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Farmers'Injuries, Discomfort and Its Use in Design of Agricultural Hand Tools: A Case Study from East Java, Indonesia

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Abstract

Farmers in East Java, Indonesia have opinions of the agricultural hand tools that they wear. In farming activities they get injured due to the use of agricultural equipments. The most injury was in hand. Farmers feel fatigue/discomfort in different levels of their body part when using agricultural tools. Majority of farmers complained to suffer fatigue in upper back (92.8%), mid back (93.6%), and lower back (91.8%), respectively. The third major criteria's design of agricultural hand tools base on survey resulted are be safe, good and fit in hand, and easy to use. The ergonomic evaluation suggests their handle length and diameter to be 12.4 cm and 3.0 cm, respectively.

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Keywords: Injuries; Discomfort; Agricultural Hand Tools

1. Introduction

In Indonesia, it is estimated that about 39.96 million farmers that are engaged in agricultural and allied activities. East Java to Farmer Households constitute the largest number of National Agricultural Households 5.1 million, which is divided into three, namely the Agricultural Household work the land themselves, Farm Household work the land with the wage distribution of agricultural products, and the Agricultural Household work land people paid with money (BPS- Statistics Indonesia, 2013). Helkamp & Lundstrom (2002) stated that farmers injuries are currently higher than injuries in workers industry. Severity of agricultural injuries worsen because of low infrastructure

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availability, no age and gender specific work, long continuous working hour and occasional use of machines (Knapp, 1965, 1966). Zhou & Roseman (1994) reported that occurrence of agricultural injuries among farmers, the most frequency injured body parts in incidents were limbs. Patel et al. (2010) stated that currently is lack of study on agricultural sector injuries from developing countries because of non-availability of nationwide compiled information on agricultural injuries.

The study was aimed to give information of farmer's injuries and discomfort of agricultural hand tools during traditional farming activities and to conduct ergonomic study of agricultural hand tools to minimize injuries.

2. Methodology

2.1. Survey of agriculture injuries and discomfort level of farmer

The study identified popularly used agricultural hand tools in the three districts of Jember, Banyuwangi and Lumajang, East Java, Indonesia and conducted survey of farmers for study/record the tools and its parts causing injuries and discomfort to the farmer. The samples number was 502 farmers consist of 132 and 138 Javanese male and female farmers and 118 and 114 of Madurese male and female farmers respectively. This study uses qualitative and quantitative approaches using the survey method. The data used are primary data and secondary data, where primary data was collected by using instrument questionnaire, observation and interview guide has been prepared to the parties who are competent with the subject comfort and injuries of the farmers in the province of East Java. While, the secondary data obtained by collecting documentations about the conditions of farmers respond to agricultural hand tools from the relevant research in accordance with the problems.

2.2. Ergonomic evaluation for agricultural hand tool

By using a measuring instrument to measure body dimensions peasant farmers to obtain data anthropometry and measure the dimensions of the handle of agriculture tools are used by farmers. Measurements of body dimensions and length and diameter of agricultural hand tools were using equipment and measurement standards.

3. Results and discussions

The sequence hand agricultural tools from the most frequent to least rarely used when farming was sickle (100.0%), hoe (92.0%), big/long knife (69.3%), shovel (23.5%), sprayer (19.1%), and harrow (16.5%) respectively. The length and diameter dimension of agricultural hand tools is preserved in Table 1.

Table 1. The dimension of popularly agricultural hand tools in East Java

Agricultural hand tools	Handle		Weight (kg)
	Length (cm)	Diameter (cm)	
Sickle	12.2-16.3	2.5-3.9	0.3-0.8
Hoe	56.2-68.4	3.8-5.2	2.3-3.2
Harrow	63.1-72.7	3.5-4.2	1.9-2.8
Shovel	44.1-57.6	5.5-6.8	2.6-3.1
Big/long knife	11.8-16.8	3.8-5.2	0.8-1.8
Sprayer	-	-	22.8-25.7

The injuries of the body of farmers consist of injury in hand, arms, legs, thighs, and feet. The injuries on hands, arms, legs, thighs, and feet of male and female farmers were 40.24, 34.86, 4.38, 3.59, 4.38, 2.59, 1.00, 0.60, 33.07 and 10.56 % respectively.