisors and farmers who want to know more about the different ways in which straw can be used for sustainable farming and rural development, and especially as feed for ruminants. It reviews experiences from around the world and discusses in depth how straws can continue to play an important role in livestock feeding and sustainable farming.

No specific knowledge of animal nutrition is assumed. Scientific terminology on nutritive value is condensed into terms that farmers use, such as 'sweetness' and 'greenness'. For readers wanting further information some technical background has been included in separate text boxes.

Agrodoks are a series of publications on small-scale agriculture. The booklets are aimed at people who work directly with small-scale farmers in the South. Each provides a theoretical background on a particular topic and then explains its practical applications extensively. All Agrodoks are published in English and French and many also in other languages. They can be ordered from Agromisa and CTA and are also available in PDF format.

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