Regional animal feed centre as an intermediary between fodder farming and milk production

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Abstract

A regional feed centre buys crops from grassland farmers and arable farmers. These crops can provide roughage or concentrates for dairy cows. It processes these fodders into balanced total mixed rations (TMR) and delivers them to dairy farmers. A feed centre makes it possible to optimize fodder production at the regional level rather than at the farm level. It also stimulates arable farmers to grow fodder, like they produce concentrates, for the dairy sector. Calculations of another exploratory study (Walsum *et al.*, 2014) showed that optimization of fodder production at regional level reduces nutrient losses to surface water by 10-20%. The advantage of a regional feed centre for dairy farmers is that they can outsource the storage of fodder and feeding of the cows. On the other hand, the feed centres provide an additional service that costs money and give more traffic. The cost of a feed centre depends on its size and its distance to fodder farmers and dairy farmers. A large feed centre creates less overhead costs, but more traffic. Therefore a model calculation (Waterwijs) has been made for the region 'The Peel' in the Province Brabant. In this study arable farmers grow 60% of the concentrates requirement of the dairy cows. This model optimizes the number and locations of the feed centres by minimizing the total overhead costs of the feed centres and the total transport cost of fodder (roughage and concentrates) to the feed centre and of TMR to the dairy farmers. When 10% of the total number of 150,000 dairy farmers participate in 'The Peel' the optimum is two feed centres. In this optimal situation the total cost of the service of a feed centre and transport is € 2 per 100 kg milk.

Keywords: dairy, feed centre, minimize cost, regional collaboration, spatial optimization

Introduction

In the current situation each dairy farmer and arable farmer optimizes his land use at the farm level. Dairy farmers also buy their concentrates from the compound feed factory. Consequently, dairy farming in the Netherlands partly relies on the import of foreign feed concentrates. This causes an extra burden on the environment due to the import of nutrients that end up leaching into surface water and groundwater. A regional feed centre makes it possible to optimize land use at a regional level. It is intermediate between fodder farming and milk production. It buys crops (fodder) from grassland farmers and arable farmers, makes a total mixed ration (TMR) and delivers it to dairy farmers. This service and the transport of the crops (fodder) and TMR cost money. The aim of another exploratory study (Walsum *et al.*, 2014) was to calculate the environmental impact of optimization of crop production at a regional level rather than at farm level and by using more regionally grown concentrates. The aim of the study reported here is to minimize the total cost of the feed centre and transport. A few large feed centres will give more traffic, but provide less overhead costs. The main question is: How many feed centres and at what location will provide the lowest total cost?

Materials and methods

To minimize the total costs for a feed centre and traffic we used the model 'Waterwijs'. This model optimizes the number and locations of the regional feed centres (Van Walsum *et al.*, 2014). It has been applied for two scenarios. One scenario where all dairy farmers with a total of 150,000 dairy cows in the region 'The Peel' make use of a regional feed centre and one scenario where 10% of the farmers participate.

In another exploratory study (Van Walsum *et al.*, 2014) the model 'Waterwijs' is used to calculate the environmental impact of optimization of land use at a regional level rather than at the farm level.

Results and discussion

The exploratory study on the impact of land use change in the region 'De Peel' in the Province Brabant of the Netherlands has shown that spatial optimization of land use conversion resulted in 10 to 20% reduction in nitrogen and phosphorus leaching (Van Walsum *et al.*, 2014). In this case 60% of the foreign feed concentrates were replaced by regionally grown crops.

The results of the impact of a feed centre on all the different costs for the situation with a total of 150,000 cows in the region, of which10% (15,000 cows) are fed by a regional feed centre are shown in Table 1.

The number of feed centres varies from 1 to 10. If all the cows are fed by a feed centre there is a wide range for the optimal number of feed centres, namely 5 to 10. In the situation with fewer than 5 centres the traffic costs will increase too much.

But it is not realistic that all farmers will join the feed centre. Therefore a situation has been simulated in which 10% of the cows are fed by a feed centre. In that situation the optimum is two feed centres. The total of overhead costs of the feed centre (labour, machinery, storage, location) and traffic (supply of feed stuffs from arable and dairy farmers to the feed centres and delivery of TMR to dairy farmers) are lowest with these two centres. The optimal locations are shown in Figure 1, with traffic of crops and total mixed ration (TMR).

The total costs for a regional feed centre, for the optimal situation, are €2.5 million for 15,000 cows. Based on this, the total costs of the feed centre and transport will increase by almost 2 € per 100 kg milk. For some farmers this would still be profitable. Calculations in another study have shown that the cost for the dairy farmer can be €1.80 to €3.30 per 100 kg milk lower, due to less labour and machinery for feeding and less feed storage (Galama *et al.*, 2012).

Table 1. Cost for a feed centre and traffic with an increasing number of feed centres for two scenarios: 150,000 cows (all farms) and 15,000 cows (10%).

Number of feed	Capacity (M ton year^{-1}		Average distance (km)		Costs (M€ year^{-1})			
centres	Supply crops	Deliver TMR[1]	Supply crops	Deliver TMR	Feed centre	Supply crops	Deliver TMR	Total costs
Feed centre for 150,000 cows								
1	2.7	2.5	29.1	27.4	14.2	6.1	7.4	27.7
2	2.7	2.5	20.7	19.6	14.5	4.3	5.3	24.1
3	2.7	2.5	17.2	15.6	14.7	3.6	4.2	22.6
4	2.7	2.5	14.0	12.7	14.	3.0	3.4	21.3
5	2.7	2.5	12.7	11.4	15.1	2.7	3.1	20.9
6	2.7	2.5	11.4	10.2	15.4	2.4	2.8	20.6
7	2.7	2.5	10.8	9.7	15.7	2.3	2.6	20.6
8	2.7	2.5	10.0	9.0	15.9	2.1	2.4	20.5
9	2.7	2.5	9.7	8.3	16.1	2.1	2.3	20.5
10	2.7	2.5	9.2	8.2	16.4	2.0	2.2	20.6
Optimized feed centre for 15,000 dairy cows (10% of region)								
2	0.27	0.25	4.5	19.6	1.88	0.09	0.53	2.5

[1] TMR = total mixed ration.

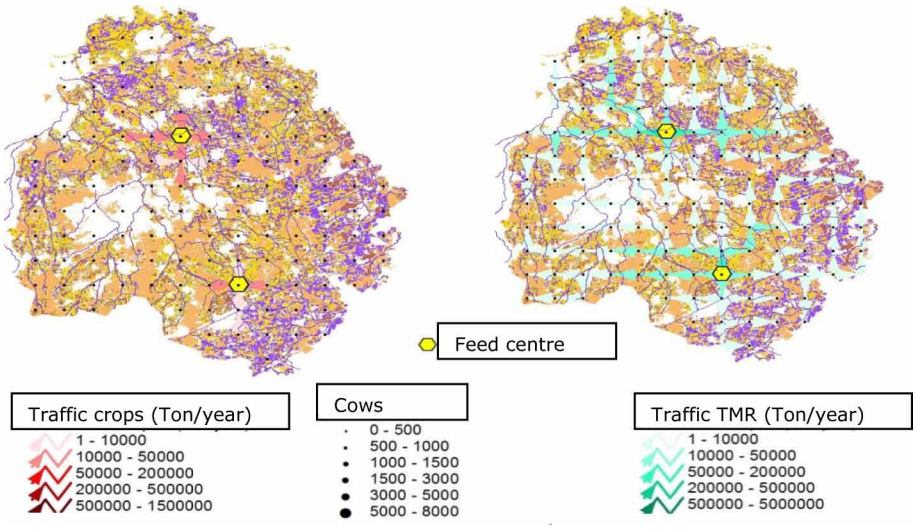

Figure 1. Optimal location for two feed centres in region 'The Peel', for 10% of dairy cows.

Conclusions

Regional feed centres can play an important role in optimizing the growing of crops at a regional level and stimulate collaboration between arable and dairy farmers. For the situation in 'The Peel', if 10% of the dairy farmers were to participate in a feed centre the lowest total overhead costs of the feed centre and transport would be achieved with two feed centres. The extra total costs are in that situation would be €2 per 100 kg milk. This can still be profitable for dairy farmers, because they save costs on labour and machinery for feeding and feed storage. This study and another study with the model 'Waterwijs' have shown that a regional feed centre, as an intermediate stage for optimizing crop rotation and feeding at regional level instead of at farm level, can be promising from an economic and environmental point of view.

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