

The Decision of 21st Century Famers in Developed Countries to Use Horse Labor Instead of Tractors

By Klaus Strüber



In an industrial advanced country such a Germany, the use of the tractor has been the primary source of power and the drive of the farming industry for the past 50 years. The application of tractors and other machinery have proved to be quicker and more powerful means of force than animals, and thus replaced animal labor. Tractors increase agricultural production from the meat to the dairy industry, and allow greater work with less manpower. About 50 years after the first implementation of tractors in the framing industry, comes the question of what farms give up for this technological advancement and comfort. 9 out of 10 people in Germany live in suburban areas, but the extent to which this affects the amount of machines used for agriculture is not covered in this article; the direct affect of high suburban populations in relation to the need for quicker farming technologies has yet to be calculated. The direct effects of machine use (i.e. tractors) instead of animals will be further examined in this article; effects on the farm land, the required energy supply, and the effects on the environment. Horses, next to cows and oxen, were the most useful animals for farming until the 1960s. The results of a test operation, started in 2005, using horse labor instead of agricultural machinery will be explained in this article.

The Physical Impact of Tractor Use on Farm Land

Through the emergence of increased tractor use on farmland brings along the pressing issue of soil compaction, due to the heavy agricultural machines. In Kanton Bern, Switzerland, for example, the amount of land acceptable for planting crops has been reduced by 25% (Bodenschutzfachstelle). Roughly 30 million hectar of land in Europe are irreversibly compacted from machine use (Horn 2000). In soil of loam, Baden-Württemberg, Germany, it took ten years of natural methods to loosen up compacted soil (Hildebrand und Wiebel 1982). In an East German area, with moraine soil, Dannowski (1987) found no decline in highly compacted areas, due to regular use of train tracks, after long periods of penetrating frost to a depth of up to 80 cm. In these areas there could be no measurable change established in the

basic soil compaction, even after the ground had not been exposed to new forms of strain from the tracks for a period 2 ½ years (Petelkau 1989). In a model test on existing Albic Luvisol ground, a fertile clay-boulder-sand mix left by glacier deposits, the generated compressed layers of subsoil were still unchanged after 22 years. The use of tractors creates this compacted soil, resulting in a drop of profits, as well as water erosion due to the decreased ability to absorb water, creating a possible flood risks (Petelkau 1991). (Reference for the paragraph: Dürr, Petelkau, Sommer 1995)

Energy

The worldwide supply of crude oil will eventually run out and thus the search for alternative energy sources has already begun. The agricultural industry will profit by comparing the energy efficiency of its machines, i.e. tractors, with animal labor. If horses prove to be more efficient, their heightened use will not be a reversal to primitive farming methods, but instead a development, since the latter can be sustained through regionally found renewable resources. In Germany, 13% of greenhouse gasses come from agricultural practices, through the burning of fossil fuels in tractors (Hirschfeld Et. al. 2008). At the same time, the agricultural industry is the only one that can theoretically eliminate more greenhouses gases than it produces (NSAC 2009). In all areas of comparison, tractors are considerably less energy efficient when compared with horses; horses can utilize energy from raw renewable sources to a much greater extent than tractors (Zimmermann 1994, Jackson/Bender 1982). The “green-balance analysis” – an energy appraisal system for the suitability of industrial productions created by the German Federal Environmental Agency– rates horse higher than tractors (Schnell 2003). In Sweden in 1927, 60% of the needed energy for farming came from renewable sources, whereas in 1996, due to machinery, that number rests at only 9% (Rydberg/Jansen 2002). It takes 232 kilograms of corn to produce 50 liters of bioethanol for tractor fuel. That amount of corn could feed a child in Zambia or Mexico for a year (Ziegler 2007). Workhorses can be substantially fed off the land, having a slight, but positive effect on human consumption and nutrition by freeing up grain formerly used for bio fuels.

The Environment

There has been a steady increase in the extinction of various species in the last 100 years. One cause of this issue stems from the agricultural industries, which have greatly advanced in the past century through the use of machines, particularly tractors for farming. Today the regular use of tractors for services such as mowing and plowing has decimated various species of amphibians by about 90%, whereas with traditional horse drawn farming equipment that number would rest at only about 10% (Claßen Et. al. 1996).

Impact on the Horses

Confirmed facts justify this proposed question: is the tractor the most beneficial source of power for agricultural production? On one German farm, with 22.5ha of productive land, the project “Hummussphäre” has evaluated the ability to regenerate compacted land through the use of horses; also evaluating what type of energy balance arises from this change in applied work forces. Environmental effects were not evaluated during this study.

The Ground

In 2005, 3 different parcels of land were committed for a serious of test to directly compare the impact of tractors and horses on the land; each parcel is 200 m² in size and was tested to ensure identical physical characteristics and properties (Holthusen 2005). The land parcels were divided and subsequently worked for 3 years. One side of each parcel was worked only with horses and the other only with tractors; the land was always worked with the same tools and at the same time; a tractor is actually lighter than two horses used for farming.

By 2008, there were measurable differences between each side of the worked areas; the land's capacity to hold water and greater aeration were up to 45cm higher in areas worked by horses as opposed to tractors. Thus, it is suggested to use workhorses instead of tractors on damaged and compacted farmland (Mordhorst 2009). The benefit and profit every year of each land parcel on the horse-worked side is at least 15% higher (Strüber 2010). These tests will continue to be compared until 2015.

Energy

The use of horse labor on various test farms is limited by the availability of manpower, which in turn depends on financial status, i.e. the ability to pay each worker proper wages. Due to this, only about 60% of the test locations can be worked with horses (in gardens equal or larger to 1.6ha that reaches 100%), the rest is completed with the help of tractors. The 60% of work through horse drawn equipment minimizes the overall fuel consumption by about 30% (Strüber 2010). If a suitable solution to financially support more wages could be found, for example through the initial use of basic incomes, it would be possible for these areas to switch over to only horse-labor within 2 years. Thus, the use of fossil fuel on these farms could be completely diminished.

The Prospects

Apart from the ability of tractors to work large areas, it doesn't have many other positive attributes, but instead has negative ecological effects. Therefore, it is wrong to use the tractor as the only means of power in the future of agricultural cultivation. The results of various test farms in Germany show that to replace machines with workhorses, in highly developed countries, can help regenerate unusable, degenerated, and compacted farmland. Developed nations have the ability to create an economical system, and should exercise this, to permit the financial means for further cultivation through horses. However, these developed countries also have a problem since there are presently neither enough workers to oversee the workhorses on farms nor to pass on their skills and knowledge. In countries where traditional methods of animal labor are still in use, the knowledge about animal care and limitation is an important resource, one that is now lacking in highly developed countries. In all countries on Earth where animals are currently being used as a form of power, it should be carefully reviewed as to if these animals should really replace tractors and other agricultural machines; the results from countries that have already greatly implemented tractor use does not solve this question. Perhaps if the feasibility to finance wages was higher, the exertion of animal labor would become more preferable.

Literature

Bodenschutzfachstelle des Kantons Bern (1997): Bodenbeobachtungen im Kanton Bern – Rütli, Zollikofen

Claßen A., Hirler A., Oppermann Dr. R. (1996): Auswirkungen unterschiedlicher Mähgeräte auf Amphibienbestände in Nordost-Polen - DAS ZUGPFERD“ 3/96=S. 14 -18

Dürr, H.-J., Petelkau H. und Sommer, C. (1995): Literaturstudie „Bodenverdichtung“. Umweltbundesamt

Hirschfeld J., Weiß J., Preidl M., Korbun T. (2008): Klimawirkungen der Landwirtschaft – Schriftenreihe des IÖW 186/09, ISBN 978-3-932092-89-3 = 188 S.

Holthusen, D. (2005): Bestandsanalyse zur Quantifizierung von Bearbeitungseffekten im ökologischen Landbau – Bachelor-Arbeit im Studiengang Agrarwissenschaften, Christian-Albrechts-Universität zu Kiel 2005 = 75 S.

Horn, R.; Akker van Den, J.J.H.; Arvidsson, J. (2000): Subsoil compaction: distribution, processes and consequences – Reiskirchen : Advances in GeoEcology, 32 S.

Jackson W., Bender M. (1982): Pferde oder Pferdestärken, Zusammenfassung einer Studienarbeit – „Das Zugpferd“ 6 92/93 = S. 10 -17

Mordhorst, A. (2009): Zeitabhängige Strukturbildung bei biologisch-dynamischer Bodenbewirtschaftung mit leichten Maschinen und Zugpferden – Masterarbeit im Studiengang Agrarwissenschaften, Christian-Albrechts-Universität zu Kiel = 82 S.

NSAC (National Sustainable Agriculture Coalition) (2009): Agriculture and Climate Change: Impacts and Opportunities at the farm level – A policy position paper = 39 S.

Rydberg T., Jansen J. (2002): Comparison of horse and tractor traction using energy Analysis - Department of Ecology and Crop Production Science, Swedish University of Agricultural Sciences, Box 7043, SE-750 07 Uppsala, Sweden = 16 S.

Schnell, R. (2003): Zugpferdetechnologie in Mitteleuropa - Diplomarbeit von Robin Schnell, Landwirtschaftliche Fakultät der Rheinischen Friedrich-Wilhelms-Universität, Bonn, Deutschland

Strüber, K. (2010): Humussphäre, Projektbericht Nr. 6 – Projektarbeit der Gesellschaft für Landwirtschaft und Pädagogik, Bremen = 57 S.

Ziegler, J. (2007): Ein Kind, das an Hunger stirbt, wird ermordet – Bonner Generalanzeiger vom 22.10.2007

Zimmermann M. (1994): Energieaspekte des Pferdeeinsatzes = „Das Zugpferd“ 2/3 94 =S. 22 – 25