Risk Management of Occupational Health and Safety in Rice Farmers in Ngrendeng, East Java in 2012

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Abstract— **Agriculture is an important sector that has big impact to the society thus a program that can keep its sustainability is needed, especially in term of productivity. The focus of this study was risk management of Occupational Health and Safety (OHS) in rice farmers in Ngrendeng Village, Ngawi, East Java in 2012 with analyze hazard and risk on activities and workplaces. This study was a semi-quantitative analitical descriptive with observational approach using Australian Standard/New Zealand Standard (AS/NZS) 4360:2004 about risk management. Analysis was made based on whole farming processes observed and information from village headman, a land and farm machines owner, and 5 farmers. The result showed that rice farmers' activities have 71 risks from 16 work activities and hazard sources. Rice grinding activity was a high risk activity with 11 risks. The highest value of risk, reaching 1500 (very high), comes from ergonomy, in which noise exposure, vibration exposure, UV radiation exposure, chemical exposure from pesticide and fertilizer, gas exposure, and dust exposure attained. In brief, rice farming was an agriculture activity with high risks that harmful for farmers' health and safety. Therefore, OHS program would be needed to manage hazard and risk and keep farmers' productivities.**

Keywords— **Risks; Rice Farmers; Risk Management**

I. INTRODUCTION

The number of workers in the world have been increasing every year. International Labour Organization (ILO) showed that there was an increase in the number of labour, reaching 52 millions between 2004 to 2007 and 33 million between 2008 to 2011. In line with that fact, Indonesia workers has increased to 109.670.399 in 2011from 93.722.036 in 2004 (BPS, 2012). Most of that number comes from agricultural sector, reaching 39.328.915 or 35,86% of all workers in 2011 (BPS, 2012). However, the number of farmers decreased by 5,2% from 41,49 million in 2010 to 39,33 million (HKTI, 2012). That was caused by labour shortages that usually comes from family relation.

Agricultural Census in 2003 showed that most of farmer families (45% to 85%) have 3 to 4 family members. Moreover, decreasing number of farmer was caused by lack of interest from young man to become farmer because lack of interesting incentive as result of low product price, higher input price, none of land distribution, and narrowing of farming land. The average of land ownership was 0,5 hectares per householder. This was lower than ideal land ownership, that is 2 hectares (Sumarno and Kartasasmita, 2009).Those are the reason why farmers start seeking more incomes by cultivating more lands and keeping the

production with agricultural mechanization. Thus, Occupational Health and Safety (OHS) risks were raised to high-level risk. In Great Britain, Fatal Injury Rate in agricultural (include horticulture, forestry, and other sector) reached 8 per 100.000 workers in 2010-2011. Moreover, Major Injury from farm activities reached 242,1 per 100.000 workers in 2009-2010. Farmers also suffered Work Related Diseases, such as zoonosis infections, Musculoskeletal Disorders (MSDs), Hand Arm Vibration, Vibration White-Finger, Whole-Body Vibration, and respiratory diseases (HSE, 2012). In 2010, there are 476 fatalities in farming with fatality rate 26,1 per 100.000 workers in USA. Farmers suffered pesticide related diseases, pulmonary diseases, Musculoskeletal Disorders (MSDs), hearing loss, and stress (NIOSH, 2011).

The high number of workers and high of fatality rate in agricultural sector had to be alert the authority to create prevention programs for various of work related diseases and accidents, and increasing workers' productivity which will have significant impact to farm sustainability and global market competition.

Indonesia rice production in 2011 can be considered high, reaching 68.061.715 tons. Main rice producer areas are West Java, East Java, and Central Java. However, production reduction number of East Java would be higher in 2012 that would increase by 11,69 million tons. One of the main

producer areas in East Java is Ngawi Residence. Thus, Ngawi has to sustain and increase its farmers' productivity to comply with that target by implementing OHS program. Therefore, analysis about hazard and risk in farmers activities would be needed as basis to organize OHS program in agricultural. The objective of this research was to analyze OHS hazard and risk in rice farmers in Ngrendeng, Ngawi, East Java in 2012.

II. METHODOLOGY

A. Samples

Research subject was hazard and risk in rice farmers activities in Ngrendeng, Ngawi. Information about hazard and risk was procured from observation and interview with some sources. They were headman of Ngrendeng, 1 land and farm machines owner, and 5 farmers in Ngrendeng, Ngawi.

B. Methods

Researcher used Job Hazard Analysis (JHA) form and electronic transcriptions to record source's answer. Their information became justification for validating data using triangulation method. This research was a surveillance using semi-quantitative method and descriptive analysis using AS/NZS 4360:2004 about Risk Management as standard. Research was held in Ngrendeng Village, Ngawi on November 14th-23th 2012.Variables that were measured include hazard, risk, exposure, probability, consequences, basic risk, existing risk, redictive risk, risk control, communication and consultation, and monitoring and review (Fig. 1).

C. Data Analysis

Risk was procured from calculation among exposure (E), probability (P), and consequences (C) which were determined from Fine criteria. Basic risk was calculated from formula below.

$$Risk = P \times E \times C \qquad (1)$$

Then Existing Risk and Predictive Risk were calculated using formula below.

$$Risk = PoF \times E \times CoF \qquad (2)$$

Existing risk is risk level that procured from measuring existing control which has been done by farmers. And predictive risk is risk level that procured from measuring control actions which recommended if those will be done. Final risk level from this research was classification based on risk value. It classified to five levels: high risk (>350), priority 1 (181-350), substantial (71-180), priority 3 (21-70), and acceptable ($\leq$20).
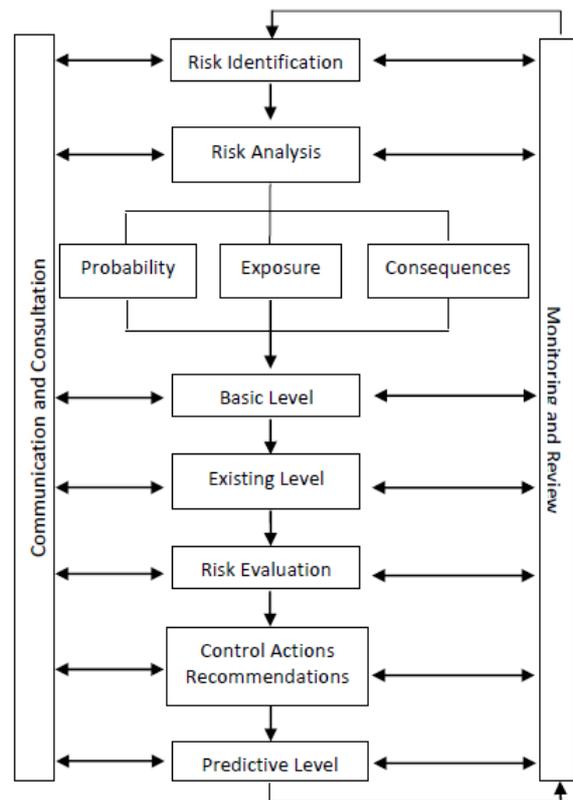

Fig. 1 Conceptual Methodology of Research

III. RESULT AND DISCUSSION

Overall, hazards came from production processes and workplace. Farming processes consist of 13 activities (Fig.2). Other hazard sources that were analyzed include workplace (wet rice field), health behaviour, and work organization and work culture. Total hazards in activities and workplace was 71 risks. The highest risk had value of 1500 (very high) and found in 17 risks (Table. 1). These highest risk could be categorized into six groups. They were noise, vibration, chemical, ergonomic, UV radiation, and health behaviour. Noise and vibration exposure came from vehicles, such as motorcycle, car, tractor, and grinding machine.

Farmers could be exposed for 8 to 10 hours every day with noise exposure of more than 85 dBA and Whole Body Vibration (WBV). This long-time noise exposure may cause Noise Induce Hearing Loss (NIHL). WBV may cause blood and joint disorders, central nerve disorders, and metabolic disorders. Chemical hazard came from exhaust fume and dust from vehicles and road, contact with fertilizer and pesticides (dermal, eye contact, ingestion, inhalation). The farmers were exposed from inhalation, ingestion, and dermal contact. Farmers can suffer respiratory diseases, cancer, nausea, vomiting, headache, eye and skin irritation, central and peripheral nerve disorders, Parkinson's disease, toxication, and disability.
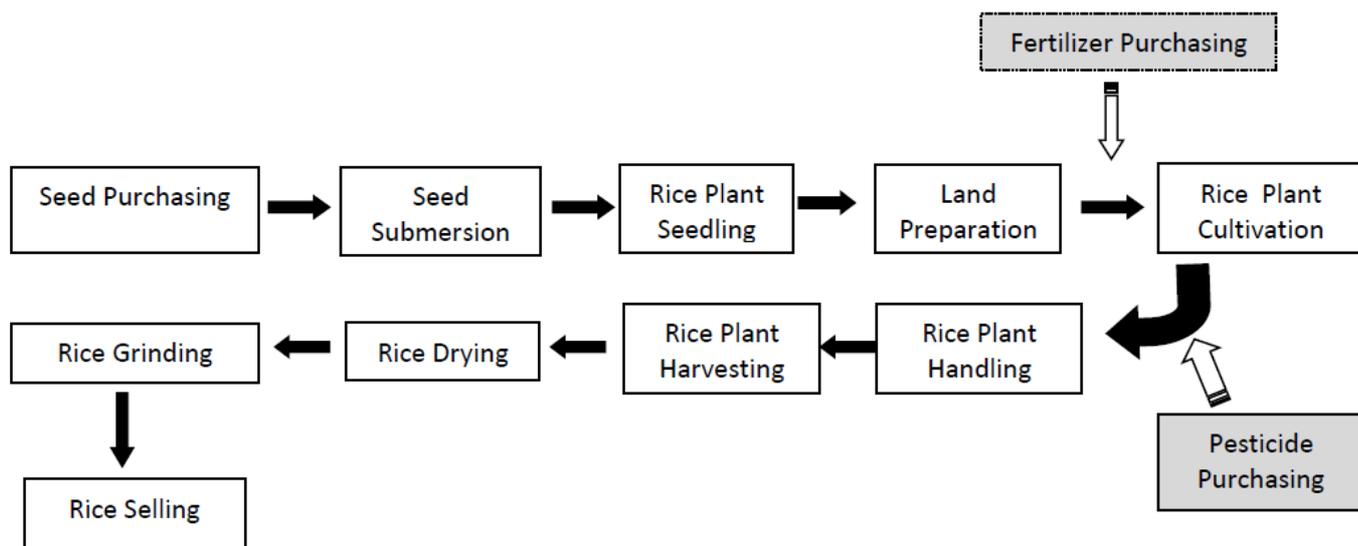
Fig. 2 Rice Farming Processes

TABLE I
CALCULATION OF THE HIGHEST RISK GROUPS

Hazard	Source	Health and Safety Effect	Basic Risk Level	Existing Risk Level	Predictive Risk Level
Noise	Vehicles	Communication disturbance, uncomfortable, hearing disorders	1500 (very high)	1500 (very high)	300 (priority 1)
	Diesel machine (grinding)	Communication disturbance, uncomfortable, accident, NIHL	1500 (very high)	1500 (very high)	33.75 (priority 3)
Vibration	Vehicles	Fatigue, uncomfortable, blood vessel and joint disorders, central nerve disorders, metabolic disorders	1500 (very high)	1500 (very high)	450 (very high)
	Diesel machine (grinding)	Headache, sleepy, stomach ache, vomiting, fatigue, pins and needles, blood vessel and joint disorders, central nerve disorders, metabolic disorders	1500 (very high)	1500 (very high)	60 (priority 3)
Chemical	Exhaust fumes and dust of vehicles and road	Asphyxiate, cough, respiratory infections, pulmonary cancer	1500 (very high)	1500 (very high)	300 (priority 1)
	Exhaust fumes of tractor	Asphyxiate, headache, vomiting, cough, respiratory infections, pulmonary cancer	1500 (very high)	1500 (very high)	300 (priority 1)
	Dental contact with fertilizer	Eyes irritation, itchiness, espiratory irritation, laryngeal cancer	1500 (very high)	1500 (very high)	90 (substantial)
	Contact with fertilizer (dermal, eyes, ingestion)	Dermal and eye irritation, itchiness, vomiting, sore throat, blurred vision, shaking, headache, sweat, poisoned, cancer, central and peripheral nerve disorders, Parkinson's Disease, disabilities	1500 (very high)	1050 (very high)	42 (priority 3)
	Exhaust fumes, grinding dust and rice husks	Asphyxiate, vomiting, headache, cough, respiratory infections, pulmonary cancer	1500 (very high)	1050 (very high)	84 (substantial)
Ergonomy	Squatting while revoking seed	Foot and waist exhausted, pins and needles, muscle and bone disorders	1500 (very high)	1500 (very high)	225 (priority 1)
	Hoeing repetitively	Fatigue (hand-arm, foot, shoulder, waist), muscle and spine disorders, Cumulative Trauma Disorders (CTDs)	1500 (very high)	1500 (very high)	45 (priority 3)
	Walking while controlling tractor	Limbs exhaustion, muscle and joint disorders	1500 (very high)	600 (very high)	30 (priority 3)

	Blending down and walking backward	Limbs exhaustion, backache, muscle and joint disorders	1500 (very high)	600 (very high)	30 (priority 3)
	Bearing sprayer	Hand-arm and shoulder exhaustion, backache, muscle and joint disorders, CTDs	1500 (very high)	1500 (very high)	37,5 (priority 3)
	Bending down while harvesting repetitively	Limbs exhaustion, fatigue, muscle and joint disorders, CTDs	1500 (very high)	1500 (very high)	75 (substantial)
UV Radiation	Sun's rays	Irritation, sunburned, erythema, dehydration, cataract, dermal cancer	1500 (very high)	600 (very high)	168 (substantial)
Health Behaviour	Smoking while farming	Asthma, cough, respiratory infections, Cardio Vascular Disease (CVD), hypertension, cancer	1500 (very high)	1500 (very high)	450 (very high)

Ergonomic hazard comes from various awkward postures when farmers work. The postures of interest includes quatting, repetitive hoeing, bending down, controlling vehicle, bearing, etc. These posture might cause muscle exhaustion, muscle and joint disorders, spine disorders, and Cumulative Trauma Disorders (CTDs). Sun's rays was the source of UV radiation. Farmers were exposed for 8 to 10 hours every day. UV radiation may cause irritation, erythema, cataract, dehydration, and skin cancer. Health behaviour that was high risk was smoking. Farmers usually smoke while working. This behaviour may cause cough, respiratory diseases, cardiovascular disease, hypertension, and cancer. Basic risk level consisted of 36 high risks, 6 priority 1risks, 13 substantial risks, 12 priority 3 risks, and 4 acceptable risks. Then all existing control in each risk was analyzed so the existing risk level could be procured. Existing risk level consisted of 33 high risks, 4 priority 1risks, 18 substantial risks, 10 priority 3 risks, and 6acceptable risks. After that, all risk was analyzed and recommendation was made to minimize the risk. Risk level was calculated again to produce predictive risk level. Final predictive risk level consisted of 2 high risks, 8 priority 1 risks, 16 substantial risks, 23 priority 3 risks, and 22acceptable risks. Comparison of risks distribution is showed on fig. 3.
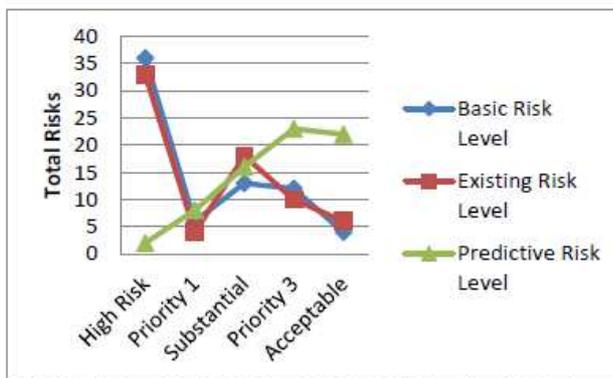

Fig.3 Distribution of Basic Risk Level, Existing Risk Level, and Predictive Risk Level in rice farmers' activities

Communication and consultation occured among farmers group in each Ngrendeng sub-village. These groups' activities included routine forum twice a month, information sharing about agriculture engineering and training that was provided by Government. Government programs that had been held in Ngrendeng were counseling and agricultural aid. The aid included seed, fertilizer, and pesticides. Nevertheless, this process could not be said that was done because this process did not involve any concerned authorities, such as Agricultural Ministry, Health Ministry, Labour and Transmigration Ministry, farmers, and businessmen. Risk assessment, which had been made, should be communicated to all stakeholders through government meeting, counseling, promotion, and information media such as leaflet, module, and poster. All concerned authorities should have integrated agricultural program. Monitoring and review were rarely held by Government. Though this processes were held, those were limited to agricultural activities only, not included labour and OHS problems. Government authorities should arrange integrated and sinergic development program immediately. All farmers activities both indoor or outdoor should be monitored so the Government can take immediate action if there is any inexpediencies. Moreover, all activities should be reviewed routinely to minimize in effectivity and inefficiency.

IV. CONCLUSIONS

Rice farming activities consisted of 16 tasks which had 71 total risks. Grinding activities was activity with the highest risk level. The highest risks from whole process had the value of 1500 (very high), they included noise exposure(vehicle, tractor, grinding machine), vibration exposure(vehicle, grinding machine), UV radiation (sun's rays), ergonomic (squatting, repetitive hoeing, bending down, controlling vehicle, bearing, etc), chemical (exhaust fume,dust, hull of rice), and health behaviour (smoking). In general, risk management process in agricultural activitieswhich includes risk identification, risk assessment, risk control, communication and consultation, and monitoring and review, has not been well done.Rice farming was an agriculture activity with highrisks that harmful for farmers' health and safety. Therefore, OHS program would be needed to manage hazard and risk and keep farmers' productivities.

V. RECOMMENDATIONS

Risk management study that has been made should be informed to all rice farmers through farmers group forum that was held in Ngrendeng to become the reference in

establishing integrated and sinergic development programs among Government concerned authorities. Implementation of routine counseling about agricultural health and safety should be initiated by community leaders through farmers meeting forum and OHS implementation modules for farmers. Moreover, there is urgency to arrange general procedure regarding work organization that all farmers agreed to. Some control actions that need to informed to farmers are using long-sleeve clothes, trousers, hat, and boots if possible, stretching and resting, mineral water consumption, providing first aid, engineering control on tractor and grinding machine, such as make stirrup on tractor, enclosure, longer exhaust pipe design, etc.

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