academicJournals

Vol. 8(49), pp. 6537-6547, 19 December, 2013
DOI: 10.5897/AJAR12.2158
ISSN 1991-637X ©2013 Academic Journals
http://www.academicjournals.org/AJAR

African Journal of Agricultural Research

Full Length Research Paper

Can design improve the agricultural work conditions in the developing countries? A study based in the development of an animal traction seeder

Eduardo Romeiro Filho* and Aline Capanema Barros

Industrial Engineering Departament, Universidade Federal de Minas Gerais, Integrated Laboratory of Design and Product Engineering, Escola de Engenharia, bloco 1, sala 3104, Av. Presidente Antônio Carlos, 6627 - Campus Pampulha, 31270-901 - Belo Horizonte – MG, Brazil.

Accepted 4 December, 2013

This paper presents a study conducted as a part of development of an animal traction seeder machine, using principles related to disciplines such as usability, Ergonomics Work Assessment (EWA) and Antropotechnology, in a perspective of Design for Sustainability (DfS) and product development suitable for the Base of the Pyramid (BoP). The study provided information for a series of design changes to be introduced in the equipment, in order to improvement of working conditions in small family farming properties. From this approach analysis on an existing implement, are suggested ways to adaquate the product and presented a proposal for a new animal traction seeder machine.

Key words: Design for sustainability, base of the pyramid, ergonomics work assessment.

INTRODUCTION

Human labour is still the main source of energy used in agricultural work in developing countries (Jafry and O'Neill, 2000). It is also responsible for approximately half of the cultivated area in the world (Ramaswamy, 1994). In developing countries like Brazil and others in Latin America, Africa and Asia, there is a need to create sustainable ways of development and income generation for the “Bottom of the Pyramid” (Prahalad, 2009) people. Employ improvement in rural areas, through the incentive to family farming on small farms, is a much used alternative and represents a potential increase in food production.

In Brazil, family farming produces 87% of manioc, 70% of beans, 46% of corn, 38% of coffe, 34% of rice and 21% of wheat (IBGE, 2006). However, it is important to highlight the specific features of this kind of farming, such as the restriction to investment on equipment and limited access to formal education that often undermines the use of more sophisticated technologies. In small farms like these, agricultural machinery with low cost and technological adequacy that makes it easy to be operated by the farmer is essential. In these cases, machinery moved by animal traction is a good alternative to the one using machanical traction, since it uses renewable resources, the implementation costs are usually low and it does not need a sophisticated technical system. In the mid-1990’s draft animals saved the equivalent to US$ 6 billion in fossil fuel with more than 300 million animals used (Wilson, 2003).

In Mexico alone, over 3,765,000 animals are used in agriculture (Ortiz-Laurel and Rössel, 2007). The tools and implements for animal traction available in the Brazilian Market, however, are characterized mainly by outdated technological solutions and design (Araújo et al., 1999),

*Corresponding author. E-mail: romeiro@ufmg.br, romeiro@dep.ufmg.br, Tel: +55 31 3409 4892. Fax: +55 31 3409 4888.

as is the case of planters (Figure 1).

The Brazilian industry of agricultural machinary is of great importance to the country and to its export potential. Nevertheless, it still lacks a system of systematized product development (Romano et al., 2005) and provides an opportunity for the application of new design tools and approaches that take into account the need for new solutions that fit the characteristics of small producers, ensuring standards of efficiency and financial return to the investment made in an appropriate period of time. Furthermore, the focus should be on the user of the equipment. Therefore, aspects of safety, comfort and efficiency should always be considered, using principles of ergonomics and industrial design.

From the foregoing, this paper aims to present a case of development of a fertilizer seeder powered by animal traction from an approach that considers the principles of usability, Ergonomics and Anthropotechnology, with views to suitability for agriculture sustainable and its application in small properties, characteristics of the Base of the Pyramid (Prahalad and Hart, 2002).

This study was developed based on design of a "chassis to keep implements", built in Brazil by IAC - Agronomic Institute of Campinas, and described by Peche Filho et al. (1987) with the objective of providing to the small farmer a model of low cost animal traction equipment (Figure 2). The target proposal was a modular product: starting from a common base (the chassis), a variety of tools could be coupled to meet diverse demands that emerge from different methods and phases of farming. In this way, solutions have been developed for plows, cultivators, fertilizer and planter (which were the basis for this study). The technical system used as a basis for the design of the new drill seeder was also developed by the IAC (Figure 3).

The choice for the planter comes from the fact that it presents a series of problems related to use, such as postural needs resulting from the weight of the equipment and the need for balance during movement (the deposits modify the center of gravity of the machine). Add to that the constant flow of information related to the conducting of the animal, the ground conditions, the speed and direction of the trajectory as well as the operation of the input-output system of seeds and fertilizer. Finally, the fact that they are no technically updated, low cost and suitable for small farmers' equipment available in Brazil was crucial for the choice.

Demand for better product-user interfaces

Although the term UCD has greater application in the field of software engineering, its principles can be applied to any device or product, in studies of human-computer interface (Nielsen, 1993). This is done by recognizing the importance of users, their needs, capabilities and limitations, and the contexts in which they will relate to the product. It is also important to bear in mind that UCD represents not only techniques, methods, processes and procedures to design products and "usable" systems, but mainly the philosophy that puts the user at the center of the design process (Rubin, 1994). In this aspect, Ergonomics and Usability can be considered important concepts in a vision of UCD. Adler and Winograd (1992) define usability as the ability of a product or device to take advantage of the skills of its users, working effectively in a given range of real work situations, going accordingly to the principles adopted in ergonomics. Although they can not be regarded as similar disciplines both can be incorporated into a design perspective that brings the user as a central concern in a real situation activity with the product.

In this study, factors related to anthropotechnology are also considered relevant (Wisner, 1985, 1997; Geslin, 2004), once they evaluate the impacts resulting from the transfer of technology between different regions, either by its geographical features, economic, social or cultural. In the case of agricultural labour this aspect becomes even more important in view of the differences in education, tradition, conditions of use and technical knowledge among farmers. When developing a technical solution (or set of solutions) one should take these factors into account, together with an "Anthropotechnological" approach.

Nowadays, among the various fields dedicated to improving the product-user interface, usability is perhaps one of the most widely used that can provide results in this sense. Nielsen (1993) states that this approach is possible for any object, product, system, or service used by humans which have potential problems in their use and that they should be subjected to some form of "Usability Engineering". Despite the fact that in the literature review there were more references about studies related to the product-user interface for software development, studies devoted to equipment, durable and capital capital, such as equipment for power transmission (Costa, 2006), CNC milling machines (Shinno, 2002), electric screwdrivers (Freund et al., 2000) and medical equipment (Rose et al., 2005; Carrol et al., 2002; Garmer et al., 2004; Liu and Osvalder, 2004), were also collected. Data from literature suggest that despite these equipment operators receive training, the application of methods to improve the usability of these products is appropriate and beneficial to its design and to its users.

In this case, the application of principles of Ergonomics in developing technical solutions is especially recommended, either in a human-centered approach (Dreyfuss, 2001), to the physiological aspects of labour (Kroemer and Gradjean, 2005; Iida, 2005) or to human factors (Nemeth, 2004). Methodologies of participatory nature are also mentioned as useful in developing appropriate solutions to the rural environment (Kogi, 2006), especially in industrially underdeveloped countries (Jafry and O'Neill, 2000). In addition, Ergonomic Work

Figure 1. Example planter produced by John Deere in the 1920s (above), very similar to those currently available on the market (below). Source: author's file and http://www.marchesan.com.br

Assessement (EWA) (Guérin et al., 2001; Wisner, 1987) can provide interesting opportunities and contributions to the development of agricultural equipment (Cerf and Sagory, 2004). While the farmers are (in the situation assessed) the owners of the means of production, the forms of work organization (in particular those related to the "optimal time" for planting) are influenced by factors beyond their control in a much more evident way from that of the work performed in factories, for example.

Moreover, it is natural for technology (as well as organizational structures) from certain countries not to be easily adaptable to others, as stated by Wisner (1985, 1987) in his studies related to anthropotechnology. Shahnavaz (1991) includes in this assessment an approach that is more closely linked to human factors and to impacts of technology transfer between countries of different levels of development.

Several experiments demonstrate that when a technology designed for a certain reality is transferred to another, in a different context, it must undergo significant changes in order to adapt itself to the conditions peculiar to the region it is taken to and to its people. Each population has its own culture and traditions, different levels of formal education, technological expertise and production methods. Therefore, each one requires unique technical solutions, developted for its own reality. This problem is even more severe in agriculture, where climatic, geographic and cultivars influence directly the adequacy (or not) of imported technologies. Within a single country there may be large regional diferences, including different ethnic groups, which is the case of Brazil that should be considered in the design, planning and implementation of technologies. The issue, in these cases, lies in investigating the real situation of rural

Figure 2. Prototype of the "chassis to keep implements" in field studies. (Source: author’s file).

Figure 3. Prototype of a mechanical traction seeder. Both developed by IAC - Agronomic Institute of Campinas. (Source: author’s file).

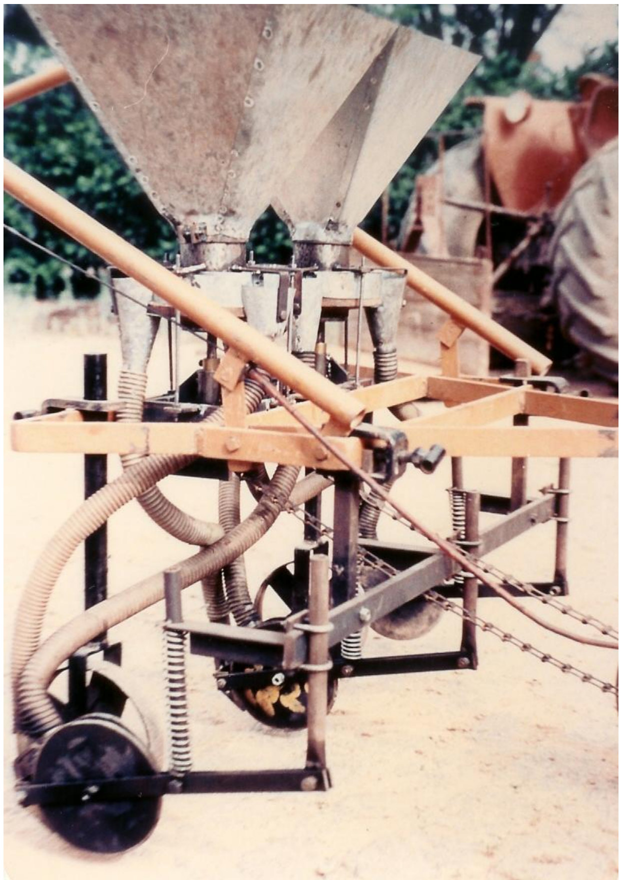

Figure 4. Prototype of the planter built by IAC, coupled to the chassis to keep implements. (Source: author's file).

labour including variables not normally foreseen by the designers, such as using situations in bad conditions or maintenance restrictions, common situation in developing countries. Thus, a user-oriented approach aims to contribute to the research of real situations of equipment use, providing new elements to the project team.

Animal traction

Animal traction was adopted as a parameter in this study because it is of great importance to the development of agriculture, especially in small and medium farms in pioneer or with unfavorable topography regions (Pereira et al., 2010). This indicates that there is great potential for using this form of energy, which is a segment that lacks catering from implemente factories, more focused on the development of equipment suitable for use in large properties.

Despite the economical and technical constraints to the use of animal power, it presents significant advantages which deserve to be addressed: it is an abundant source of renewable, decentralized and mobile energy which does not depend on inputs (such as fuel) or imported equipment that entail external dependency. The investment cost is low when compared to alternative technologies, such as mechanical tractor which is not accessible to most smallholder farmers in different regions of the world. Furthermore, it lends itself to be used in sloping areas where mechanization is not appropriate. Also the employ generation is much larger in comparison to the moto-mechanization. It is an important factor to be considered where there is large availability of skilled workforce in need to generate income.

Finally, the use of animal traction as an energy source in establishments served only by human strength is undoubtedly a substantial technological progress and a large gain in productivity. Moreover, there is an undeniable improvement in the working conditions of the farmer from the use of this type of traction, since much of the physical effort is transferred to the animal.

RESEARCH METHODOLOGY

The first phase of the study consisted of free (non-systematic) observation, which is a step of the EWA method (Guérin et al., 2001; Béguin and Daniellou, 2004). These observations showed that the variables relevant for understanding the activity were offset, posture, information taking and gaze direction, which was verified on detailed observations. In fact, subsequent observations, as well as consulted references (Santos, 1986) demonstrated that monitoring the flow of seed and fertilizer is essential to the satisfactory completion of the proposed task. Therefore, it was decided that the most appropriate location for the driver would be behind the mechanism of the planter so that the continuous monitoring of machine operation was made possible.

In order to design the new seeder using a user centered approach, several observations in field were performed (Figure 2) and the chassis was used in other applications (such as spring cultivators) over about a month, once the seeder prototype had not been built. In addition, the main features (technical and dimensional) of some of the animal traction seeders available in the Brazilian market were identified and their use in planting was also accompanied by the research group. Given the fact that the conditions of use of planters have very different characteristics from those observed in other stages of the cultivation process, a literature review on the topic was conducted, especially on postural needs and information taking in agricultural equipment. This was especially important in view of the fact that the project was conducted from the adaptation of a technical system originally developed for mechanical traction (Figure 3) to animal traction. A prototype of the seeder was built, but only to evaluate how the proposed technical system would work (Figure 4).

The ergonomics approach (particularly EWA) requires a detailed analysis of the activity in the real situation held from field observations. However, there was no previous situation of seeder use in such chassis (wider than other models on the market). The project included the use of the seeder on two rows, which made the machine more stable than the existing ones that work only on one row. The research for similars in the market did not indentify any seeder with such characteristics. The intervention configures itself in this way, in an approach lying among those labeled by Iida (2005) as "ergonomic correction" (since it was an adequacy of the existing chassis) and "ergonomic design" (since the seeder presented several unprecedented aspects in relation to others on the market).

In this case, the ergonomic approach was complemented by some tools adapted from those described in ISO standards 18529 and 13407 (Human-Centred Design Process for Interactive Systems, 1999): Watching users; Questionnaires, Interviews and Evaluation Expert. The way of applying questionnaires differed from the interviews and verbalizations provided in EWA. The questions were directed to researchers (in this case considered "experts") and sought to address technical issues related to the use of equipment such as the compatibility of different planting systems on the use of a system of soil beading, which would eventually interfere with the effort required and the "optimal" period for planting. Thus, it was possible to build an information base that served to the construction of the situation addressed in the project in various ways.

As an essential element to complement the approach, a literature review on the implications of technology transfer between different realities was used so that anthropotechnology would be incorporated as "design philosophy" to the technical solution development process. This aspect proved to be essential to product acceptance by target users, emphasizing the importance of the adequacy of the final solution to the different realities found in the Brazilian countryside. In this case, once again, using questionnaires sent to researchers proved to be relevant to the development of the new machine. Finally, for the dimensioning of machine controls and determination of viewing angles needed to take the necessary information to work activity, anthropometric tables available, such as Dreyfuss (2001) and Ferreira (1988), were used.

RESULTS AND DISCUSSION

Seeder machine

For the development of the animal traction seeder it is essential to consider the real needs of the users and topographical, climatic, demographic, cultural and sociological data from each region. Failing to do that, one would not be able to adequately transfer and spread the new solution, especially when it comes to technologies related to rural areas, traditionally more conservative. When considering the implementation of agricultural animal traction equipment in several regions of Brazil, it should be considered that:

(i) The existence of different levels of competence between populations (some workers more familiar to mechanical aspects than others, some illiterate, some more qualified to training different animal species) can lead to the development of different education processes, in order to satisfactorily meet the needs of the various groups;
(ii) Geographic differences, different soil types, terrain characteristics, can cause some equipment to be much more accepted and have a better performance in one region than in another;
(iii) Climate differences can result in a specific labour organization (number of breaks, resting periods) for each situation. In areas where the worker is exposed to higher temperatures, heavier equipment that may demand a greater physical strain from the farmer can present major drawbacks in relation to its acceptance among users;
(iv) Demographic differences (availability of workforce), existing means of communication, access to training programs may require a couple of operators to drive the equipment and animals rather than a single person. Moreover, the animal (or animals) used may require a second person to direct it.

In addition, other factors influence in the increase in labour costs with animal traction (Santos, 1986):

(i) The weather and its variations;
(ii) The time constraints (deadlines to perform work due to the optimal condition of the physical environment, harvest periods);
(iii) The physical effort required by the equipment, and the postures necessary to get information;
(iv) The animal used (and therefore the speed and traction force) and operating conditions that require more physical exertion by the operator (eg arched ground, stone, etc.);
(v) The difficult maneuvers imposed to the end of the lines by certain equipment and the use of joints of animals;
(vi) The experience and competence of the operators (during the learning phase of operation of the new machine he may have a greater energy expenditure).

Issue of fatigue

Fatigue can be considered as a reversible decrease in functional capacity of an organ or a body as a result of an activity (Iida, 2005). It can usually be retrieved after a period of rest or a pause. The concept of fatigue includes both objective reduction of the capacity of the neuromuscular mechanisms, regarding subjective feelings of discomfort and tiredness. In the rural workers situation, when using the animal traction planter, the fatigue comes primarily of certain factors as mentioned below:

(i) Efforts to stabilize the machine, since the conventional seeder of only one row, are quite high, which makes them very unstable. Even when they are still, it is often difficult to keep them standing. This is an item that requires constant attention and effort by the operator, at the risk of tipping the machine;
(ii) Performing maneuvers at the end of each crop row. The machine should have its back raised and rotate 180 degrees on the front wheel. When there is use of a pair of bulls this work is even more difficult, given the specific characteristics of these animals. If one takes into consideration the weight of these machines, which reaches seventy pounds being empty, one will have an idea of the effort involved;
(iii) Lifting of machine to remove the straw from the planting device when there is straw accumulation;
(iv) Corrections of the trajectory of the machine with stabilization. The operator must also be aware of the

trajectory taken by the machine, having to constantly make corrections to maintain the quality of work and the parallelism of the rows;
(v) Supplying of deposits of seeds and fertilizer, performed several times per hectare, according to seed size and / or density of planting. The farmer takes to the field several bags of seeds, leaving them at strategic points to refuel the machine at the right time.

Postural aspect

In terms of evaluating the activity, posture assumes a central role once it is an easily observable variable (Guérin et al., 2001) and is directly related to the needs of the activity, such as applying forces and taking information that is relevant to the development of the work. Harris (1982) and Iida (2005) analyze the changes after the application of mechanical traction systems in agriculture.

Reversing the position of the farmer (now placed in front of the implement) leads to the need for continuous twisting of the torso in order to follow the evolution of cultivation by the implement pulled by tractor. This is inadequate, since the action of the implement in the ground is an essential source of information, needed so that the task is conducted appropriately. Even in old advertisements, dating from the early twentieth century, the animal traction planters in two or more rows predicted that the farmer should be sitting on the equipment.

Based on the EWA with the seeder, one can see that the positions taken during the work of seeding denote the importance of control of the output seed tank by the operator. As consequence of the visual exploration required performing the seeding, the operator of the seeder (positioned behind the implement) assumes a forward leaning posture for more than 50% of the working time. It was found that the operator controls continuously the output of seeds and every ten minutes, on average, checks the level of seeds in storage.

Another important finding regarding the posture is the position of the handlebars (instruments of handle of the operator in animal traction implements), not always allowing adjustments in height and / or width appropriate. Its adequate design could greatly reduce postural costs to the operator.

Recommendations for improving the equipment

It is necessery to improve the equipment so as to increase their performance and provide users with better work conditions. The user must, always when possible, work in the adequate posture without making excessive effort and with good visibility to control the animal traction system. The new designs of agricultural animal traction equipment should also:

(i) Improve the design of the implement so that it can "pivot" and facilitate the maneuvers, great sources of energy expenditure;
(ii) Simplify and improve the regulation systems of the machine, so the maintenance is performed more quickly and efficiently;
(iii) Prioritize and facilitate access to forms of information necessary for developing their strategies (e.g. seed output area). In these cases, the evaluation of the operator on the results achieved by the equipment is essential to the development of the activity;
(iv) Develop implements elements incorporated from the farmer's "know-how", so that they can be better adapted and more accepted by the farmers;
(v) Develop alternative technical solutions in order to meet different demands made by different users. In this case, the design of a common base (chassis) allows a form of "modular design," reducing the costs of production and broadcast of equipment. Thus making it widely adaptable to regional differences or even the characteristics of each farmer.

In addition to this, other improvements can be introduced in the agricultural activities in terms of education, extension services and work organization:

(i) Enable suppliers of equipment, whether private or public companies (as extension services), to diagnose technical (and dimensional) solutions most appropriate to each farmer, based on the concept of modularity of the implements attached to the chassis;
(ii) Disseminate new agricultural techniques to farmers, so that they have a greater amount of options for developing their work, using cultivars or varieties that allow, for example, a longer growing season;
(iii) Disseminate operation manuals of the machines to operators (these should be adequate so as to used satisfactorily even by the illiterate).
(iv) Avoid work during the hottest hours of the day, whether through forms of work organization such as the adoption of cultivars (or varieties) that allow a longer period of planting;
(v) Inform farmers not only the logic of machine usage, but also the logic of its mechanical operation, enabling them to diagnose faults and perform minor repairs on the equipment in the field.

Starting of the proposed design from a seeder originally concepted for use with mechanical traction (Figure 3), a more compact and lightweight version was built to be coupled in the original chassis (Figure 4). However, a prototype with the proposed features based on the study for field tests in real situation was not built. In its place, a model with the proposed changes was developed (Figure 5). Although this is a limitation to the evaluation of the study results, interesting changes in the design can be observed in order to make the equipment more suited to real work situations in the field, considering the different components of the workload (e.g. the physical effort in the seedering activities, cognitive and psychic aspects

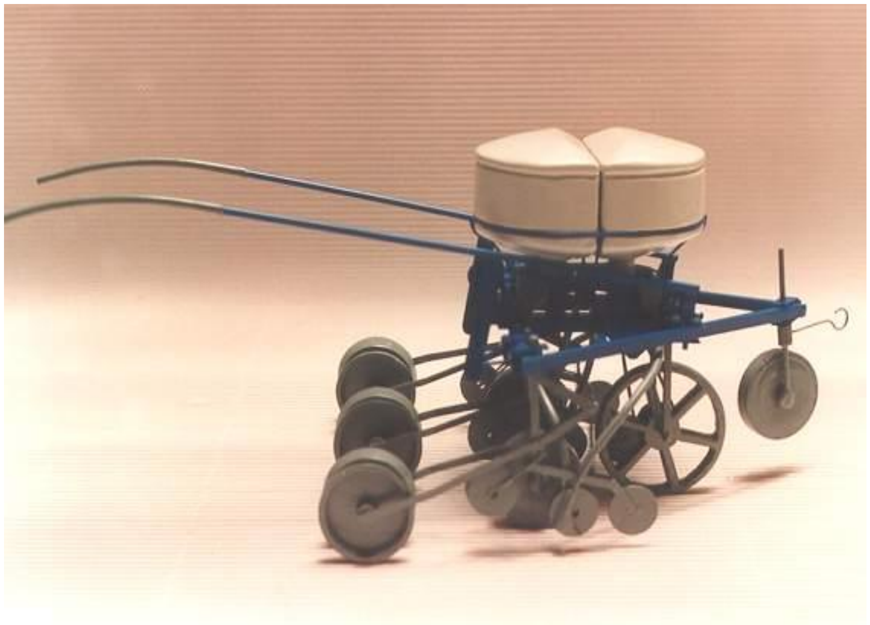

Figure 5. Model of the equipment after the proposed changes. (Source: author's file).

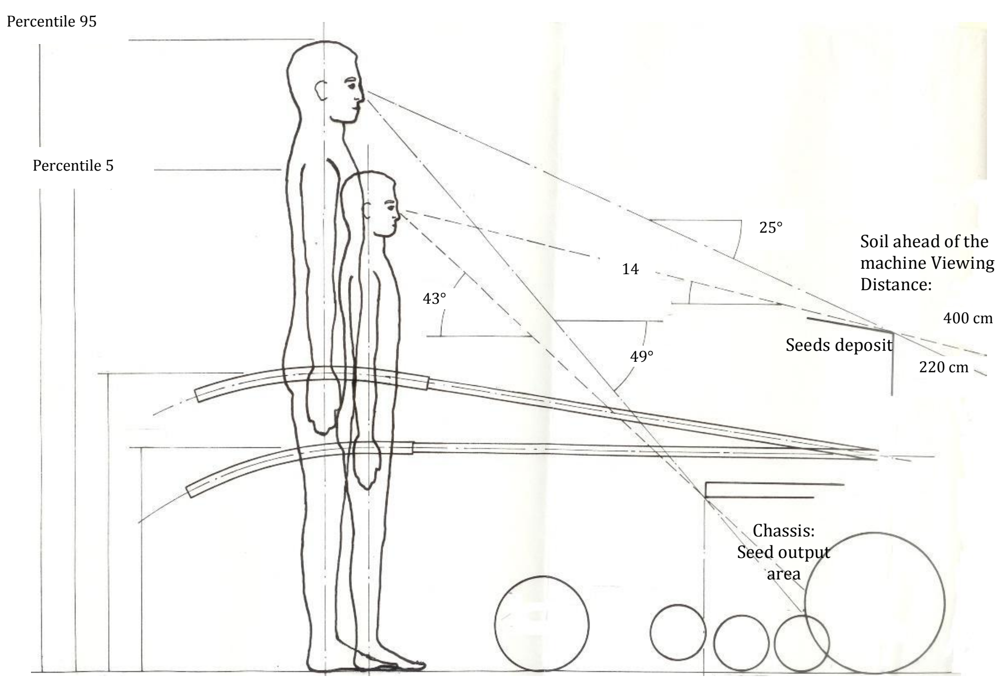

Figure 6. Schematic drawing of the result of applying some principles of dimensioning to percentiles ranging from 5 to 95%. Dimensions defined based on Dreyfuss (2001) and Ferreira (1988).

related to work, as observation of the seed output area and seeding preparation).

As an example for reducing the physical load component the size and the curvature of the handlebars, aiming at a comfortable grip in extreme situations (Figure 6), deserve attention. Handlebars that are longer than traditional ones were proposed. This allows maneuvering and shifts in equipment direction to be more easily made.

The use of two or three planting rows also gives more stability to the product, further decreasing the effort of the user. The longer handlebars also allow a better and continuous monitoring of work performed, without further postural efforts. The diameter adopted for handle was 25 mm (defined based on Dreyfuss, 2001), considering the use of rubber coverage.

An important aspect of the cognitive component of the work is that the farmer has continuous access to information related to the equipment operation and to planting conditions. Bearing in mind the total height of the seeds deposit, are considered the taking of information from the seeds outlets and soil viewing distance in front of the machine. In this particular case an important issue was raised, because the view in front of the machine is reduced as the height of the conductor decreases. Moreover, one should consider the existence of a traction animal, which would make it impossible for the operator to see the ground ahead of the machine. Although it may lead to a greater physical expenditure, it was decided to keep the user in his traditional work posture, standing behind the planter. This decision can be justified by the small area of cultivation planned for the use of the machine.

Considering some specific characteristics of the product development, some data could not be collected in order to bring statistical conclusive results. However, is possible to compare qualitatively the design solution with some of the traditional seeders found in Brazil. Although it has not been built the final prototype of the machine, it is expected that their weight is between 70 and 80 kg, which is compatible with other existing models as described in Almeida et al. (2002) and Almeida and Silva (1999). Aspects such as travel speed and number of seeds should vary according to the culture, topography and animal adopted, but also a function of operator experience and their physical and cognitive conditions. Regarding the developed model, the first observations demonstrate that simultaneous use of two planting lines becomes seeder more stable, which reduces the effort of driving. On the other hand, the ends of line maneuvers become more complex, requiring (as observed in the field) more space to revolution than the traditional equipment, and a finer degree of attention by the operator. Moreover, it is expected that learning about the new technology may facilitate such operation.

Finally, the mechanical aspects of the implement should be taken into account for a greater adequacy to the user. The use of less vulnerable to bushing cropping systems (accumulation of straw and crop residues in the planting system) facilitates the planting operation and reduces operator effort, once it reduces the need for cleaning the machine, shortens the time and facilitates the intire planting process. This will ultimately bring benefits to the workload. In addition, the adoption of simple mechanical systems allows for easier diffusion of the implement, since a larger number of farmers will be able to understand it and use it easily.

Conclusions

Based on the literature review and observations made during the field research as well as interviews with technicians and farmers, a number of suggestions for improving a model of animal traction seeder were presented. The objective was to adress the largest possible number recommendations for meeting the needs of the users and minimizing their substantial workload. For a long time, because of greater financial return and government policies of incentive, manufacturers concentrated their efforts on the development of implements for large farms, making the technology intended for small production remains stagnated. It is therefore the opportunity for improvement of these devices. However, we tried to emphasize here that the cultural, social, geographic and economic differences between regions and the diversity of cultivars and climate lead to the need for developing technical solutions to very peculiar characteristics, so as to satisfactorily cater for the existing conditions.

It should be emphasized that this work was centered on the presentation of opportunities for applying UCD principles in the design of agricultural machinery, and not the improvement of mechanical planting. This is a challenge that also depends on other product design tools such as ways of design for modularity. Starting from a basic chassis numerous technical and usability solutions that may be suited to the different conditions observed, as well as to the different features of the users, can be developed. Using a modular product system the costs of production and acquisition would be reduced, while the rural extension services could be responsible for guiding farmers on the best options available in every situation. It would thus be possible to build appropriate solutions to regional differences in terms of climate, terrain, culture and needs even with respect to the different characteristics of users.

In the case presented the choice of an animal traction machine is mainly due to a larger number of variables involved, as professionals involved with mechanical traction machines usually have (or should have) specific training for the task. Therefore, it is believed that in the case of animal traction there is greater relevance of traditional knowledge, not formal, connected to the farmer's experience. This eventually made the research more robust and rich in its results. Design principles can and should be applied to the development of any technical solution linked to rural activity, whether in small properties with strong technical and / or financial constraints or in large enterprises.

It is noteworthy that the main contribution of the study presented focuses on a theoretical approach to the problem and on the proposal of recommendations based on (1) literature review and (2) observations of the use of other implements in field. These contributed to the preparation of a technical solution that would incorporate the features of the proposed adaptation to users and would meet the conditions observed in the field. However, it was not possible to build a complete prototype of the seeder based on the suggestions for improvements. This makes it impossible to compare the results obtained in terms of, for example, reduction of time or physical effort required for the various operations in planting, or more qualitative assessments, such as the perception of comfort by users in a real situation of machine usage compared to other implements of similar function.

It is important to note that the approach used and the results suggested show that the development of agricultural implements intended for small farmers is suitable. In a user centered approach there are, therefore, several aspects that must be analyzed before a project linked to the agriculture. This should consider specific aspects of rural life and work, which differ widely in relation to urban work environment, which is usually studied by ergonomics. The number of variables applied to rural work, related to climatic, geographic and cultivars factors, for example, makes the assessment become more complex, requiring specific strategies and methodological tools in the search for technical solutions that meet the needs of the sector. Applying this approach in the design of agricultural machinery can contribute to the solution of various demands of the field and the improvement of working and life conditions of the rural population.

ACKNOWLEDGEMENT

The authors would like to thank the staff of the Section of Harvesting Machine and Processing of Agricultural Products Division of Agricultural Engineering of the Agronomic Institute of Campinas, through Dr. Claudio Alves Moreira, without whom it would have been impossible to accomplish this work.

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