

THE ROLE OF ERGONOMICS IN THE AGRICULTURAL SECTORS

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Abstract: The study focuses on the role of ergonomics and ergonomic interventions that reduce the problems and musculoskeletal injuries among agricultural workers. Literature review summarizes various problems and risk factors present in agriculture activities such as incorrect techniques, stooped postural work, repetitive work, prolonged squatting postural work, long duration of work, awkward picking postures, forward bending, high exertion of work, prolonged static posture, manual cutting of plant materials, lifting and carrying of heavy materials, vibration, working in high temperature and relative humidity during work. These all problems lead to musculoskeletal injuries specifically in lower back, neck, buttock, thigh and knee joint. Incidence of musculoskeletal symptoms like pain, aching, stiffness prevails among agricultural workers. The paper concludes that problems and musculoskeletal injuries among agriculture workers can be reduced by ergonomic interventions.

Keywords- Ergonomics, Agriculture sector, Problems of agricultural workers.

Introduction

The agriculture sector plays strong role in fulfilling the basic needs of human beings by providing food and generating employment at large scale in rural areas. Nearly around fifty eight percent rural sectors depend on agriculture as their main source of income in India. Agriculture occupation has also considered as risky for workers in agriculture. (Babu, 2016) Agriculture has been treated as one of the drudgery prone occupation of unorganized sector due to unavailability of improved agricultural technologies. (Mehta, 2012) . An adverse health conditions including musculoskeletal disorders are directly linked to agricultural activities. (Singh, 2010). Majority of farmers complained back pain as occupational health problem in farming.(Xiang, 1999) . Agriculture workers have been facing many problems due to unavailability of proper equipments in farming and poor knowledge of ergonomics. So ergonomics can play major role in solving the problems and reducing musculoskeletal injuries among workers in agriculture sector.

Agriculture – “Agriculture is the science and art of cultivation on soil and the rearing of livestock.” (Organization, 1999) As from the point of view of ILO “Agriculture is defined as agricultural and forestry activities carried out in agricultural undertakings including forestry activities, crop production, animal husbandry and insect raising, the primary processing of agricultural and animal products by or on behalf of the operator of the undertaking as well as the use and maintenance of machinery, equipment, appliances, tools, and agricultural installations including any process, storage, operation or transportation in an agricultural undertaking, which are directly related to agricultural production.” (Hurst, 2004)

Musculoskeletal injuries- It involves damages to the human body structures such as muscles, joints, tendons, ligaments, nerves, bones and the localized blood circulation system due to working in improper conditions or the inappropriate environment at the workplace. (Nunes, 2009)

Ergonomics- “It is process to define the best match between the job and the worker in the work area.” The goal of ergonomics is to examine the person (his range of motion, strength, speed, endurance) task, work environment and design as per requirement of the workers. (Dombeková, 2016).The efficiency and productivity of the worker can be increased by implementing the ergonomic interventions in agriculture sector. Hence in view of the above, an attempt has been made to study the role of ergonomics in increasing productivity and efficiency of agricultural workers by reducing their problems and musculoskeletal injuries with the help of ergonomic interventions.

Objective of the paper

The purpose of this study is the role of ergonomics among agricultural sectors and reducing their problems, risk factors and injuries with the help of ergonomic interventions.

Research Methodology

Literature review was done in order to identify the problems, risk factors and injuries prevailing among agriculture workers and relevant ergonomic interventions. The articles were retrieved from search engines Google scholar by mentioning key words such as ergonomics, agricultural workers problems, ergonomic interventions. The research design is descriptive in nature.

Literature review and Findings

This research paper summarizes articles on the reducing agricultural workers problems and injuries with the help of ergonomic interventions and focusing on importance of ergonomics in increasing productivity and efficiency of agricultural workers.

Summary of ergonomic solutions among agriculture worker

References	Objective of the study	Methods	Problems and injuries faced in activities of agriculture	Ergonomics interventions & suggestions
(Babu, 2016)	Study the postural problems using ergonomic study and highlight the importance of ergonomics on productivity improvement.	Data is collected from Farmlands in Theni district of Tamil Nadu.	Musculoskeletal injuries, psychological disorders, incorrect application techniques, vehicle hazards, stooped postural work and heat related illness.	Analysis of Posture, simple and efficient farm tool design including Napier grass cutter, adjustable trenching hoe and relay farming to improve productivity in agriculture sector.
(Chakrabarti, 2012)	This paper deals with ergonomics intervention for work tool design development.	To get the relevant information from tea gardens of Jorhat, Assam	-Tea leaf pluckers are engaged in a single task throughout the year -The schedule of work and job equipment is decided and supplied to them based on the corporate decision where the workers do not have any individual control.	-A redesigned improved basket for tea-leaf plucker -An ergonomic plucking aide was designed and developed consisting of finger guard with blade embedded to facilitate plucking and protect finger aberrations
(Mehta, 2012)	Assess intervention of drudgery reducing technologies in agriculture and its impact evaluation.	Data was collected from sample of 30 respondents (15 male and 15 female) selected randomly from village Shahpur	Identified drudgery prone activities in agriculture included weeding, interculturing, harvesting, threshing & processing.	Intervention consisted participatory field level skill training for proper use cot bag (for cotton picking and vegetable picking), capron (protective face mask), improved sickle (serrated self sharpening blade), wheel hand hoe (for weeding) and protective gloves (used during harvesting).
(Rana, 2005)	To determine ergonomic evaluation among rural women while performing the wheat harvesting activity.	The field experiment was carried out on 20 women involved in wheat harvesting activity in Ludas village of Hisar district of Haryana	They reported severe pain in lower back and knees because of continuously working in squatting posture for long duration without changing to any other posture.	Organizing periodic training programmes to educate agricultural workers about the recognition of musculoskeletal disorders, the importance of rest pauses and maintaining proper posture while performing agricultural activities.
(Ng, 2013)	This paper highlighted the ergonomic problems by analyzing each of the breakdown task analysis among oil palm plantation	Cross sectional field visits involves ten oil palm plantation in Malaysia	Ergonomics risk factors prevails among fresh fruit bunch cutters during different stages of harvesting such as stooping while performing harvesting task, balancing and manoeuvring long sickle to erect pole for harvesting task and lifting and carrying fresh fruit bunch over a distance to where wheelbarrow are left	Ergonomics must take into consideration redesigning work environment, task, while implementation should be participatory, culturally, socially acceptable and cost effective.
(Fulmer, 2002)	The study of ergonomic risks for strains of the shoulder and lower back and identify opportunities for intervention among apple harvesters.	Pilot observation in four orchards and a Posture Activities Tools Handling was used to analyze the work of fifty-one workers in eight additional apple orchards.	Ergonomic risk included physical loading on the shoulder due to factors such as reaching to pick apples with elbows over shoulder height, downward pressure from the bucket's strap in contact with the collarbone, strain from carrying the ladder. -Strain to the lower back due to awkward picking postures,	Intervention suggesting direct communication and active involvement on the part of the growers and harvesters.

			bending to empty the picking bucket into the bin and supporting a full load of the apples with the lower back.	
(Mayton, 2008)	To assess driver whole-body vibration exposures and suggest interventions to reduce the risk of back-related injuries among agricultural tractor drivers.	Collecting from two independent samples, field data and health and work history data of farm equipment operators.	Health and work history data showing ninety six percent of respondents reported having to bend or twist their necks, twenty four percent reported only neck symptoms, Sixty-four percent of participating operators reported experiencing back symptoms such as pain, aching, stiffness.	-Suggestions included specifying a seat that "better" isolates operators from jars/jolts with new tractor purchases -Maintaining the seat suspension and tested viscoelastic cushions foam padding -Using larger diameter tires with radial-ply instead of bias-ply construction particularly on small utility tractor-movers -To aid in ride rough using a swivel seat to reduce the stress on the neck from bending or twisting -Improving efforts to educate operators of the adverse effects of whole-body vibration exposures.
(Borah, 2012)	To determine physiological workload and to ascertain muscular and postural stress involved in the activity of rice with this traditional tool 'Dhenki'.	Stepstool technique was adopted for assessing physical fitness of the twenty subjects selected through purposive sampling method from Jorhat district of Assam	-A traditional tool pounding activity involved physiological workload as moderately heavy -Exertion perceived by women was reasonably high -Incidence of musculoskeletal problems prevailed in low back, buttock, thigh and in knee joint -The high temperature and relative humidity was observed in environment.	Ergonomic interventions through improvement in working conditions, technology tool and occupational health redesigning of traditional tool will improve performance in work and enhance productivity of farm women.
(Soheili-Fard, 2017)	The evaluation was done for the position and posture of the workers of tea factories in Guilan province.	Study conducted among six tea factories and total forty eight workers in Langroud city in Guilan province, Iran.	-Production unit included withering unit, curling and oxidation unit and drying and grading unit -Awkward postures, workers back flexion, placing one arm above shoulder and standing on one leg need corrective action in tea factories that lead to musculoskeletal disorders.	-The height of dry tea discharging platform should be increased in the grading section. -The carts with standard lever can be redesigned which eliminates the need for bending by workers in curling section -For handling the tea from one work phase to another a conveyor can be used instead of using carts
(Singh, 2010)	Literature review done to determine the types and extent of musculoskeletal disorders and identify ergonomic intervention among farm women in India.	Based on literature review	Field problems such as stooped posture, static positioning, hand cutting of plant materials, lifting and carrying of heavy materials, kneeling and presence of vibration.	-Designing tools and equipment for women, improved work processes and stipulation of shorter rest periods for farm women. -Training to farm women for the proper and safe ways of handling tools and equipment

				-Work station should be adjustable for women.
(Chapman, 2004)	The study was done to implement intervention among fresh market vegetable operations and reduce exposures to musculoskeletal injury.	Data was collected through mail questionnaire among vegetable growers before and after the intervention.	Facing the problem of musculoskeletal injury.	-Providing better information to vegetable growers to use ergonomically designed mesh bags and standard containers increase the speed of work in agricultural practices.

Conclusion

Thus on the basis of above data it can be summarized that agriculture workers face number of problems, risk factors and musculoskeletal injuries in agricultural activities. The literature review summarize ergonomic interventions including designing efficient farm tools and equipments, participatory field level skill training for proper safe handling of tools and equipments, direct communication and active involvement of workers to educate about the recognition of musculoskeletal disorders. The working condition can be improved by maintaining proper posture, redesigning work environment, improve work processes, adjusting work station and stipulation of shorter rest periods. So problems and musculoskeletal injuries can be reduced to greater extent by implementation of ergonomics in the activities of agriculture sector.

Scope for further research – There is scope for further research in understanding the problems of agricultural workers in varied activities and developing new ergonomic designed tools and equipments with innovative technology.

Suggestions

- Strong need to integrate ergonomics in varied activities of agriculture sector.
- Creating awareness regarding importance of proper use of tools and equipments in the activities of agriculture.
- Training and orientation regarding ergonomics can improve knowledge among agriculture workers through government authorities or NGO.
- Government should provide subsidy for ergonomically designed tools and equipments used in agricultural activities.

Research limitations – Being a review paper, the present paper is purely academic in nature.

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