Improving the supply and distribution of animal traction implements: the thoughts of an inventor

by

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Abstract

This paper is a brief overview of the philosophy and practice of animal traction development, as seen through the eyes of an inventor who, during a 58-year career, has invented more than 200 machines, tools or implements for agriculture. It discusses the two opposing concepts of development—that of industry, or the manufacturer, and that of agriculture, or the farmer. It also addreses issues such as the differences between engineers and inventors; the role of animal intelligence; the development of village workshops; and the part that animal traction can play in the emergence of a modern rural society. Some of the implements invented by the author are described. Many of these were manufactured by the author himself in the countries where they were to be used, his main reason being to show the people of these countries how to make their own tools. This, it is concluded, is the true engine of development: work, not words.

Introduction

"Improving animal traction technology" is the title of this workshop and "Improving the supply and distribution of animal traction implements" is the title of my paper. There is one important word common to both titles, *improving*. This word can mean several things, depending on the context: it does not necessarily mean the same thing for agriculture as it does for industry.

I think I am qualified to speak about both areas, as I have been involved in agriculture for 58 years, in industry for 48 and in tropical agriculture for 42. During that time I have invented more than 200 machines, tools or implements of every kind for agriculture. My career has been unusual, and so I will describe it briefly before developing the theme of my paper.

Personal background

I began my career as a farmer in 1934, when I was 15 years old. I had 120 ha of land which I plowed with 21 draft horses. I expected to remain a farmer all my life, but the advent of the Second World War forced me in another direction. There were many difficulties during the war, one of them being a shortage of labour. To overcome this I designed and built a big potato-digger that enabled me to harvest 10 ha on my own. But in 1945 I was obliged to leave my farm. So I started a new career, in industry. My first job was to improve, supply and distribute the potato harvester I had invented.

My harvester was a great success, so much so that in 1950 I was asked by the French Compagnie générale des oléagineux tropicaux (CGOT) and Secteur expérimental de modernisation agricole (SEMA) to invent another digger for use in Senegal. After the war the industrial revolution had been having an dramatic impact on agriculture in France, and our trusty draft animals were killed to make way for tractors. In Africa, also, CGOT and SEMA cultivated groundnuts using tractors, and displaced many farmers. After four years they realised the error of their ways; they threw out their costly tractors and rediscovered the farmers. It was then that they asked me to invent an agricultural implement for them. I invented a "bullock tractor"—the famous *Polyculteur*.

In 1958 I exhibited my *Polyculteur* with different attachments at the Bambey exhibition (Figure 1). I put a sign next to it that said "The *Polyculteur* affords freedom to African farmers, by enabling them to do their work by themselves". My sign was shocking, because it pointed to the fact that although France was giving African countries political *independence*, it was still trying to maintain African economic *dependence*, particularly by the process of industrialisation, including agricultural industrialisation. I was offering the African farmer an alternative, a means of economic *independence*.

Needless to say, the idea of giving African farmers improved animal-powered technology was immediately rejected by the French politicians. Now we can see the disastrous results of their blind faith in industrialised agriculture. That is why we are here at this workshop, to try to repair the damage that has been caused.

*Jean Nolle died in France on 30 September 1993 at the age of 74. He had proof-read and approved this edited version of his paper

Development philosophies

This workshop is about development. But development of what? Development of agriculture, or development of industry? There is a dilemma here, because developments in industry do not necessarily lead to developments in agriculture. All too often, as industry becomes richer, agriculture becomes poorer; rural areas decline as urban areas expand and spread, often dangerously so. Animal traction can offer a solution to this dilemma. Animal traction technology can revitalise agriculture and the rural economy because it depends on *natural* energy instead of the *artificial* energy that the cities depend on. This is important because right now we are in the midst of the worst war the world has ever known: a war between two energies—artificial energy and natural energy. But I do not want to speak of war and destruction; I want to speak about improvement and development.

Any development project has two main phases:

- fundamental and applied research, leading to *invention*
- refinement of the invention for a specific purpose, followed by its supply, distribution and use.

The improvement process marks the transition between the two phases: then it continues throughout the life of any invention. The inventor, the first manufacturer, the manufacturer's agents—all have a role to play in the cycle of development. Each "actor" makes a different, but vital, contribution to modifying the usefulness and successful application of the original invention. This is as true in the field of animal traction technology as it is in any other human endeavour.

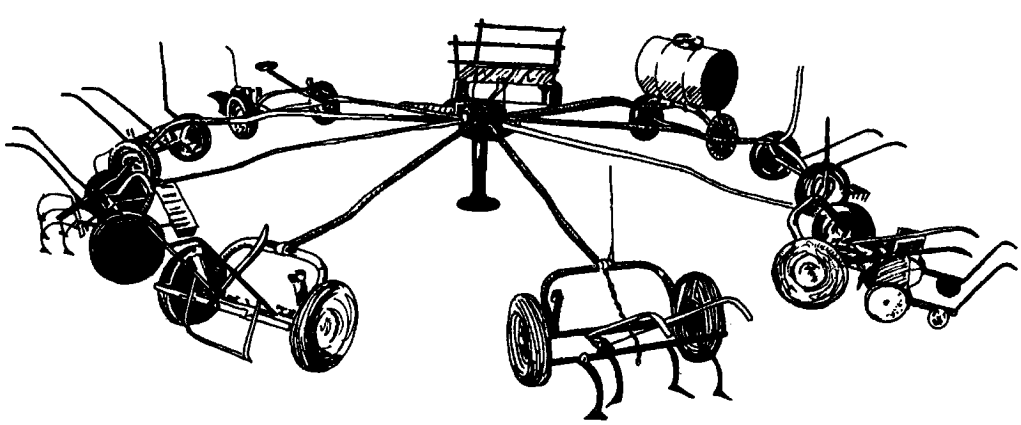
As already mentioned, there are two opposing concepts of development: the agricultural, or farmer's concept; and the industrial, or manufacturer's one.

For farmers, a new agricultural technology is a **means** to an end, the end being a better life, with less pain and drudgery as they go about the task of growing food. But the farmers' livelihood does not depend solely, or even primarily, on the technology itself; the importance of a new technology, machine or implement ranks at the end of a long list of other factors which influence a farmer's work, such as soil, climate, insects, diseases and the market. Farming is hazardous; farmers can never be certain of the results of their work because the forces of nature are involved. Because of this unpredictability, a farmer's thinking is *long-term oriented.*

For a manufacturer, a new agricultural technology is the **end** itself. A manufacturer's job is to make and sell as many products as possible, as quickly as possible and, most importantly, for as much profit as possible. Manufacturers are not concerned with the unpredictable, uncontrollable variables that affect a harvest, and they are the controllers of their own destiny. Because their work is predictable and controllable, their thinking is *short-term oriented.* This conception of life is dangerous as far as protection of life and the environment are concerned, but it makes sense to economists concerned with development, because it involves easily measurable units of productivity and profit.

For us, the simple-minded approach of measuring everything by how much profit can be made is dangerous, because we are concerned with the poorest people in the world—the small, forgotten farmers. How can they fit into such a scheme? How can the welfare of nature and the environment fit into such a scheme?

Figure 1: Artist's impression of the display of Polyculteurs with different attachments at Bambey, Senegal, in 1958



When inventors or first manufacturers are designing their prototypes they pay careful attention to the least detail, to make sure that their products will be accepted by their clients. But after a product has been developed and sold, and the inventor is no longer involved, the manufacturer becomes interested in a new aspect of the product—*"after-sales service"*. From this point, the term *improve* takes on a new significance. For example, manufacturers (or their agents) can make the implement more complicated: thus, while deluding their clients into thinking they are getting a better product, prices, and hence profits, can be increased. Alternatively, they can simplify the implement in order to undercut the competition. More products can be sold and so, again, profits can be increased, but the farmer, or the environment, may suffer.

When an implement is sold far away from the factory, the local government can ask the manufacturer, or agent, to demonstrate its use to farmers. Alternatively, the local government can use its own agents to make the demonstrations. In either case there is a risk that incompetent demonstrators will give farmers a wrong impression of the usefulness of the implement. Demonstrations should only be given by certified officials who understand the implement and its uses under normal and difficult conditions, and who care about their reputation and credibility.

When a local government wants to modify an old implement in order to create a new, improved model, it must be certain that the person it hires for the task is both competent to perform it and aware of the working conditions and practices of the farmers. The fact that such precautions are not always taken is one of the reasons why development is so slow in some countries.

Finally, improvements (in the industrial sense) often do not take into account the philosophy of the farmers. Manufacturers (and their agents) and governments are seduced by the novelty of a new invention because they consider routine hard work as drudgery, as a factor of stagnation in the lives of farmers and in the economy as a whole. But farmers understand that routine means security and they are wary about adopting a new technology and hence possibly jeopardising their security. They are patient, and prepared to wait until the benefits of a new technology have been proved. We, too, must have patience, and be aware of all the consequences of *improvement*, if we are to be successful in our quest to bring about sustainable development.

Animal issues

Implements are only one part of animal traction technology. Much more important are the animals used to pull or operate them. If farmers do not know how to work with animals, there is little point in buying plows or ridgers; the farmers will not pull them themselves! An animal traction development effort must therefore consider the improvement, supply and distribution of draft animals. In the animal context:

- **improve** means training the animals better, working them better, harnessing them better and developing better methods to use them in the fields
- **supply** means providing food for the animals, including storing forage or making silage for use during times of feed scarcity
- **distribute** means providing someone with a draft animal, or establishing breeding programmes to produce animals better suited for work.

How can animals be trained and worked more effectively? Traditional farmers do not know how to do this, and the people who come from developed countries to help them are even less well informed. It is, indeed, a great skill; a person who can control an animal, and make the animal understand what it is expected to do, is extremely clever. It is not my purpose at this workshop to teach animal training. I can, however, relate some anecdotes from my own experience, which may give a taste of working with animals.

In Ecuador I asked farmers: "Who is the most intelligent of the three workers in the field? The plow? The bullocks? Or the farmer?" "The farmer", they replied. When I asked them if they were sure, they did not understand what I meant. So I asked them: "Why do your bullocks raise their heads when pulling your wooden ard plow (*arado de palo*)?" Nobody could answer, so I answered my question myself: "It is because your bullocks are more intelligent than you." "I do not believe that," said Don Modesto. In order to make my point, I held out my hand, horizontally, with my middle and index fingers extended. "Imagine that my middle finger is the pole of your plow and my index finger is the spike," I said. "The angle between them is constant, as with your arado. So, when I raise my middle finger—the pole—the spike rises too, and the plow cuts less deeply. Your bullocks have detected the *effect* and understand the "cause". They know what they are doing. But do you?"

In Senegal, the bullocks lower their heads when pulling the plow. They do so for the same reason, to

reduce their pain. But in Senegal the plow is fitted to the Polyculteur, behind the wheels, so when the bullocks lower their heads the plow rises.

Another day I asked the farmers: "Do you know why the bullocks walk straight when they are attached to the same pole?" No-one knew. The answer is that bullocks have hairs along their bodies and these hairs detect the pole, just like a cat's whiskers can detect a mouse.

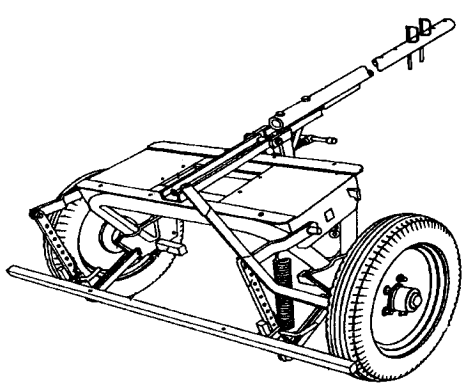
When you watch animals for a long time you can see how intelligent they are. In Lesotho I saw a bullock taking another bullock to feed. He had taken his companion's rope in his mouth and was pulling him towards a plot of grass, just like his master did for him with his hands. Curious, isn't it?

Of course, all animals are perfectly conscious of their environment, more so than we are. Their ears are more acute than ours. A horse knows when a hare is passing around him in a field. Most animals are very sensitive to sound, which is why it is very important to accustom a draft animal (horse or bullock) to the voice of its controller: for example, in the early morning, when rubbing them while they are eating their oats. The voice is an important means for the animal to recognise its controller. When animals hear their controllers, they work hard to please them.

Animal traction and civilisation

Animal traction technology has existed for about 4000 years, and has hardly changed in all that time. My impetus for attempting to introduce a new concept in animal traction technology came when I was in Senegal, in 1954, when CGOT and SEMA realised their mistake in relying on tractors and threw them away. I wrote about that in my book *L'accident de civilization* (Nolle, 1989).

Figure 2: Tropiculteur *toolcarrier invented as a development and improvement of the original* Polyculteur



I do not claim to have revived interest in animal traction, which has continued to provide an important means of producing food crops, with or without my participation. I claim only to have adapted the technology to modern circumstances. All the people who have copied my machines or implements are not thieves but my associates, since they are also working for a new civilisation—a modern rural society.

Only agriculture and animals can save our civilisation, by giving us true self-sufficiency. The tractor is useless for tropical agriculture; it has many more disadvantages than advantages. But it has given me a valuable technological example in my work of designing improved tools for animal traction.

Implement development

As I have explained in my books, of the several hundred implements that I have designed in 38 years, I am especially proud of four. Two are pulled with a chain (*Houe Sine* and *Ariana*) and the other two with a shaft or pole. One implement with a shaft is my *Polynol* which derives from my earlier *Polyculteur* and *Tropiculteur* (Figure 2)

I named my other major invention pulled with a pole the *Kanol*—K as in *Kolba* (an Afghan wooden ard plow) and Nol as part of my name. I chose this name after a thief had copied my *Houe Sine* and named it after himself!

Figure 3: Invention of the Kanol
The Houe Sine *toolbar (A) was combined with the long pole of an ard (B) to form a prototype long-pole toolbar (C). Attachments developed included a plow (D), subsoiler (E) and weeding tines (F). Source: after Nolle (1986)*

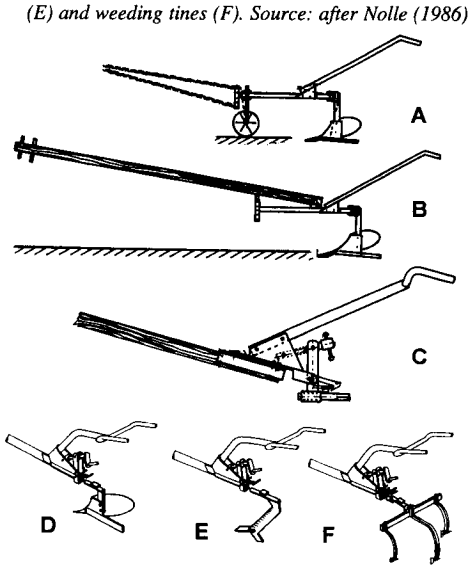


Photo: Jean Nolle

Photo 1: Kanol with "vibrocultor" being tested in Tchad

I invented the Kanol in 1974 when I was in Nicaragua (Figure 3). Since 1985 I have been improving it, little by little, as a result of my experiences in Tunisia, Sumatra, Ecuador and Chad. By working out the improvements myself, I could be sure of the quality of the changes.

The new Kanol is both similar and different to the original design. Similar, because the central part of the toolbar, the *module*, is still an adjustable triangle. Different, because it is quicker and easier to fit numerous tools to the device called the *crochaxe*; this is now made as an "open hole" through which sand and dirt can escape, so that the "peg" easily be fitted or removed by hand, while a specially shaped hook keeps the peg in place. The weight of the central module, including the pole but without tools, is less than 10 kg, so it can easily be carried on the shoulder, even over rough ground. There is no wheel to control the depth, as the adjustable triangle makes it unnecessary

I manufactured the main tools myself on site in various countries (in Chad, for example). I had three main reasons for wanting to manufacture locally:

- to see if it was possible to invent something in various countries
- to improve the implements and adapt them to specific local conditions
- to give an example to the people who lived in the countries. If an old European man is able to produce some metal tools in the tropics, why cannot the young local people do the same themselves. This is the true engine of development: work, not words.

The new implements I made were improved almost immediately. The original plow is now reduced to its body (share and mouldboard). The support is limited to a peg, with a nail on the upper part which can be hooked on the *crochaxe*; all the tools have such a nail, and so can be very quickly fitted onto the adjustable triangle.

I made six implements on location. The people who watched me work can now design and make other new tools themselves.

Implement attachments

In addition to my modifications to the plow, I also adapted the ridger, with the same support, keeping only its share and mouldboard. These are carried by a simple straight body, provided with the standard peg on the top to fix it to the *crochaxe*.

I manufactured a "vibrocultor", a type of cultivator equipped with five special spring tines fitted on the frame—two on the front bar and three on the rear one (Photo 1). Because of the rigid pole, this equipment is perfectly stable; it does not twist when in use. If the central rear tine is removed, the tool can be used as a hoe, the operator straddling the row while working.

For the cultivation of sorghum, millet, cotton or groundnuts, I produced an earthing-up device. This straddles a crop row, and two half ridgers, one on either side, lift the soil around the plants. Earthing-up kills weeds, by burying them (easier than digging them up), and also enables water in the damp soil between the rows to reach the crop roots. Henceforth, the traditional method of hoeing between two rows can be replaced by "hoe-straddling", which is possible whether or not the rows are perfectly parallel.

Subsoilers are well known, but my own design is rather different; it is based on an old broken spring from an abandoned car or lorry, and it can be easily produced by a village blacksmith. The tine is made from a flat spring of 50 x 6 mm or more, and at its lower extremity has a spike that can be made in various sizes, according to the soil conditions. In the future I plan to add two lateral wings to make the implement into a ridger.

I devised a special attachment to enable a donkey to pull a small bicycle trailer. I plan, sometime, to make a bigger one, to be pulled by two bullocks, for transporting manure or compost.

Finally, I invented a special "leveller" that can be used as a harrow or a clod-crusher. It can also be fitted with two or three adjustable fingers under the main blade, and used as a marker for hand-planting various seeds in straight, parallel lines.

Village workshops

While I was working on improving tools, I was also helping village workshops to improve their capabilities, by giving a lot of advice to their managers on how they could face challenges in the future. It will be some time before these village workshops are able to manufacture the hardened steel components of various implements, such as shares, mouldboards, blades, springs, tines, etc. They can produce the frames and various supports for these wearing parts, and they can act as suppliers and distributors of imported parts.

Research and development

After research comes invention. Who invents the machines and their technologies—engineers or inventors? Do not confuse them: engineers and inventors are different, even when their work looks similar.

Engineers are "mercenaries" who work for money or pride. They belongs to the industrial system which is pirating everything—people, animals, forests, soil, water, minerals, even human blood and life itself.

Inventors are "volunteers" who work for their ideas, and consequently do not follow the dictates or values of industry. Invention is a *vocation*, not a *profession*. Inventors, therefore, respect moral values, since they are intuitively in touch with the forces of nature, and are not seduced by money or pride. They feel that real development must be diversified, not selective.

The first people are dangerous to civilisation, howling with the industrial wolves. The second are practically defenceless before such industrial powers, as they are generally alone and nonviolent. The two types represent two forces which are at work in the world: one, driven by greed, attempts to exploit the earth through ruthless industrialism; the other creative in a gentle way that seeks to live in harmony with creation. What will be the outcome of this conflict?

Concluding thoughts

- It is almost incredible that tropical countries still exist, considering their poverty or indebtedness
- It is an incredible fact that the developed countries, too, are sinking into poverty and chaos, despite their outward appearance of opulence and pride
- It is an incredible reality that farmers in the developed countries, having killed all their draft animals, are now sentenced to death by their own economy!
- It is an incredible observation that the developing countries are consequently being led to discover, at last, the value of animal traction to their survival
- But do not over-improve your animal traction technology. Remember that *perfected* is often *rejected* by the proud
- Finally, animal traction technology is now a *job* for you and a *chance* for the future of the world. Do not spoil it. Be serious. Follow your conscience.

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