

Farmnote

Chaff heaps - a useful source of feed for sheep and cattle

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- Recent developments in cart collection systems have improved the availability of the higher quality components of cereal, pulse and canola crop residues by allowing separation of harvested material into leaf-rich and stem-rich components.
- The heaps from the chaff cart collection systems provide an accessible source of feed for sheep and cattle at discrete locations within paddocks. The average energy content of the collected material is generally enough to maintain liveweights of adult dry sheep and cattle.
- In large stubble paddocks, the provision of strategically placed chaff heaps will improve the use of the feed over the whole stubble paddock. Livestock are attracted to graze these chaff heaps, particularly when they are beyond the over-grazed areas surrounding watering points.

Introduction

Leaf material (eight megajoules per kilogram dry matter) makes up one quarter by weight of the dry plant matter in a wheaten crop at harvest. Shattering during harvest and trampling as sheep selectively graze the stubble paddocks causes large losses of the edible dry plant material within a crop. Microbial breakdown, wind and rain further contribute to the loss of the leaf material. It is therefore important to use the leaf-rich parts early. Alternatively, towing a chaff cart behind a harvester will collect the energy rich components available in stubble. The heaps of chaff residue will improve the value of the stubbles for stock feed and allow sheep to eat more than just six percent of it.

Use of chaff residues

Monitoring of sheep over summer on farms in the wheatbelt suggests the number of grazing days in stubble paddocks with chaff heaps could be extended by up to one third compared with those stubble paddocks without chaff residues.

Grazing value of chaff residues

Chaff residues have a relatively low average food value but it is generally enough to maintain liveweights of adult dry sheep and cattle. The improved accessibility of this source of feed should help reduce the total amount of supplementary feed needed for some classes of livestock over summer and autumn.

Sheep grazing chaff heaps

Sheep spread the chaff heaps while foraging for grain and other fine plant material in them. They tend to completely eat the oatens, barley and pulse chaff heaps within a paddock but some canola residues can remain. Sheep may not eat one quarter of the collected wheaten chaff residues within a paddock.

Sheep are selective in what they eat and most of the uneaten wheaten chaff residues are the more indigestible parts of the heaps (coarse plant material, stem and other long fibre material). The nutritive value of the energy rich parts of the wheaten chaff residues (whole and large fragments of wheat seed and fine plant material) is above the threshold to maintain a 50-kg adult sheep (7.5 megajoules per kilogram dry matter). Young sheep (25 to 30 kg) will start to lose weight when their diet has energy content below eight megajoules per kilogram dry matter.

Cattle grazing chaff heaps

Cattle are less selective in what they eat than sheep. Cattle will perform according to the average nutritive value of the chaff residues. Young cattle (300 kg) will start to lose weight once they are eating chaff residues with an average energy content below 7 megajoules per kilogram dry matter. Adult dry or early pregnant cows (500 kg) require diets with an average energy content above 6.5 megajoules per kilogram to maintain liveweight. Cattle tend to spread out the chaff heaps and soil them more than sheep.

Supplementation and chaff heaps

Supplementation is usually needed to maintain the liveweight of young sheep on cereal stubbles with chaff heaps, as well as to improve the efficiency of the use of nutrients within the stubble materials. The aim of the supplementation is to stimulate the sheep to eat more of the chaff materials by providing a protein-rich feed such as lupin seed. The protein and soluble carbohydrate in the lupins stimulate the microbial population in the rumen, which can then process the eaten chaff material more quickly. Similarly, small amounts of green material (weeds or crop regrowth) following summer rains will also increase the productivity of animals grazing chaff heaps.

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Deferred grazing of chaff heaps

The fine stubble material in a heap is degraded over summer more slowly than when it is spread on the ground in normal stubble. Because of this, deferred grazing of sheep during autumn and early winter is a more cost-effective option for using chaff heaps and should reduce the amounts of supplementary feed needed.

Chaff heaps for feedlot rations

Chaff residues have been sold for inclusion in rations in cattle and sheep feedlots. Feedlot rations based on chaff residue increase the profitability of feedlotting cattle compared with the traditional grain-hay or grain-straw based systems.

Information about chaff heaps

Quantity collected

Measurements from 72 paddocks on 19 wheatbelt properties over three years showed the average amount of material collected in carts increased from barley and oat (300 kg per hectare), to wheat (600 kg per hectare), to canola and lupins (1,200 kg per hectare). Three to 36 per cent of the cereal or lupin biomass in a paddock was collected. The chaff material has a bulk density of 10 to 20 per cent of that of harvested seed. Pre-treatments like swathing increased both the amounts of material collected and the capture of weed seeds.

Composition of the heaps

Approximately half by weight of the oaten and barley, and one third of the canola, lupin and wheat residues was fine stubble material, the size of ryegrass seed. The fine material was 91 per cent plant matter and nine per cent seed (small grain fragments and weed seeds) by weight.

Weed seeds

Annual ryegrass was the main weed seed captured. Other weed seeds collected included brome grass, erodium, barley grass, wild turnip, wild radish, marshmallow, wild oats, wireweed, silver grass, dock, annual poa (winter grass), cluster clover, medic and subterranean clover.

Fate of the annual ryegrass seed

Chaff carts towed behind a harvester can result in the collection of up to 80 per cent of the annual ryegrass seeds from a wheat crop. These weed seeds are concentrated into heaps. The annual ryegrass seeds are then destroyed either by a hot fire when the ungrazed heaps are burnt in autumn or when eaten by sheep over summer. Studies suggest that less than three per cent of viable annual ryegrass seed ingested by sheep can pass through the rumen into the faeces. Sheep grazed on chaff heaps have little impact on the spread of annual ryegrass seed back to the paddock. In comparison, about one third of the viable annual ryegrass seeds will pass through the digestive system of cattle into the faeces.

Grazing allows seeding machinery to pass through any remaining residues more easily. Burning the ungrazed chaff residues can result in the heaps smouldering for up to four days creating a smoke and fire hazard but earlier grazing by sheep can speed up the burning process.

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Nutritive value

While 27 per cent of the unharvested whole seeds were generally captured within the heaps, the proportion varied from 1 to 79 per cent. The carts also captured 90 per cent of the larger seed fragments shattered by the harvester. Barley, wheat and oaten chaff residues have average crude protein levels below those needed to maintain good microbial activity in the rumen of sheep. All crop residues have an adequate mineral concentration for sheep under grazing conditions. The nutritive values of the various chaff residues are listed in Table one.

Table 1. The energy and crude protein content of chaff residues

Chaff residue type	Range and average energy (megajoules per kg/dry matter)	Average crude protein (per cent)
Oats	7.6 to 7.9 (7.8)	4.0
Barley	5.5 to 9.9 (7.8)	4.8
Wheat	4.7 to 9.4 (7.2)	5.6
Canola	7.7 to 8.2 (8.0)	7.4
Lupin	7.4 to 10 (8.7)	10.7

Health issues

The bacterium associated with annual ryegrass toxicity (ARGT) was detected in many chaff samples collected. Outbreaks of annual ryegrass toxicity in livestock have occurred when grazing chaff heaps containing infected annual ryegrass seeds.

Some lupin heaps had a relatively high concentration of phomopsins. This is the toxin that causes lupinosis in livestock. Ergot was detected in very few of the samples from chaff heaps.

Feedlot rations may need some adjustments in composition to ensure a low intake of some toxins (annual ryegrass toxicity and/or phomopsins).

Collection of a representative sample for testing

A bin sampler is required to collect a representative sample from about half the chaff heaps within a paddock. You need to collect at least half a kilogram sample of chaff residues when testing for its nutritive value or the concentration of toxins (annual ryegrass toxicity, phomopsins or ergot). Collection by hand will result in underestimating the energy content by more than 10 per cent.

Further reading

Farmnote No. 65/91 *Selection of supplementary feeds* (Agdex 430/57)

Warren, B. (1991). *Sheep performance on cereal stubbles*. In 'Stubble management in farming systems' (Technical Report No 40, Western Australian Department of Agriculture. pp 44-52).

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