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Transport quantities in agriculture

Within the DFG project "Material flows, storage and handling on farms" an investigation was carried out on 92 farms in Germany regarding applicable transport arrangements. For this, data on farm transport quantities, times and the applied transport, handling and storage technologies as well as logistics of the farms was to be collected and classified for evaluation.

Data from 92 German farms with differing enterprises were evaluated. The farms were classified according to enterprise type with arable, forage-livestock, livestock feeding and mixed enterprises. These groups were divided once again into three size classes. The first comprised "small" businesses of between 20 ha and 120 ha, the second class consisted of "medium" farms of 120 and 500 ha and the final section comprised "large" farms with more than 500 ha.

Transport factors

The average field size, steading-field distances and available labour have become established as critical external factors in farm transport organisation.

The small average field size problem occurs mostly in the western German farms. Farms in the new States are seldom affected. There, the average fields in the survey were from 30 to 35 ha. The small arable units, on the other hand, had an average field area of 4.81 ha and the medium ones 6 ha. Even more serious was the situation on the forage-livestock farms. Here the small units had a mean field size of 2.79 ha and the medium ones only 1.5 ha. These sobering facts can be explained through farms having to expand substantially in recent years, with the pressure for increasing forage area not allowing any account to be taken of size and distance from steading of the new fields.

Field distance represented a further important transport aspect. With the small cropping farms, the average steading-field distance was 2.13 km, for the medium farms 3.95 km, and for the large ones even 6.71 km. The situation was similar with forage-livestock farms with field-steading distances: 1.93 km, 3.20 km and 7.0 km for small, medium and large units respectively. With mixed farms, the situation was only a little better with distances here 2.81 km (medium farms) and 4.82 km (large ones). These distances have led to some of the very large farms in the survey establishing several smaller integral units within the main farm, each unit with own machinery and storage facilities so that transport distances could be reduced at peak times.

Available labour is the third area which applies directly to transport organisation on the farm. Farms up to 100 ha showed a very large range of staffing intensity here, from under one to over four labour units per 100 ha. It was notable that especially on farms with very high staffing, there was, on the one hand, not enough land to allow optimum exploitation of available labour force and on the other, no opportunity to enable full use of large transport vehicles. Thus, their transport operations with smaller vehicles took as much time as on other farms which were substantially larger. The farms with the best exploitation of available labour were those between 150 and 1 000 ha. In this class the farms were mainly cropping units and they emerged with 0.5 to 0.8 labour units per 100 ha. This low figure led to missing labour units having to be substituted by more efficient transport capacity. The farms over 1 000 ha, because these tended to have more emphasis on livestock production once again, had from 1 to 3 labour units per 100 ha, a situation which also allowed a balancing of requirements during peak periods.

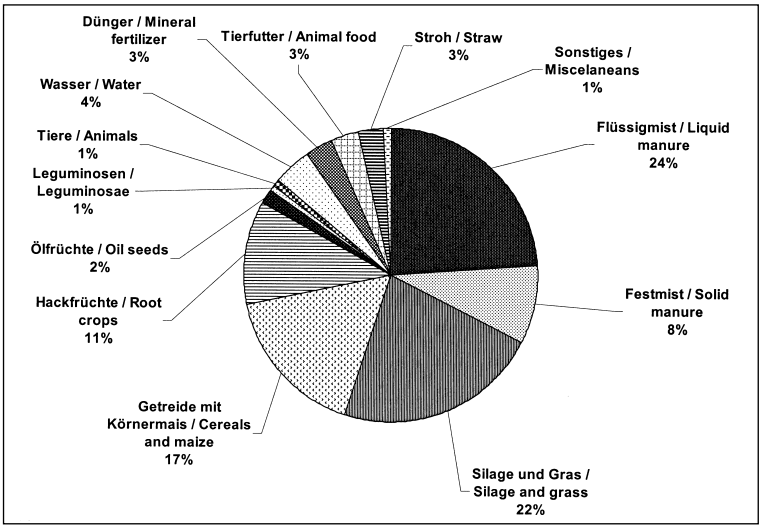

Fig. 1: Quantitative distribution of transport masses

Transport quantities

In *figure 1* the distribution of the individual transported amounts over the total investigated farms is presented. Especially notable here is that with liquid manure, solid manure, silage, grass and feed, 57% of the total transport amount was directly associated with livestock production. A further 31% was associated with the arable enterprises with cereals, roots, oilcrops and legumes being moved. Interesting is also the 4%

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Keywords

Transport, transport quantities, transport organisation

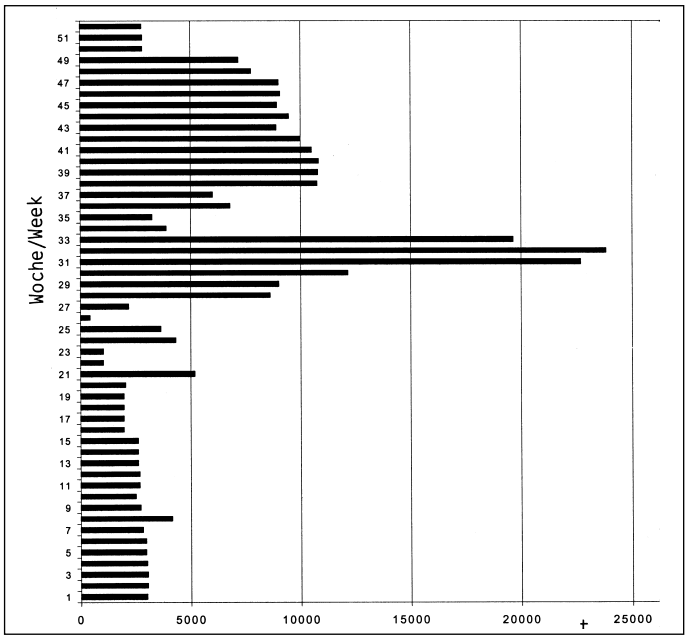

Fig. 2: Transport quantities per week of all field crop farms

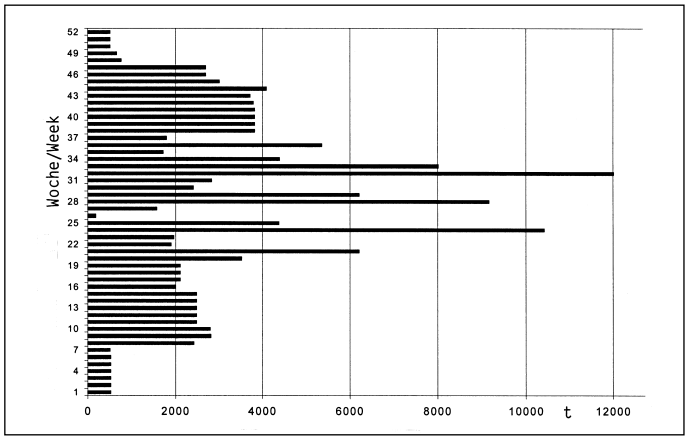

Fig. 3: Transport quantities per week of all forage-grazing livestock farms

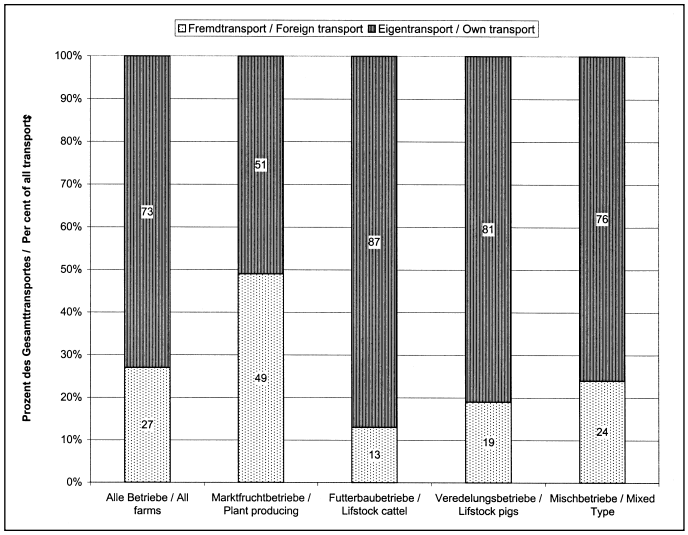

Fig. 4: Relationship between own and contract transport for the farm types

share of transport dedicated to water. Hereby only a small proportion of the transported water was for grazing livestock, the major proportion being for plant protection operations.

Transport per week

The decisive problem with transport in agriculture in comparison to other businesses is the inconsistent distribution of requirements over the whole year and the very strong seasonal variations.

In *figure 2*, the weekly transport requirements of the cropping farms are depicted. These began with a relatively even transport load in spring comprising seed and fertiliser movements. The quantities were continually reduced with the progressing season and by the beginning of June had reached their lowest point. This changed suddenly, however, with the start of the cereal harvest. Within a few weeks there was an extreme transport peak to take care of. After grain harvest, the transport quantities once again decreased before rising to form the next-largest block of carrying work based around root harvests. Whilst as far as the amount transported was concerned, this could be classified as similar to the grain operations, it represented less of a peak because it stretched over a longer period of time.

This could be compared with the weekly transport requirements of forage-livestock farms as shown in *figure 3*. As expected, these farms had a very low level of transport requirement during winter. As the year progressed, there was a relatively even block of work featuring slurry transport which was only interrupt by a dip shortly before the cereal harvest and periods when spreading operations were not permitted. For this type of farm the peak loading for transport came at silage time. In this context grass silage is much more demanding than forage maize as with the latter there is always the opportunity of lengthening the season through careful selection of varieties.

There were also notable differences between the arable and forage-livestock farms in the organisational management of their transport peaks. Thus, many arable farms had changed from direct farm to merchant grain transport at harvest time and now instead were storing it on-farm and later transporting it further. Also, farms further away from the market were stopping employing their own vehicles for some off-farm deliveries, hiring haulage contractors for the longer transport tasks instead.

The second large transport peak on arable farms was at root harvest. In this case a redistribution of the transport load through storage is not so simple as with grain. For this reason, road transport of roots is often non-farm. Here the tendency with beet is for the roots to be dumped at the field edge and picked-up by delivery associations or haulage contractors.

This restructuring of transport organisation in arable farms is also necessary because the number of trade delivery points is increasingly reduced. With own-farm grain transport, the average distance from farm to delivery point in the survey was 10.7 km and that for sugar beet 45.8 km.

The transport peaks are emphasised just as strongly in the forage-livestock farms and here there are actually less opportunities for reorganisation to help avoid them. Where changes are being made, these tend to affect maize silage transport before grass silage.

These differences in transport organisation between individual types of farms are also depicted in *figure 4* with relation to using own or outside transport. In this case, the arable enterprises had developed more the use of non-farm help through grain marketing and sugar beet deliveries, whilst outside transport did not play such a role with the other farm types.