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SOCIO-ECONOMIC FACTORS, WORKING ENVIRONMENT, AND PHYSICAL HAZARDS AFFECTING AGRICULTURAL WORKERS IN ALIGARH DISTRICT, UTTAR PRADESH, INDIA

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ABSTRACT

Background: Agriculture is the primary occupation in rural India. Agricultural workers are indispensable to rural economies, playing a significant role in ensuring food security and economic stability. However, they are among the most vulnerable occupational groups, facing numerous health and safety challenges. This study seeks to examine their socio-economic and working conditions, with a particular emphasis on the physical hazards common in their work environment. **Method:** This cross-sectional study was conducted among 380 agricultural workers in Aligarh district, Uttar Pradesh, India. Information on demographic details, work-related characteristics, and physical hazard factors was gathered using a structured interview schedule between November 2023 to March 2024 through multistage sampling. The descriptive data were presented in the form of categories, along with their corresponding numbers and percentages. **Results:** Agricultural workers face many challenges, especially those from disadvantaged groups like Scheduled Castes and Other Backward Classes. Low education levels make these problems worse. About 30% of workers could not read or write, and very few have studied beyond high school. Financial struggles are common, with 63.6% of workers reported that their earnings from farming are not enough. The hard physical labour also takes a toll on their health. Over 84% of workers often feel tired and weak, and many suffer from sunstroke due to working long hours in the sun. **Conclusion:** The findings emphasize the importance of implementing proper health and safety measures, including training programs and providing protective equipment. Addressing these issues can improve the health and quality of life of agricultural workers while creating a safer workplace in the farming sector.

INTRODUCTION

Agriculture is the lifeline of rural economies and a major contributor to the Indian economy. As per the Economic Survey 2022-23, it approximately contributes 18% to the national Gross Domestic Product (GDP) and, provides employment to 42.6% of the labour force. Despite its critical role in ensuring food security and economic stability, agricultural work is often associated with low-income, high-risk employment. Agricultural workers, particularly in regions like Aligarh district in Uttar Pradesh, represent a vulnerable segment of society. These workers face a combination of socio-economic challenges and occupational hazards that adversely affect their quality of life and productivity.

The socio-economic characteristics of agricultural workers, such as their educational background, income levels, and living conditions, are deeply intertwined with their ability to manage occupational risks. Limited access to education and skill development opportunities restricts their capacity to adopt safer and more efficient farming practices. Financial instability, compounded by the seasonality of agricultural work, often forces these workers into poor working conditions, further exposing them to a host of occupational hazards.

Social networks within communities play an important role in helping people find jobs and share the benefits of agricultural development. These networks are usually built on mutual support and direct interactions among neighbours (Koike et al., 1987). In the agricultural labour market, a large part of the work is done by hired workers, who often hold the lowest-paying and least secure jobs. As economies grow and farms become larger, the reliance on hired workers tends to increase (Martin.P. 2020).

1.1 Socio-Economic Profile

Agricultural worker are often middle aged with a significant portion being illiterate or having minimal education. They typically belong to medium size families and have extensive experience in agricultural work (Reddy.I. 2020). The socio-economic status of agricultural workers is generally low .They have marginal land holding and depend on a combination of wages and agriculture for their livelihood. Their economic orientation, self-confidence, and achievement motivation are typically at medium level (Chandra et al., 2023).

Understanding the socio-economic profile of agricultural workers is critical to addressing their vulnerabilities. In India, agricultural labourers typically earn insufficient incomes, with an average monthly wage of 5,000– 8,000, according to the National Sample Survey Office (NSSO, 2019). Educational attainment among this group is also notably low; nearly 40% of agricultural workers in rural areas are illiterate, and only 25% have completed primary education (Census 2011). These socio-economic constraints restrict their access to better employment opportunities, healthcare, and safety training, leaving them highly vulnerable to occupational risks.

Agricultural workers generally come from rural areas and have limited educational backgrounds. In Adana, Turkey, for instance, a significant proportion of migrant seasonal workers (MSWs) were illiterate, especially when compared to the resident agricultural workers (RAWs). Similarly, in India, many female agricultural workers lack formal schooling and are not affiliated with any unions. Economic instability is a prevalent challenge for agricultural workers, who frequently lack social security and experience poverty. For instance, a large portion of agricultural workers in Turkey are not included in any social security programs. Similarly, in India, female agricultural workers do not have access to occupational health services or social security benefits (Yadav,D et al.,2023 & Okyay, R et al., 2018). Agricultural workers typically live in difficult conditions. In Brazil, they face worse living standards and have less purchasing power than workers in other industries. Likewise, seasonal migrant workers in Turkey struggle with housing and sanitation issues (Okyay, R et al., 2018 & Nogueira, F et al., 2021)

A considerable proportion of agricultural workers fall in the India's state of Uttar Pradesh, within the middle-aged to elderly demographic. For instance, in the Meerut and Hapur districts, 61.88% of vegetable growers are above the age of 45, while in Varanasi, 60.62% belong to the middle-aged category. Most agricultural workers reside in joint family systems, typically comprising medium to large family sizes, often with more than four. In terms of educational attainment, a

substantial number of workers have completed education up to the intermediate level. Meerut and Hapur, 41.88% of respondents reported having completed 12th grade, whereas in Varanasi, 36.25% had achieved similar educational qualifications (Verma, A et al., (2019) & Singh, A et al., 2022).

A significant proportion of agricultural workers belong to the Other Backward Caste (OBC) category. In Meerut and Hapur, 53.75% of vegetable growers are from the OBC group, while in Varanasi; this percentage rises to 77.50%. In terms of housing, a large majority of agricultural workers reside in pucca (permanent) houses, with 80% in Meerut and Hapur and 92.50% in Varanasi living in such structures.

The size of landholdings among agricultural workers varies widely. In Meerut and Hapur, 57.50% of vegetable growers are marginal farmers with up to 1 hectare of land, while in Varanasi, 38.75% have larger holdings of 2 to 4 hectares. Income levels also differ, with many falling into the medium-income category. In Meerut and Hapur, 68.75% of vegetable growers earn an annual income between 300,001 to 500,000 INR, whereas in Varanasi, 30% have an income between 200,000 to 300,000 INR per year.

1.2 Working Conditions

Agricultural workers, especially migrants, often face difficult working conditions that put their health and safety at risk, such as exposure to harmful chemicals, physical injuries, and illnesses. Along with these risks, they deal with challenges like discrimination, low wages, long working hours, social exclusion, and language barriers (Syennsson et al., 2013). Legal status adds to these problems, as workers with proper documentation earn about 15% more than those without it. However, knowing the local language can help reduce this gap for undocumented workers (Ise et al., 1995). Certification programs meant to improve economic conditions have shown mixed results. While they help certified farmers earn better prices and income, they do not do much to improve workers' wages or their overall household earnings (Oya et al., 2018). Agricultural workers typically work long hours under harsh conditions. In Turkey, RAWs work an average of 9.9 hours a day, while MSWs work 10.9 hours a day (Okyay, R et al., 2018). They are also exposed to various environmental hazards such as solar radiation and chemical agents (Nogueira,F et al.,2021)

The agricultural sector is fraught with occupational hazards. Workers are exposed to risks from machinery, hand tools, animals, and chemicals. These hazards lead to a wide range of injuries and illnesses, from minor cuts to severe injuries like amputations and spinal cord injuries (Litchfield, M. 1999). In India, female agricultural workers are at risk of diseases such as tuberculosis, diabetes, hypertension, and pesticide poisoning (Yadav,D et al.,2023)

1.3 Occupational Health Hazards

The physical demands of agricultural work significantly affect the health status of labourers. Studies have shown that over 50% of agricultural workers in India suffer from musculoskeletal disorders due to repetitive motions and prolonged hours of bending or lifting heavy loads (Chatterjee et al., 2022). Additionally, respiratory issues are prevalent among those exposed to fertilizers and pesticides, with approximately 32% of workers reporting symptoms of chronic respiratory diseases (Singh et al., 2021). Access to healthcare remains a significant challenge, as many workers reside in remote areas with limited healthcare facilities.

Occupational health risks in agriculture are multi-faceted and include physical, chemical, biological, and psychosocial hazards. Physical hazards such as musculoskeletal disorders, injuries from machinery, and extreme weather exposure are particularly common. The widespread use of agrochemicals, including pesticides and fertilizers, introduces significant chemical risks, often resulting in acute and chronic health issues. Biological risks from exposure to zoonotic diseases, fungal infections, and unsanitary conditions further exacerbate health challenges. Additionally, the psychosocial impact of financial stress, job insecurity, and social isolation cannot be overlooked, as it plays a critical role in shaping the mental well-being of these workers.

Agricultural workers face numerous health risks, including respiratory illnesses, skin diseases, and psychological stress. In Brazil, agricultural workers have a higher frequency and severity of occupational accidents compared to non-agricultural workers (Nogueira,F et al., 2021) In India, female agricultural workers suffer from muscle and joint pain, lung disease, and other morbidities (Yadav,D et al., 2023).

1.4 Physical Hazards

Physical hazards are among the most common occupational risks faced by agricultural workers. Prolonged exposure to extreme weather conditions, such as high temperatures and heavy rainfall, leads to heat stress and dehydration, while unsafe interactions with machinery increase the likelihood of injuries. The International Labour Organization (ILO, 2022) records that nearly 20% of workplace fatalities in agriculture globally are due to machinery-related accidents. In India, lack of safety training and protective equipment exacerbates these risks, particularly among smallholder farmers and labourers.

Despite the evident risks, agricultural workers in rural areas often lack access to adequate healthcare. Inadequate enforcement of labour laws and insufficient awareness about occupational safety standards worsen their situation. This creates a pressing need for a comprehensive understanding of the socio-economic and health challenges faced by agricultural workers, especially in regions like Aligarh district, where agriculture remains the primary occupation for a majority of the population.

2 MATERIAL AND METHODS

2.1 Study Design

The present study incorporated the community based cross sectional descriptive design.

2.2 Population, Sample And Study Variables

The study population consists of Agricultural workers of Aligarh district, Uttar Pradesh, India. The sample size was determined using the known infinite population formula. The population Size is infinite and the calculated sample size is 380 (n = 380). The calculation was made assuming the parameters p: 0.50, : 0.05 and d: 0.05.

Age, gender, caste group, educational status, family type, family size, income level, agriculture occupation type, agriculture income sufficiency, years of working in the profession, cultivated land, daily working hours, work load intensity, desire to change occupation. There are five dimensions of physical hazards - sudden fall, animal kicks, body fatigue, hearing issue and sunstroke.

2.3 Sampling Design

Sampling design is a definite plan for obtaining a sample from a given population. It refers to the techniques or the procedure, researcher would adopt for sample selection. A multi stage simple random sampling design was used for the sampling of study respondents. Two blocks were selected based on distance from the district headquarter. The simple random sampling method was used to select ten villages from each block. By assigning each village of two selected blocks with a unique identifier and using a random number generator villages were selected. Total 380 respondents were selected for the study, in which 19 respondents were selected randomly from each village out of 20 selected villages of blocks.

2.4 Data Collection Method

The data were collected by face-to-face interview technique conducted by the researchers between November 2023 to March 2024. Written and verbal consent for participation in the study was obtained from respondents. The researchers framed the structured interview schedule and data was collected by using schedule. The interview schedule contained two sections – one based on socio-economic and working profile and other relied on questions related to physical hazards. The questions were developed based on a review of the literature by the researchers. To enhance comprehensibility, feedback was obtained from the experts, and a pre-survey was conducted with a group of 20 agricultural workers to refine the tool.

2.5 Data Analysis

Data were analysed using the SPSS 26.0 package program. Descriptive statistics, including numbers and percentages, were used to summarize the characteristics of the study participants.

3 RESULTS AND DISCUSSION

3.1 Description And Discussion Of Socio-Economic Findings of Agricultural Workers

Table 1 presents the socio-economic characteristics of agricultural workers. The majority (36.8 percent) are aged below 40 years, followed by 28.7 percent aged 41-50 years and 27.6 percent aged 51-60 years, while only 6.8 percent are above 60 years. Gender distribution shows a significant male predominance, with 73.4 percent male and 26.5 percent female respondents. The caste composition reveals that most workers belong to the Backward Class (46.6 percent), followed by Scheduled Caste (28.1 percent) and General Category (25.3 percent).

Educational attainment among agricultural workers is low, with 30 percent being illiterate, 32.1 percent having primary-level education, 23.9 percent completing high school, and only 13.9 percent achieving education beyond high school. Family structures are predominantly nuclear (76.5 percent), with 54.7 percent of families having more than five members.

Table 1: Socio-Economic Findings of Agricultural Workers

Socio-Economic Characteristic	Frequency	Percentage (%)
Age Group		
• Below 40 years	140	36.8
• 41-50 years	109	28.7
• 51-60 years	105	27.6
• Above 60 years	26	6.8
Gender		
• Male	279	73.4
• Female	101	26.5
• Caste Group		
• Scheduled Caste	107	28.1
• Backward Class	177	46.6
• General Category	96	25.3
Education		
• Illiterate	114	30.0
• Primary	122	32.1
• High School	91	23.9
• Above High School	53	13.9
Family Type		
• Nuclear	291	76.5
• Joint	89	23.4
Family Size		
• Fewer than 3N	19	5.0
• 4N	51	13.4
• 5N	102	26.8
• Above 5N	208	54.7
Income Level		
• Below 1 lakh	75	19.7
• 1-2 lakh	102	26.8
• 2-3 lakh	71	18.6
• Above 3 lakh	132	34.7
Agriculture Occupation Type		
• Side Employment	104	27.3
• Permanent	276	72.6
Agriculture Income		
• Sufficient	138	36.3
• Not Sufficient	242	63.6

Income data indicates that 34.7 percent of households earn above 3 lakh annually, while 26.8 percent earn 1-2 lakh, 18.6 percent earn 2-3 lakh, and 19.7 percent earn below 1 lakh. In terms of employment type, 72.6 percent of respondents are engaged in permanent agricultural work, while 27.3 percent treat it as side employment. Despite this, 63.6 percent report that their agricultural income is insufficient to meet their needs, while only 36.3 percent find it sufficient.

Discussion Of Socio-Economic Findings

The findings reveal a predominantly young and male agricultural workforce, reflecting the labour-intensive nature of agricultural work and societal norms regarding gender roles in rural areas. The significant representation of Backward Classes and Scheduled Castes highlights the socio-economic vulnerabilities often associated with these groups, underscoring the need for targeted support and empowerment initiatives. The low levels of educational attainment are concerning, as they limit access to better-paying jobs and awareness of safety measures, welfare schemes, and modern farming techniques. Education-focused programs could help bridge this gap and enhance workers' economic prospects and safety awareness.

The predominance of nuclear families and larger family sizes indicates a potential strain on household resources, especially when combined with the limited income reported by many families. This is further exacerbated by the fact that a majority of respondents consider their agricultural income insufficient, signalling financial insecurity among agricultural households. The high percentage of workers engaged in permanent agricultural work highlights the dependence of rural economies on agriculture. However, the dissatisfaction with income levels points to the need for diversifying income sources and improving agricultural profitability through better market access, subsidies, and technological interventions. These findings emphasize the importance of addressing the socio-economic challenges faced by agricultural workers to improve their quality of life, ensure financial security, and sustain agricultural productivity in the region.

3.2 Description and Discussion of Working Conditions of Agricultural Workers

Table 2 provides a detailed overview of the working conditions of agricultural workers. In terms of farming experience, 40 percent of workers have been engaged in agriculture for 10-15 years, while 36.8 percent have over 15 years of experience, and 23.1 percent have between 5-10 years of experience. Regarding cultivated land, 32.3 percent of workers manage land below 5 bighas, 23.4 percent have 6-10 bighas, 26.5 percent cultivate 11-20 bighas, and only 17.6 percent work on land above 20 bighas.

Working hours vary significantly, with 46.5 percent of workers spending 6 hours daily, followed by 40.7 percent working 8 hours, 10.2 percent working 10 hours, and a small proportion (2.3 percent) working 12 hours a day. Most workers (73.4 percent) perceive their workload as normal, while 26.5 percent consider it heavy. Interestingly, 30.2 percent of workers expressed a desire to change their occupation, while

the majority (69.7 percent) intend to remain in agricultural work.

Discussion On Working Conditions

The findings reveal a diverse range of working conditions among agricultural workers, with significant experience levels suggesting a seasoned workforce. However, the landholding data indicate that a substantial proportion (55.7 percent) of workers operate on smaller land parcels (below 10 bighas), which may limit their agricultural productivity and profitability. The predominance of 6-8 hour workdays (87.2 percent) reflects the physical nature of farming activities, with a small subset (12.5 percent) engaged in extended hours (10-12 hours), potentially exposing them to increased health risks.

Table 2: Working Conditions Of Agricultural Workers

Working Conditions	Frequency	Percentage (%)
Farming Experience		
• 5-10 years	88	23.1
• 10-15 years	152	40.0
• Above 15 years	140	36.8
Cultivated Land		
• Below 5 Bigha	123	32.3
• 6-10 Bigha	89	23.4
• 11-20 Bigha	101	26.5
• Above 20 Bigha	67	17.6
Working Hours		
• 6 Hours	177	46.5
• 8 Hours	155	40.7
• 10 Hours	39	10.2
• 12 Hours	9	2.3
Work Load Intensity		
• Normal	279	73.4
• Heavy	101	26.5
Desire to Change Occupation		
• Yes	115	30.2
• No	265	69.7

(Note: 1 Bigha = 0.625 Acre)

The perception of workload as normal by the majority (73.4 percent) suggests adaptability to labor-intensive tasks, but the 26.5 percent reporting heavy workloads may highlight disparities in task allocation or access to mechanization. Furthermore, the fact that nearly one-third (30.2 percent) of workers desire to change occupations suggests dissatisfaction with agricultural livelihoods, likely driven by financial instability, physical demands, or a lack of social security.

These findings underscore the need for interventions to improve working conditions, such as promoting mechanization, providing financial incentives, and offering skill development programs to diversify livelihood opportunities. Addressing these issues could enhance the well-being of agricultural workers and contribute to the sustainability of the agricultural sector.

3.3 Description and discussion of Physical Hazards among Agricultural Workers

Table 3 highlights the prevalence of physical hazards experienced by agricultural workers. Sunstroke is a common hazard, with 47.8 percent reporting it sometimes and 16.3 percent frequently. Sudden falls were experienced sometimes by 43.4 percent and only 3.6 percent reported frequent incidents. Animal kicks were reported sometimes by 43.1 percent among the respondents. Body fatigue emerges as a significant issue, with 58.9 percent experiencing it sometimes, 25.2 percent frequently, and only 15.7 percent never experiencing it. Hearing issues are reported by 39.4 percent of the respondents who experienced them sometimes.

Discussion On Physical Hazards

The findings reveal that agricultural work involves diverse physical risks, with sunstroke and body fatigue being the most prevalent hazards. Nearly 64.0 percent of workers experience sunstroke at least occasionally, underscoring the challenges of working in extreme weather conditions. This highlights the need for preventive measures such as providing shaded rest areas, educating workers on hydration practices, and encouraging the use of protective clothing.

Table 3: Physical Hazards among Agricultural Workers

Physical Hazards	Never	Sometimes	Frequent
	Freq. (%)	**Freq.** (%)	**Freq.** (%)
Sunstroke	136 (35.7)	182 (47.8)	62 (16.3)
Sudden Fall	201 (52.8)	165 (43.4)	14 (3.6)
Animal Kicks	210 (55.2)	164 (43.1)	6 (1.5)
Body Fatigue	60 (15.7)	224 (58.9)	96 (25.2)
Hearing Issues	224 (58.9)	150 (39.4)	6 (1.5)

Body fatigue, experienced sometimes or frequently by 84.1 percent of workers, reflects the physically demanding nature of agricultural labour. Addressing this issue may require introducing mechanization, task rotation, and improved ergonomics to reduce the strain on workers. Sudden falls and animal kicks, though reported less frequently, remain significant risks due to their potential for severe injury. Training workers on animal handling, providing safety gear, and improving the quality of work surfaces could help mitigate these hazards. Hearing issues, while not frequently reported, could result from prolonged exposure to loud machinery or environmental noise, suggesting a need for hearing protection devices and noise management in agricultural settings.

The findings emphasize the importance of raising awareness among agricultural workers about physical hazards and implementing safety measures to protect their health. Tailored interventions based on these hazards can significantly reduce occupational risks and improve overall working conditions in agriculture.

4 CONCLUSION

Agriculture holds a vital place in India's economy, contributing 18 percent to the GDP and employing over 42.6 percent of the labour force. Despite significance in sustaining the nation's food security and rural livelihoods, agricultural workers face numerous challenges that undermine their quality of life and economic stability. Most workers earn modest incomes, ranging between 5,000 and 8,000 per month, which is often insufficient to meet their basic needs. In fact, 63.6 percent of workers reported their agriculture earnings as inadequate, reflecting the financial volatility of their occupation.

Low levels of education exacerbate these difficulties. A substantial portion of the agricultural workforce, approximately 30 percent, is illiterate, and only a small fraction has completed education beyond high school. This lack of educational attainment restricts their access to alternative income opportunities and limits awareness of safety measures and welfare schemes that could improve their conditions. These socio-economic challenges are further compounded by systemic disparities, with a significant proportion of workers belonging to disadvantaged communities such as Scheduled Castes and Other Backward Classes. These groups often face additional barriers in accessing resources and opportunities, deepening their vulnerabilities.

Moreover, the physically demanding nature of agricultural work poses significant health risks. Workers are exposed to extreme weather conditions, hazardous machinery, and chemicals, leading to a high prevalence of health issues such as musculoskeletal disorders and respiratory illnesses.

Sunstroke and body fatigue are particularly common, with over 84percent of workers experiencing fatigue due to the strenuous nature of their labour. Despite these risks, access to healthcare and safety training remains limited, leaving workers poorly equipped to address occupational hazards. These socio-economic and occupational challenges call for targeted interventions. Improving educational access, modernizing farming practices, and ensuring fair wages can enhance the livelihoods of agricultural workers. Additionally, providing safety training, ergonomic improvements, and protective equipment can mitigate health risks. A multidimensional approach is essential to uplift this vulnerable workforce and ensure a sustainable future for the agricultural sector.

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