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Modern use of horses in organic farming

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Organic farming is tending like conventional farming towards ever larger enterprises with corresponding machinery fleets and the smallest possible workforce.

This development entails a multitude of problems. As well as the loss of jobs and the destruction of numerous family farms in recent decades, many enterprises find themselves facing constantly increasing use of fossil fuels and increasing compaction of soils. The search for alternatives has not been very successful up to now. Neither agricultural fuels nor low-ground-pressure tyres represent a proper solution, a fact which has long been known but so far has received little attention.

Draught horses – renewable energy in efficient form

One alternative to current practice has received little attention until now: that is the use of draught horses and modern horse-drawn implements. In agricultural practice the number of farms which rely on natural power is slowly but surely increasing. The German draught horse association, Interessengemeinschaft Zugpferde e.V., known as IGZ, published in 2007 a list with addresses of 89 farms in Germany which use draught horses in farm work (IGZ 2007). This list is by no means exhaustive. Among the businesses using horses the majority are clearly farming organically (HEROLD 2007). Interest in using horses in farming and market gardening is also increasing in other European countries. This is clearly not by chance as the use of draught horses accords well with the principles of organic farming. The objective of a closed cycle can in many respects be better achieved using horses than with a tractor. In the first place, the fuel, that is the feed for the horse, is produced on the farm itself, not bought in from outside. Horses make use of converted solar energy, in the form of grass and grain, without it having to be expensively processed and thereby losing a large part of its energy value.

Ill. 1: Round-bale mover ph.: A. Moscardo

In contrast to agricultural fuels, the use of horse power represents a real possibility for the use of renewable raw materials. Meanwhile it has become recognised that growing crops for the production of biofuels makes no sense. On one hand the necessary land is not available, while on the other the energy balance is more than dubious. The third argument, that is the competition with land available to produce food, is valid to some extent for the horse. A farm which works exclusively with horses would need to dedicate between 11% and 18% of its total available farmed land (that is, grassland for grazing and haymaking and arable land to produce hard

feed) to producing feed for horses, dependent on various factors (PINNEY 2003). In addition the horse, having an energy efficiency of about 30% in draught (PEARSON & LAWRENCE 1997), is clearly a more efficient user of energy than the tractor (BOXBERGER et al. 1997). DANGEARD (2005) has calculated that the biodiesel which a 35HP tractor requires in order to work one hour per day throughout the year would require for its production 5 hectares, whereas 1.5 ha of arable or grass land suffices to feed a horse which is used throughout the year for 5 hours per day to achieve the same output. The fact that a farm can be worked with horses with more energy efficiency than with tractors and biofuels has been known for more than 25 years (JACKSON & BENDER 1982). JANSÉN (2000) was able to show that farming with draught horses was based up to 60% on local renewable energy sources while with tractors it was only 9%.

Not only does the energy input derive from the farm itself in the case of the horse but the products of the energy conversion also remain on the farm. Horses produce no gases harmful to the environment but valuable organic manure which contributes greatly to soil fertility and before that can be used in a biodigester plant to produce further energy (SCHROLL 2000).

Modern horse technology

Three distinct ways are available for the use of draught horses in farm work. Firstly, old horse-drawn equipment may be put to use, provided it is in good condition. Difficulties arise in the event of repairs as parts are unobtainable and the repair of cast iron, which is often used in these machines, is not easy.

Anyone who wishes to work effectively and seriously with horses cannot avoid the combination of draught horses with modern machine technology. Two options arise here; either the use of modern machines designed to be horse-drawn (illustration 1 & 4), or else the use of so-called forecarts together with implements which have been developed for use with tractors (illustrations 2 & 3).
Both approaches have their advantages and disadvantages. If one wishes to swap between horses and tractors or to work horses in parallel with tractors, one can use a forecart drawn by horses to operate implements which formerly were used with tractors, as long as they are not too big and heavy. In marginal cases used tractor implements of the right size can be bought cheaply from machinery dealers. All that saves money; apart from horses and harness all that is needed is to supply the forecart. Forecarts come in the most varied forms, from single axle models for towing trailers and harrows up to two-axle models with three-point linkage and power take-off, some driven through the rear wheels, others by an auxiliary motor, so that even high-pressure and round balers, silage wrappers and other machines which require constant PTO power, can be worked with horses (HEROLD et al. 2009). Even using a forecart with an auxiliary motor drawn by horses can save 90% of the energy which would be used for the same operation with a tractor (DEGREIF 2000).

Ill. 2: Weeder with drill ph.: K. Ohrndorf

The disadvantages of the forecart are the additional weight which the horse must move and the reduced manoeuvrability due to the increased length of the outfit. More effective are the modern horse-drawn implements which are mostly built in the

USA and are increasingly seen here. Unfortunately one needs a special machine for each application and the price is very high due to transport costs and import duties. At the moment it is not worth developing and building special horse implements in Europe as the market is too small. In the USA, on the other hand, the number of farmers working with horses is increasing, and is thought to be about 200,000 (KENDELL 2003). For this reason there exist all imaginable implements for horse work, from ploughs, muckspreaders and mowers through to silage wrappers (e.g. MOORE 2007).

Ill. 3: Mowing **ph.: G. Weltin**

Advantages in using draught horses

The advantages in using draught horses lie not only in energy use, as once thought. For jobs in which the necessary pulling power and the required work rate lie within a range which horses can achieve, then horses are equal or even superior to tractors in terms of work efficiency. An example of this is hoeing row crops (SOUKUP 2008, see illustration 4). In addition, horses can be used singly or in pairs or larger teams, so that only as much energy is used as the job requires (PINNEY 2003).

In general, one advantage of using horses is the significantly lower investment costs, which fall above all on small and medium family farms. Lower costs for the acquisition and maintenance of implements and machines, lower expenditure on loan repayments, fuel, fertiliser and supplementary feeds, all these secure the future of a family on their farm, which otherwise because of its size would not be viable if horses were replaced by tractors (SIEFFERT 2004). Even under modern conditions it can make economic sense to use draught horses. Only initial concrete data exists to support this, as research into modern horse work is still in its early stages (HEROLD & HEß 2001, 2003). From the USA there is a model for comparison of the efficacy of tractors as against horses, which shows that, under the circumstances studied, use of tractors only begins to make economic sense above an area of about 70ha. (KENDELL 2003, 2005). No similar value has been established at present for European conditions. To achieve this should be a pressing task for farming research, which should also study modern horse technology in its widest terms, as demand for such concrete data is increasingly demanded.

In the prevention of soil compaction horses provide a tried and tested solution. The preferred technique for controlling weeds in organic farming using a tractor requires multiple passes over crops with a reduced working width. This results in worse soil compaction than weed control using sprays which require fewer passes and a much greater working width. It is true that horses can under certain circumstances impose a higher ground pressure than tractor tyres, but the compaction effect is limited to the top few centimetres of the soil profile because of the comparatively lower weight (WYSS 1999). For woodland soils it has been established for more than ten years that horses cause no ecologically damaging compaction (WALKER 1994; VOßBRINK 2005). As far as concerns farm land, there are also clear indications (HEROLD & HEß 2003). Farmers who have changed to horses report unanimously that after about three or four years of the new regime a recovery of the soil can be observed with higher yields as a result (see also STRÜBER 2009). This applies also in viticulture

(CANNELLE 2002). Young vines growing in a vineyard worked only with horses start to fruit (one to) two years earlier than those growing in soils compacted by tractors. (SCHARNHÖLZ 2009). In contrast, practise shows that low ground pressure tyres are not suitable for preventing compaction (EHLERS 2000), a fact already known for more than 25 years (BOLLING & SÖHNE 1982).

The development of country life through local production and marketing of foodstuffs is one of the objectives which will be linked with the future direction of organic farming. Connected with this is the wish to slow population drift from the country into the cities, or indeed to reverse it. (NIGGLI et al 2008). That will only be possible if local agriculture falls back on methods of production, processing and marketing which produce new and varied jobs in family firms and in small and medium-sized businesses. It is precisely in such an economic and social context that the use of draught horses can prove its worth. The cost of higher labour input in the production of various foods for the local market on small plots of land would be far outweighed by the massive savings in processing, packing, storage and long-distance transport (see GÜNTHER 2003). In this light, it would definitely pay to end the planned destruction of numberless small farms in Central and Eastern Europe (ROSE 2009), and instead to retain the existing structures, to promote them and to support them by adopting the principles of organic farming.

One fact from the United States can perhaps be helpful to dispel the common scepticism about the use of draught horses: the most successful farmers in the USA are the Amish who use no tractors but work exclusively with horses.

Ill. 4: Weed control in market gardening **ph.: C. Becker**

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