

# A tool for the achievement of the Sustainable Development Goals set up by United Nations

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## Abstract

In the rural villages of the developing world, several hundred million of working animals cooperate with farmers. When, instead of manual labor, the draft animal power is utilized by the farmers their productivity increases by three to five times. This makes it possible to get more food, more rural products to be sold on the market, and, on occasion, also more clean water. In several research centers, in Asia and in Europe, the generation of electric energy, through the rotary mode operation of an engine moved by a draft animal, has been successfully tested. If properly managed, this source of electric current can increase the light hours of the villages for schools and artisan shops, enhancing the education and the production of goods. The electricity can also contribute to easing the process of grain milling and lifting clean water.

Unfortunately, all these enormous benefits are either ignored or not properly considered by both the governmental and non-governmental organizations engaging in international cooperation.

The article emphasizes the necessity that an advocacy activity should be done to convince people of the need to support the draft animal power as a very efficient tool to stimulate development.

## Kurzfassung

In den ländlichen Dörfern der Schwellenländer arbeiten mehrere hundert Millionen Arbeitstiere mit den Bauern zusammen. Wenn die Landwirt:innen anstelle von Handarbeit die Kraft der Zugtiere nutzen, steigt ihre Produktivität um das Drei- bis Fünffache. Dadurch können mehr Nahrungsmittel, mehr landwirtschaftliche Erzeugnisse, die auf dem Markt verkauft werden können, und gelegentlich auch mehr Trinkwasser gewonnen werden. In mehreren Forschungszentren in Asien und Europa wurde die Erzeugung von elektrischer Energie durch den Rotationsbetrieb eines Motors, der von einem Zugtier angetrieben wird, erfolgreich getestet. Bei richtiger Handhabung kann diese Stromquelle die Beleuchtungsdauer von Schulen und Handwerksbetrieben in den Dörfern verlängern und so die Schulbildung und die Produktion von Waren fördern. Die Elektrizität kann auch dazu beitragen, den Prozess des Getreidemahlens und die Förderung von sauberem Wasser zu erleichtern.

Leider werden all diese enormen Vorteile von Regierungs- und Nichtregierungsorganisationen, die sich in der internationalen Zusammenarbeit engagieren, entweder ignoriert oder nicht richtig berücksichtigt.

Der Artikel unterstreicht die Notwendigkeit einer Lobbyarbeit, um die Menschen von der Notwendigkeit zu überzeugen, die Zugtierkraft als ein sehr effizientes Instrument zur Förderung der Entwicklung zu begreifen.

## Résumé

Dans les villages ruraux du monde en développement, plusieurs centaines de millions d'animaux de trait coopèrent avec les agriculteurs. Lorsque les agriculteurs utilisent l'énergie des animaux de trait au lieu du travail manuel, leur productivité augmente de trois à cinq fois. Cela permet d'obtenir plus de nourriture, plus de produits agricoles à vendre sur le marché et, à l'occasion, plus d'eau potable. Dans plusieurs centres de recherche, en Asie et en Europe, la production d'énergie électrique, par le fonctionnement rotatif d'un moteur mû par un animal de trait, a été testée avec succès. Si elle est correctement gérée, cette source de courant électrique peut augmenter le temps d'éclairage des villages pour les écoles et les boutiques des artisans, améliorant ainsi l'éducation et la production de biens. L'électricité peut également contribuer à faciliter le processus de mouture des céréales et à fournir de l'eau potable.

Malheureusement, tous ces énormes avantages sont soit ignorés, soit mal pris en compte par les organisations gouvernementales et non gouvernementales engagées dans la coopération internationale.

L'article souligne la nécessité d'une activité de plaidoyer pour convaincre les gens de la nécessité de soutenir l'énergie animale comme un outil très efficace pour stimuler le développement.

## Resumen

En las zonas rurales de los países en vías de desarrollo, varios cientos de millones de animales participan en numerosas actividades laborales con los agricultores. Cuando, en lugar del trabajo manual, los agricultores utilizan la fuerza de los animales de tiro, su productividad aumenta entre tres y cinco veces. Esto permite obtener más alimentos y productos agrícolas para vender en el mercado y, en ocasiones, hasta más agua limpia. En varios centros de investigación de Asia y Europa, se ha probado con éxito la generación de energía eléctrica mediante el funcionamiento de un motor en rotación movido por un animal de tiro. Si se gestionara adecuadamente, esta fuente de corriente eléctrica podría aumentar las horas de luz eléctrica en los pueblos para las escuelas y los comercios artesanales, potenciando así la educación y la producción de bienes. La electricidad además contribuiría a facilitar la molienda de grano y aumentaría en nivel de agua potable.

Desgraciadamente, todos estos enormes beneficios son ignorados o no se tienen debidamente en cuenta tanto por las organizaciones gubernamentales como por las no gubernamentales que participan en la cooperación internacional.

El artículo subraya la necesidad de realizar una actividad de promoción para convencer a la población de la necesidad de apoyar la energía/ el trabajo de los animales de tiro como una herramienta muy eficaz para estimular el desarrollo.



## Introduction

In the world, at least two hundred million animals support farmers in their everyday works<sup>1</sup>.

The use of the draft animals increases the productivity of people engaging in agriculture by three to five times.

Several studies in Asia and in Europe have demonstrated the viability of the use of the draft animal power not only for transport and soil cultivation but also for the generation of the electric current. These studies are confirmed by various websites, patents and scientific papers<sup>2</sup>.

Substantially the difficulties to multiply the slow gait of the draft animal, walking on the round path, in a sufficient number of rounds per minute, requested for the electric generation, seem to be solved<sup>3</sup>.

These new acquisitions have widened the role of the draft animal power and have shown the capacity of this source of energy to support the achievement of the Sustainable Development Goals Goals as defined by the United Nations.



**Figure 1** – Cape Buffalo, *Syncerus caffer* species, it does not belong to the *Bubalus* species, but is called African buffalo, wild and aggressive, in a rare attempt at domestication by towing a wagon with a sturdy yoke

## Draft animal power and the Sustainable Development Goals set out by the United Nations

Some considerations on how the draft animal power can match the need of the people engaged in the pursuit of the Sustainable Development Goals are here exposed<sup>4</sup>.

About the ‘No poverty’-Goal we can say that the increase of productivity, due to the employment of the draft animal power, means more rural products, more grains and more fruits to put on the market. New forms of electricity generation could increase the availability of light hours in the workshops and then could increase the productivity of the artisans.

About the ‘Zero Hunger’-Goal it is possible to say that, in the same way, the increase of productivity means more

rural products and thus more food for local consumption and distribution.

About the ‘Good Health and Wellbeing’-Goal – among many other examples – it is useful to remember that the application of certain hand equipment, such as the grain milling stones, frequently wounds the fingers of the farmers, almost always women, procuring them septicemia and at times, as a consequence, the death. This hand equipment could be substituted by draft animal powered equipment.

Furthermore, light hours due to the electric generation means more light hours in dispensaries and infirmaries and more electricity means better communication for possible telemedicine.

About the ‘Quality Education’-Goal it is possible to say that a new form of electricity generation could increase the availability of light hours for classrooms and the households of students, hence increasing the possible study hours.

About the ‘Gender Equality’-Goal we can say that the draft animals and the pack animals can move drinking water and fire wood saving a lot of work generally done, by walk, by women and children.

The lifting of the water from wells or river up to a piezometric tower could ease the distribution of the water in the villages. This will allow one or more water taps in every single house in the village, allowing access to clean water and better sanitation.

About the ‘Affordable and Clean’-Energy goal, we can say that one of the most utilized lighting systems in households of remote villages is the kerosene lamps. Kerosene is a great pollutant. A few minutes of an animal walking on a round path can generate – through a dynamo or an alternator – sufficient electricity to charge batteries to light various lamps for several hours for multiple days.

Regarding the ‘Climate Action’-Goal, it has been observed that the eventual substitution of animal work with engines would increase the presence of fossil CO<sub>2</sub> in the atmosphere and the consumption of fossil fuel in the dimension of a rough 5-6 per thousand<sup>5</sup>.

While a significant consideration is that the energy developed by the working animals has a weight of 1.4 % with respect to all the renewable energies produced in the world.

## The draft animal power and the cooperation to development

All the realities above described, even if well-known, have never exceeded the point of inertia because they have always been underestimated by the companies engaged in social responsibilities initiatives, by the charities and also by the people engaged in the international cooperation to development.

Several perplexities have also been expressed by some exponents of the Global South because they believe that supporting animal traction is condemning their countries to backwardness. But this is not true because by increasing the productivity of farmers, a state of well-being can be achieved even faster.

1 Perrone 2014, 1-6.

2 Lhoste et al. 2010; Fuller/Aye 2012, 326-332; Kienzle et al. 2013.

3 Chandraker et al. 2014; Jakhar et al. 2017.

4 United Nations, URL: <https://sdgs.un.org/goals> [14-12-21].

5 Perrone 2014, 1-6.





Figure 2 – Costa Rica 2018

The mentioned prejudices can be removed with the following considerations.

To generate a kilowatt hour of electricity, with a small generator, at least one liter of fuel is required and this has a cost of around one Euro. This means that in an isolated village it would take about four hundred euros a year to have one kilowatt hour of energy per day. This is an incredible figure for villages in countries where the average per capita income is around five or six hundred Euros a year.

By contrast, the working animals are present in rural villages in any case and their cost is already amortized by their use for transport and plowing. These processes involve the animals for no more than 120, 140 days per year. Considering this, there is a great deal of their unused time available for a possible electric generation process.

Working animals generally feed on poor pastures that are not otherwise usable for agriculture, so their nutrition is not a competitor of human nutrition but is synergistic with it.

As demonstrated, by several prototypes already made, it is now possible to replace mechanical devices operated by animal traction with electromechanical devices, however, operated by animal traction, but simpler and more efficient.

This allows to exploit deeper aquifers and therefore, more numerous than those currently used, and also enables access to water that is not polluted by trampling and animal waste.

Moreover, water pumped from deeper aquifers is less brackish, because it is not evaporated.

Making wells in tubular form eliminates the danger of collapsing walls and then the, now frequent, closing of the well.

Using the improved equipment moved by draft animal power to raise the water, costs several times less than the use of photovoltaic energy pumps or pumps driven by internal combustion engines.

Another positive note is that with draft animal power most of the expenses will be in local currency.

To raise the water with piezometric towers allows the creation of a village water network.

The grinding of grains and oilseeds with less dangerous equipment is another advantage of the system.

The potential of improved equipment must be commensurate with the number of isolated villages with predominantly rural economies and the number of working animals present in these villages. As stated before, we are talking about hundreds of millions of animals currently used in transport and tillage.

## An advocacy activity

Draft animals are buffaloes, donkeys, horses, mules, yaks, camels, dromedaries, oxen, and zebu. The rural work is seasonal and then it is possible to consider that the animals are engaged approximately only 120 days per year for an average time of five hours. Michael R. Goe and Robert E. McDowell in the publication "Animal traction Guidelines for Utilization" in Table 16, propose the following data, evaluated for light and heavy animals: horses from 0.6 (light) to 1.3 Hp (heavy), mules from 0.3 to 0.9 Hp, asses from 0.3 to 0.4 Hp, ox from 0.3 to 1.3 Hp, cow from 0.2 to 0.6 Hp, buffalo from 0.5 to 1.1 Hp, camels from 0.5 to 0.9 Hp.

All the above consideration should convince that an advocacy activity should be started in several directions in order to divulgate the potential of the draft animal power for the development of the remote villages of the developing countries.







Figure 3 – Costa Rica 2018

Target of these advocacy campaigns should be, as above said, charities, companies engaged in social responsibility initiatives and NGOs engaged in the field of the cooperation to the development.

### Draft animal power and educational farms

A study is in progress addressing the use of the animal power, in the information processes, in the educational farms.

The proposed project involves the creation and diffusion of training modules to be allocated to the said kind of farms.

The modules will be used to implement procedures (i) of environmental education, (ii) of creating awareness in the fields of energy and climate change, (iii) of diffusing knowledge on issues related to cooperation with the Global South.

The idea is inspired by some activities already carried out in various rural areas in France and the United



Figure 4 – Costa Rica 2018



States (Tillers International and Prommata) and in some research centers in India and South Africa.

The training modules will be carried out according to a linear path that shows the energy cycle through the following stages: solar radiation, chlorophyll photosynthesis, the creation of the vegetable mass, the cultivation of animal feed, the development of the muscular energy of the animals fed by fodder, the animal traction, the use of animal traction also for the generation of electric current and finally, the transformation of the electricity generated by the muscular energy of the animals into mechanical energy for lifting water and grinding grains.

The young people who attend the educational farms, where these training modules are introduced, will thus be able to understand, with easy examples, why almost all the energy used by a person, even fossil energy, derives from solar radiation. Young people will be given the opportunity to understand how the simple movement of a dynamo is able to produce electric current. This will happen thanks to the device moved by animal traction and everything will take place with the same ease and attractiveness of a real equestrian show, but realized with the utmost respect for animal welfare.

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## List of Figures

**Title** (The author with Eschilo, a donkey of Martina Franca breed) – A. Perrone.

**Figure 1-4** – A. Borghese.



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