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Operational problems and accidents in agricultural machinery

G. SENTHIL KUMARAN, V.J.F. KUMAR AND K. KATHIRVEL
Deparment of Farm Machinery, Tamil Nadu Agrl. University, Coimbatore - 641 003, Tamil Nadu

Abstract: A survey was conducted to collect the information on the ergonomical and other problems experienced by the farmers and the agricultural workers of Madurai, Theni and Kanyakumari districts of Tamil Nadu in using agricultural tools and machinery during various agricultural operations. Three types of questionnaire were prepared and 25 farmers/agricultural workers were interviewed from one village each from the districts. The villages were selected based on the highest usage of agricultural tools and machinery in the respective district. It was concluded that the tractor operation has problem of vibration which resulted in stomach and back pain. The problem of posture and operation control were not felt by the operators. The tractor accidents were due to lack of training and ignorance of operators. The farmers have no major problems of using animal drawn and power operated implements. The hand tools resulted more stress on neck, arms, back and hands of the operator. The accidents involved in operating the hand tools were due to poor design and ignorance of the user.

Key words : Ergonomics, accidents, tools, machinery, problems)

Introduction

Ergonomics is the scientific study of the interrelationship between the man, machine and environment. By applying the science of ergonomics, the tools are designed to reduce the fatigue of operators. Thereby it increases the working efficiency of the machine and productivity. It helps to avoid the accidents due to poor design, enhances the safety and comfort. At present the human engineering principles are used in the industrial field and defense field. It was found to be so useful to increase the working efficiency and the worker's comfort and safety. But in agriculture, the human engineering application is so little. The tools which are not properly designed cause fatigue during its operation. Accidents are very common during the use of implements in various agricultural operations due to ignorance, lack of knowledge about the operation and improper design of tools and implements. To collect information on the present situation, a survey was conducted during May, 2000 among farmers and workers in Madurai, Theni and Kanyakumari districts of Tamil nadu regarding the use of tools, tractors, power tillers and their implements, their safety and comfort involved. The results of the survey was used to list out the problems and to suggest improvement in the design of tools and other implements.

Materials and Methods

Village Selection

The district wise availability of agricultural machinery and implements for all the districts of Tamil Nadu state were collected from the Directorate of Statistics and Economics, Chennai. Two predominant districts representing the southern zone and one district from high rainfall zone of the state were chosen. In each of the selected districts, the blockwise and villagewise availability of agricultural machinery and implements were collected from the Assistant Directorate of Statistics and Block Statistics Inspectors respectively. Three villages were selected from the above said districts such that they use agricultural machinery extensively for various operations in crop production and processing activities. The district, block and villages selected for this study are furnished in Table 1.

ethod of survey

The survey on ergonomical problems such man-machine-environment incompatibility, fety and health hazards to workers in agricultural d allied activities was carried out from the rmers and farm workers. Three types of estionnaires were prepared namely Part-I. Village vel Information, Part-II Information from e Farmer/Labourer and Part-III Machinery-ise Proforma. The survey work was conducted the selected villages. In each village 25 rmers/farm workers were selected randomly. hey were interviewed in person using the ove questionnaires.

esults and Discussion

The survey data were analysed to identify e extent of usage of different farm implements nd the drudgery involved, causes and kinds f accidents.

ractor/power tiller operated equipment

It is inferred that the tractor is the main ower source for tillage and transport in agriculture n Thamaraikulam village. In other villages amely Thazhakudi and Kumaram, animal, tractor nd self propelled power sources are used (Fig.1). n all the villages, the attachments prevalently sed with the tractor are trailor, cultivator and isc plough. Use of other attachments are negligible.

Majority of the tractor operators are adopting twisted/awkward posture sometimes during the operation of tractor (Fig.2). About 83.23% of operators responded that road marching of tractor gave a lot of jerk followed by primary and secondary tillage (Fig.3 and Fig.4). During tractor operation, 54.6% operators felt pain in stomach, back and buttock and 45.4% operators felt pain on other parts of the body (Fig.5). This may be due to vibration in the available tractor in those villages. It is observed that almost all the operators in the three villages had no problem in terms of convenience, positioning and force applied while using different controls of tractor (Fig.6). The vibration study on the tractor may be taken up in solving the body ailment problems of the operators in those villages.

Hand tools / manually operated equipment

Among all the agricultural hand tools, spade, crow bar, hand hoe and sickle were used for earthing up, digging, irrigation channel preparation, weeding and harvesting (Fig.7 and Fig.8). The users felt that the hand tools require heavy or moderate force to work (Fig.9). The usage of hand tools developed pain on the back, arms, neck and hand. Drudgery in operating the hand tools was the major concern in operating hand tools in those villages. The drudgery might be due to either poor design of the tool or wrong posture involved during operation. These factors induce reaction forces in different intensity on various parts of the body namely neck, back or lumbosacral joint, arms and hand during the operation of the tool. The intensity of forces are also dependent on anthropometric parameters of the operator. These forces could be analysed through biomechanical study on various body parts with the help of the tool force, tool parameter and anthropometric

Table 1. Details of district, block and village selected for the study

Agro-climatic zones	District selected	Block selected	Village selected
Southern zone			
Madurai	Madurai	Alanganallur	Kumaram
Theni	Theni	Periakulam	Thamaraikkulam (II)
Heavy rainfall zone			
Kanyakumari	Kanyakumari	Thovalai	Thzakudi

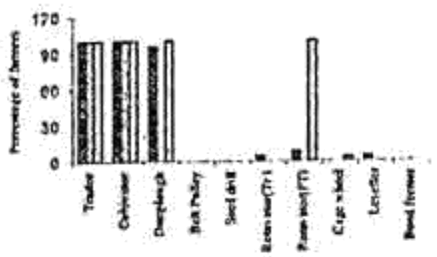

Fig.1. Tractor attachment available with farmers

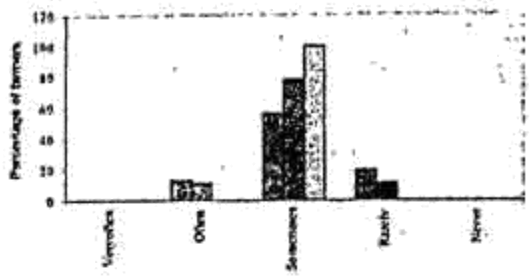

Fig.2. Twist posture needed while driving matter

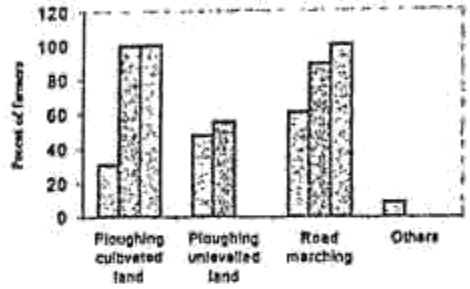

Fig.3. Farm operations done using implements

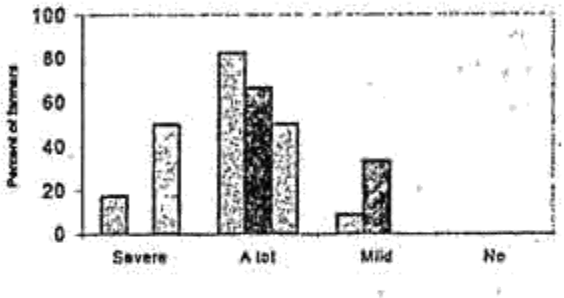

Fig.4. Vibration during tractor driving

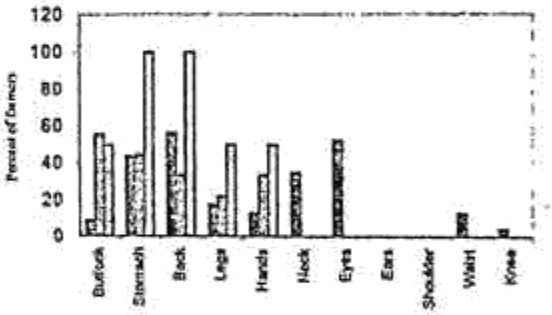

Fig.5. Pain experienced on body parts while driving tractor

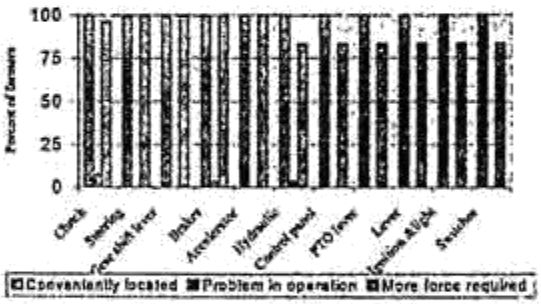

Fig.6. Response regarding various parts of tractor

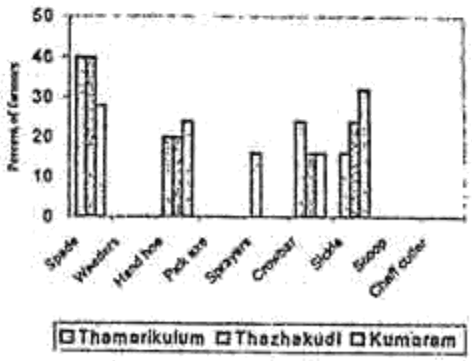

Fig.7. Hand tools available with farmers

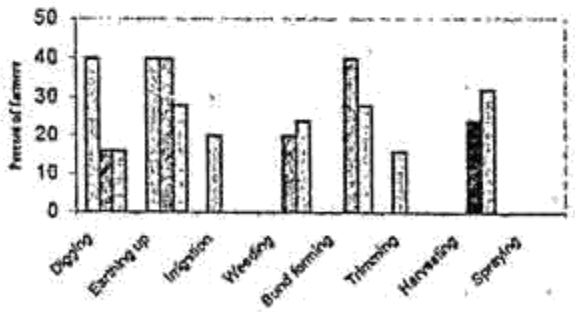

Fig.8. Various operations done by hand tools

parameters of the operator.

Animal drawn equipment

As the tractor was the main power source of Thamaraikulam village, no farmer is using the animal drawn equipment for agricultural operation. In other two villages, country plough

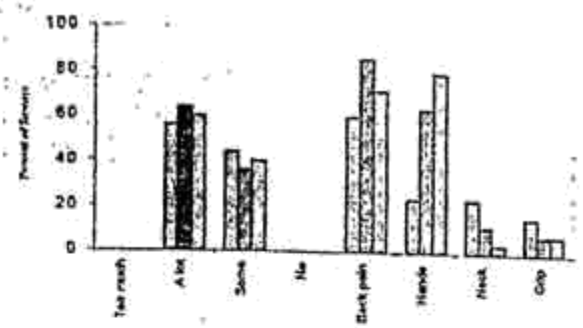

Fig.9. Force required and pain experienced while using hand tools

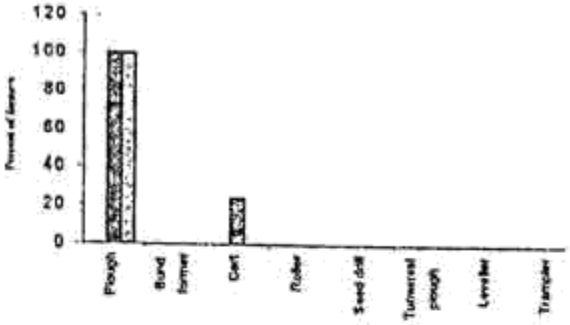

Fig.10. Animal drawn implement

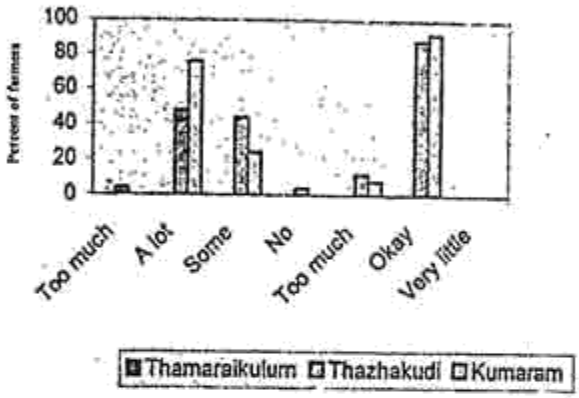

Fig.11. Force required and pain experienced while using animal drawn implement

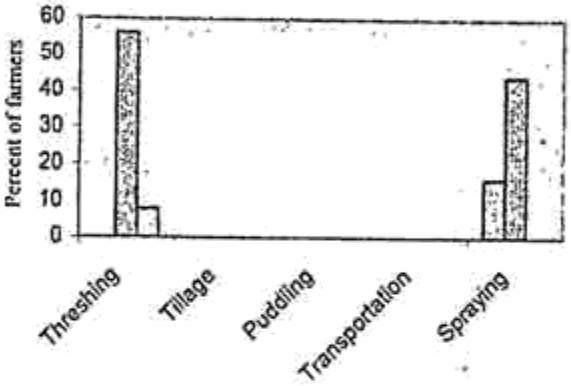

Fig.12. Operations required self propelled implement

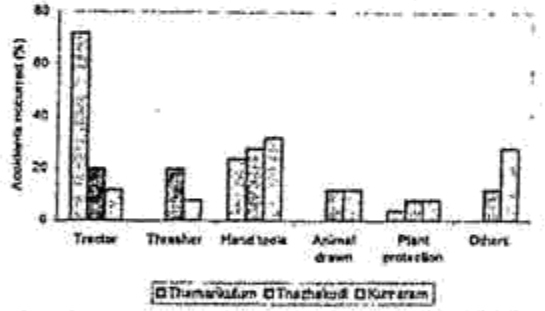

Fig.13. Occurrence of accidents while using tractor and different implements in the villages

was the main animal drawn equipment used for land preparation. A few carts were used for transport (Fig.10). The handle force was not the cause of drudgery in operating animal drawn implements. It might be due to other factors like the anthropometric parameters and soil condition (Fig.11).

Power operated equipments

In Thamarikulam village only power sprayers were used for spraying. About 56% threshers and 44% power sprayers were used in Thzhakudi village and two numbers of threshers were used in Kumaram village (Fig.12). No one had major problems of break down of power operated equipment in Thamarikulam village whereas breaking of cultivator spring and transmission belt in threshers were the major breakdowns faced by the operators in the other two villages. As these were the routine breakdowns, it may be concluded that there were no problems among the users of power operated equipments in the surveyed villages.

Accidents in using machinery

Details of accident in the surveyed villages are presented in Fig.13. The fatal accidents are due to tractor operation and causes like snake bite etc. Among major and minor accidents, tractor and hand tool operations are the main causes. Tractor accidents were mainly overtuning, slip and hit. It clearly showed that the tractor drivers in those villages are not properly trained

or they have lack of knowledge about the safe driving. They may be properly trained in safe tractor driving. The hand tool accidents caused cuts and other small injuries. This may be due to either poor design of hand tools or ignorance of the operators. The design parameters of the hand tools may be studied to improve the safety aspects. Other accident like snake bite, consuming pesticide, fracture while transporting paddy bundles on head etc. could be avoided by adopting safety clothes and carrying proper load on head. The age factor has no significant effect on accidents.

References

Gupta, P.K. *et al.* (1983). Anthropometric surve of Indian farm workers. *Agricultur mechanisation in Asia, Africa and Lat America*, **14**: 27-30.

David J.Oborone (1987). International Reviews Erogonomics, Vol.1: 51-54.

Gite, L.P. (1993). Ergonomics in Indian agricultu - a review. Paper presented in the internation workshop on "Human and draugh anim powered crop protection" held at Harar on January 19-22, 1993.

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