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A Review of Occupational Safety and Health in Uganda's Agricultural Sector: National Legal Policies, Hierarchy of Controls, Gender and Literacy

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Abstract

Agriculture is the backbone of Uganda's economy, employing over 70% of the population and contributing about a quarter of the national Gross Domestic Product (GDP). Yet farm workers, employers, visitors, and communities living near agricultural land remain exposed to mechanical, chemical, biological, ergonomic, and psychosocial hazards, while institutional attention in the sector has focused on productivity, food safety, and value addition rather than on the safety and health of the people who do the work. The purpose of this review was to examine agricultural occupational safety and health (OSH) in Uganda with respect to four themes: the national legal and policy framework, the hierarchy of controls, gender, and literacy. A narrative review design was adopted, drawing on national legal instruments, government policy documents, International Labour Organization (ILO) and United Nations publications and peer-reviewed studies, including twenty recent studies published between 2021 and 2026, which were synthesised thematically. The review found that Uganda's OSH legislation, anchored in the Constitution of the Republic of Uganda (1995), the Occupational Safety and Health Act (2006), the Workers' Compensation Act (2000) and the Employment Act (2006), is general rather than sector-specific and does not adequately address agricultural hazards, including child labour, which is concentrated in agriculture. Recent evidence shows that fewer than half of farmers in developing countries handle pesticides safely, that musculoskeletal pain, machinery injuries and heat stress are widespread, and that hazard control on farms relies heavily on personal protective equipment, the least effective level of the hierarchy of controls, which is itself seldom used in full. Women form a large share of the agricultural workforce and experience distinct exposures, and low literacy limits workers' awareness of their OSH rights and of preventive practices. The review concludes that agricultural OSH in Uganda is constrained by mutually reinforcing legal, technical and social gaps. It recommends agriculture-specific OSH regulations aligned with ILO Convention No. 184, systematic application of the hierarchy of controls in farm machinery design and agricultural extension, gender-responsive OSH programmes, and translation of OSH instruments into local languages supported by digital training tools.

Keywords: *Agricultural occupational safety and health, Hierarchy of controls, Gender, Literacy, Labour legislation, Uganda*

1. Introduction

1.1 Background

Worldwide, about one-third of the labour force is employed in agriculture, making it the second-largest source of employment after the services sector (ILO, 2011). Quantitative and qualitative studies show that, in both developed and developing countries, agriculture remains one of the most important yet most hazardous sectors of the economy (O'Connor et al., 2021; Fuhrimann et al., 2022). Although occupational health problems in agriculture are global (O'Connor et al., 2021), exposure to on-site hazards that can result in fatalities (Vigoroso et al., 2021) is more prevalent in low- and middle-income countries (LMICs) than in high-income countries. This difference reflects weaker implementation of control measures and enforcement of regulations in LMICs (Fuhrimann et al., 2022), as well as the higher level of mechanisation of agricultural enterprises in many developed countries (ILO, 2011).

Recent reviews confirm the scale of the problem. Farmers are regarded as a high-risk group for both intentional and unintentional injuries, with risk factors arising from the worker, the agent of injury, and the physical and social environment before, during and after an injurious event (Qi et al., 2024). In low- and middle-income countries, a meta-analysis of 64 studies covering more than 68,000 agricultural workers estimated the 12-month prevalence of low back pain at about 52% overall and at about 62% among African agricultural workers, the highest of any region (Shivakumar et al., 2024). Heat stress, which is intensifying with climate change, is a further threat, with heat-related illness and kidney disease being the most frequently reported outcomes among farmworkers (El Khayat et al., 2022). Attention to farmers' psychosocial health has also grown markedly over the past decade, with suicide, stress and depression emerging as the most common themes in this body of research (Díaz Llobet et al., 2024).

For a long time, agricultural non-governmental organisations and government agencies have placed their emphasis, resources and efforts on food safety, value addition, biosecurity, product quality, soil productivity, new agricultural techniques and environmental sustainability. These initiatives, while important, have tended to marginalise the safety and health of farm workers (Watterson et al., 2020). Moreover, the introduction of more modern agricultural machinery cannot by itself be expected to reduce occupational health risks; without comprehensive measures to guarantee safe working conditions, mechanisation may instead increase the severity of accidents (Scherrer & Radon, 2019).

Despite efforts by the Government of Uganda and private agricultural enterprises to promote mechanisation, labour-intensive agriculture remains common in Uganda (ILO, 2011). Labour-intensive activities such as lifting heavy loads, machine maintenance, ploughing, construction and animal handling expose workers to occupational accidents, stress, ill health and cumulative musculoskeletal disorders (ILO, 2011). Agriculture accounts for about 24% of Uganda's GDP and employs over 70% of the population, most of whom live in rural areas (FAO, n.d.). The sector has therefore been instrumental in economic progress, poverty alleviation and food security, and it is central to the agro-industrialisation agenda of the Third National Development Plan (NDP III) 2020/21–2024/25 (National Planning Authority [NPA], 2020). If this agenda is to be realised, the safety and health of the men and women who work in agriculture must be prioritised jointly by the Ministry of Agriculture, Animal Industry and Fisheries, the Ministry of Health, and the Ministry of Gender, Labour and Social Development (MGLSD).

1.2 Problem statement

Uganda's agricultural value chain comprises a wide diversity of food and cash crops, livestock and fisheries enterprises. Over time, this diversity has exposed employees, employers, farm visitors and populations living near agricultural land to a broad range of occupational hazards and accidents, including entanglement in machinery, exposure to pesticides, zoonotic infections, manual handling injuries and long working hours (ILO, 2011; Fuhrimann et al., 2022). A recent meta-analysis of studies from developing countries found that only about 43% of farmers follow safe pesticide-use practices, while about 30% report acute health symptoms after pesticide exposure (Desye et al., 2024). In Uganda, stakeholders in the coffee sector ranked contact with pesticides as the highest-risk occupational hazard, ahead of ergonomic, biological, environmental and psychosocial hazards (Wey et al., 2026). The national OSH legal framework is largely general and has been described as outdated, weak and poorly aligned with the OSH needs of different economic sectors (Atusingwize et al., 2019). At farm level, hazard control tends to rely on personal protective equipment (PPE) rather than on more effective measures, and many workers lack the training, awareness and empowerment needed to protect themselves (Atusingwize et al., 2019; Wekoye et al., 2020). These problems are compounded by the gendered division of agricultural labour and by low literacy among farm workers (Fuhrimann et al., 2022; Wekoye et al., 2020). Although each of these issues has been reported separately, there is limited literature that brings together the legal, technical and social dimensions of agricultural OSH in the Ugandan context. This knowledge and information gap weakens the design of policies and interventions aimed at protecting the sector's workforce.

1.3 Objectives of the review

1.3.1 General objective

The general objective of this review was to provide a consolidated understanding of occupational safety and health in Uganda's agricultural sector, with particular attention to the national legal framework, the hierarchy of controls, gender and literacy.

1.3.2 Specific objectives

i. To examine the national legal and policy framework governing agricultural occupational safety and health in Uganda.
ii. To review the application of the hierarchy of controls to the mitigation of agricultural hazards.
iii. To examine the gender dimensions of agricultural occupational safety and health.
iv. To assess the influence of literacy on awareness of, and compliance with, occupational safety and health practices in agriculture.

2. Methodology

2.1 Review design

This study adopted a narrative (non-systematic) literature review design. A narrative review was considered appropriate because the objectives span legal, technical and social questions that are addressed in different types of documents, ranging from legislation and government guidelines to international technical publications and empirical studies, which cannot be pooled statistically.

2.2 Sources of information

Four categories of sources were reviewed: (i) national legal instruments, namely the Constitution of the Republic of Uganda (1995), the Occupational Safety and Health Act (2006), the Workers' Compensation Act (2000) and the Employment Act (2006); (ii) government policy and planning documents, including the national OSH profile for Uganda (MGLSD, 2004), the standard operating procedures for the prevention and control of COVID-19 in the agricultural sector (MGLSD, 2021) and the Third National Development Plan (NPA, 2020); (iii) publications of international organisations, including the ILO code of practice on safety and health in agriculture (ILO, 2011), the ILO Safety and Health in Agriculture Convention (ILO, 2001), the 2030 Agenda for Sustainable Development (United Nations, 2015) and guidance on the hierarchy of controls from the National Institute for Occupational Safety and Health (NIOSH, 2024); and (iv) peer-reviewed empirical studies and reviews on agricultural OSH in Uganda and other low- and middle-income settings.

To capture current evidence, the review was updated with twenty peer-reviewed studies published between 2021 and 2026, identified through searches of scholarly repositories and publisher platforms, including ResearchGate, the Directory of Open Access Journals, PubMed Central and journal websites. Search terms combined *occupational safety and health*, *agriculture*, *farmers* and *farm workers* with terms for specific hazards (pesticides, machinery, musculoskeletal disorders, heat stress, zoonoses), groups (women, children, migrant workers) and interventions (training, personal protective equipment). Studies were retained if they were published in a peer-reviewed journal, addressed the safety or health of agricultural workers, and reported primary data or a structured review. Priority was given to studies from Uganda and sub-Saharan Africa, supplemented by systematic reviews and studies from other regions where they addressed a review theme directly.

Sources were selected purposively on the basis of their relevance to at least one of the four review themes, their focus on agriculture or on OSH regulation in Uganda, and their availability in English.

2.3 Data analysis

The selected documents were read in full and the relevant content was extracted and organised under the four themes defined by the specific objectives. Findings were then synthesised thematically, comparing the provisions of legal instruments with the evidence on practice reported in empirical studies, in order to identify gaps and their implications for agricultural OSH in Uganda. The results of this synthesis are presented and discussed in Section 3 and summarised in Section 4.

3. Results and Discussion

3.1 National legal and policy framework for agricultural OSH

3.1.1 Evolution of OSH legislation in Uganda

Uganda's OSH legal framework, although straightforward, has historically been old (MGLSD, 2004). The Factories Act of 1964, enacted shortly after independence, was modelled on British legislation inherited from the colonial period, with minor modifications to suit the Ugandan context (MGLSD, 2004). Several labour laws now contain OSH components, but most are outdated, weak and not well streamlined to address the OSH needs arising from different economic activities (Atusingwize et al., 2019).

3.1.2 Current OSH legal instruments

The principal OSH policy and legal instruments in force in Uganda today are the Occupational Safety and Health Act, 2006; the Workers' Compensation Act, 2000; and the Employment Act, 2006 (Atusingwize et al., 2019). Although each instrument has specific objectives, they share the general aim of promoting decent work among the Ugandan labour force. Their main provisions and their implications for agriculture are summarised in Table 1.

Table 1: Principal legal instruments on occupational safety and health in Uganda

Instrument	Main OSH-related provisions	Implications for agriculture
Constitution of the Republic of Uganda (1995)	Supreme law; protects human dignity; requires Parliament to provide for the right to work under satisfactory, safe and healthy conditions (Art. 40); protects children from economic exploitation and harmful work (Art. 34(4)).	Sets the guiding principles, but these must be operationalised through sector-specific laws and enforcement to reach farm settings.
Occupational Safety and Health Act (2006)	Backbone of OSH implementation; establishes the rights, duties and responsibilities of employers and workers, welfare and health requirements, and the Occupational Safety and Health Board.	General in scope; agricultural hazards such as agrochemicals, farm machinery and animal handling are not addressed through dedicated provisions.
Workers' Compensation Act (2000)	Provides for compensation of workers for injuries suffered and diseases contracted in the course of their employment.	Benefits depend on an employment relationship, which many family and casual farm workers do not have.
Employment Act (2006)	Regulates employment relationships, wages, leave, working hours and termination of employment.	Working-hour limits are relevant to fatigue-related farm injuries, but enforcement in informal and seasonal agriculture is limited.

Source: Compiled by the authors from the Constitution of the Republic of Uganda (1995), MGLSD (2004) and Atusingwize et al. (2019).

Despite continuing efforts by the Parliament of Uganda and labour unions to bring OSH legislation into line with a fast-changing work environment, the legislation remains too general to address the many labour challenges and hazard phenomena specific to agriculture. The ILO Safety and Health in Agriculture Convention, 2001 (No. 184) provides an international benchmark for such sector-specific provisions, covering, among other things, machinery safety, the sound management of chemicals, animal handling and the protection of young and women workers (ILO, 2001). Recent studies from comparable settings make a similar case for sector-specific rules. A survey of orthopaedic surgeons in Pakistan, for instance, concluded that dedicated safety regulations for farm machinery are needed to reduce the toll of machine-related injuries (Raza et al., 2024), while a Kenyan study recommended that health and safety enforcement agencies use evidence on PPE use among pesticide handlers to guide interventions and policy (Kinyua et al., 2023). Prevention frameworks for farmer injuries likewise identify enforcement, alongside education, engineering, economic incentives and emergency response, as one of the five complementary strategies needed to reduce injuries (Qi et al., 2024).

3.1.3 Constitutional provisions, international commitments and child labour

The Constitution of the Republic of Uganda (1995) contains several articles that promote respect for human dignity at work. These are consistent with ILO labour standards and with Sustainable Development Goal (SDG) 8, Decent Work and Economic Growth, whose aim is to promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all (United Nations, 2015).

Globally, about 70% of child labour is found in agriculture, the highest share of any economic sector (ILO, 2011; Watterson et al., 2020). This is largely due to the heavy reliance of farms on family labour, supplemented occasionally by wage labour (Scherrer & Radon, 2019). Article 34(4) of the Constitution provides that:

> *"Children are entitled to be protected from social or economic exploitation and shall not be employed in or required to perform work that is likely to be hazardous or to interfere with their education or to be harmful to their health or physical, mental, spiritual, moral or social development." (Constitution of the Republic of Uganda, 1995, Art. 34(4))*

Nevertheless, many children below the minimum employment age are exposed to agricultural hazards such as pesticides, because most of them live and grow up in farm settings. Evidence from West Africa illustrates the consequences. In an analysis of 3,338 school-going children in the cocoa-growing regions of Ghana and Côte d'Ivoire, more than half were engaged in hazardous agricultural work; these children were far more likely to suffer work-related injuries, mostly cuts and wounds, and were more likely to repeat a school grade than children who did no such work (Pirkle et al., 2024). Hazardous child labour therefore harms not only children's health but also their education, and with it their future capacity to understand and apply OSH information. The gap between the constitutional guarantee and conditions on the ground illustrates the need for agriculture-specific regulations, guidance and enforcement mechanisms.

3.2 Hierarchy of controls in agricultural hazard mitigation

The hierarchy of controls is a framework used by OSH professionals to systematically identify, select and prioritise interventions to address workplace hazards (NIOSH, 2024). It ranks risk management measures in order of effectiveness so that, if followed, risks in the agricultural sector can be reduced as far as is reasonably practicable (Wekoye et al., 2020). The elements of the hierarchy are commonly represented as an inverted triangle, with the most effective measure (elimination) at the top and the least effective measure (PPE) at the bottom, as shown in Figure 1. Everyone working on a farm should be familiar with this framework. Notably, many farmers already apply one or two of these strategies based on indigenous knowledge, without prior formal training (Akullo et al., 2007). Applying the hierarchy effectively begins with identifying and prioritising hazards. In Uganda, the recently developed Tool for Identifying Occupational Exposures and Risks in Agriculture (TIERRA) enabled local stakeholders in Mbale District to reduce a list of 80 candidate hazards in coffee farming to 23 priorities spanning biological, chemical, ergonomic, physical, environmental and psychosocial categories (Wey et al., 2026). Participatory tools of this kind provide a practical starting point for selecting controls at the appropriate level of the hierarchy.

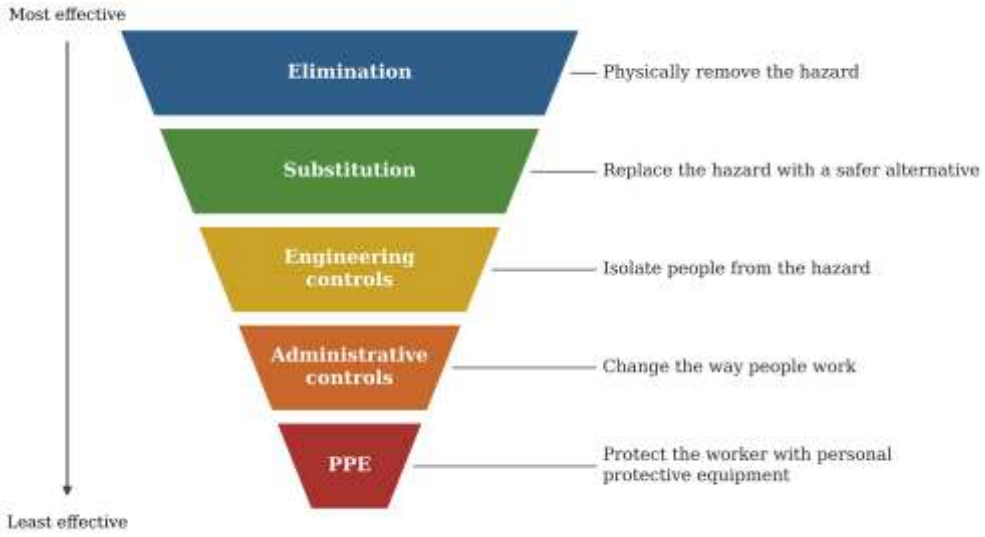


Figure 1: Hierarchy of controls (adapted from NIOSH, 2024)

3.2.1 Elimination

Elimination is the most preferred measure for guaranteeing the safety of agricultural workers because it physically removes the hazard from the work environment (NIOSH, 2024). In an agricultural setting, for example, a farm employer can work towards eliminating the risk of zoonotic diseases such as rabies through disease-eradication measures that include animal and human vaccination, proper disposal of animal and human waste, and the provision of separate water supplies for animals and people (ILO, 2011). Such measures depend on awareness among those who handle animals. A qualitative study of livestock traders and trekkers in the Lake Victoria crescent of East Africa found that, although participants could name diseases such as brucellosis and anthrax, few could tell which were transmissible to humans, and some continued to skin and eat animals that had died of unknown causes (Majiwa et al., 2024). Elimination of zoonotic risks therefore needs to be combined with targeted awareness among farmers and livestock traders.

3.2.2 Substitution

Substitution replaces an existing process or material with a less hazardous alternative (NIOSH, 2024). It is applied where elimination is not feasible. In adopting a substitute, safety practitioners must consider its cost and effectiveness and ensure that it does not introduce new hazards. For instance, an agrochemical formulation that readily becomes airborne as vapour, mist or dust carries a high risk of inhalation; replacing it with a granular or pelleted formulation of the same product, or with a less toxic product, reduces worker exposure.

The case for substitution is strengthened by recent Ugandan evidence on the health effects of commonly used pesticides. Among 288 smallholder farmers, glyphosate, cypermethrin and mancozeb were the most frequently used active ingredients, and higher combined exposure to multiple pesticides was associated with poorer performance in tests of visual memory, verbal fluency, motor speed and attention (Fuhrimann et al., 2021). A follow-up study of 253 farmers that used both questionnaires and urinary biomarkers found that recent application of pesticides, and of glyphosate and mancozeb in particular, was associated with sleep problems (Fuhrimann et al., 2023). In rural Ethiopia, pesticide applicators reported symptoms such as skin irritation, cough, shortness of breath and dizziness considerably

more often than non-applicator residents (Tessema et al., 2022). Replacing the most hazardous products with safer alternatives, and adopting integrated pest management, would reduce these exposures at their source.

3.2.3 Engineering controls

Engineering controls isolate people from a hazard through the application of technology and physical barriers (ILO, 2011). On farms, they frequently target power-transmission components that endanger people working near moving parts. For example, guards are installed on gear trains, belts, ropes, chains and sprocket drives to prevent entanglement of body parts. Such controls should be built into farm machinery at the earliest stages of the iterative design process. A designer who specifies filleted and chamfered edges and vertices on engineering drawings, for instance, enables fabricators to produce finished equipment without the sharp edges that cause cuts and lacerations. The importance of such controls is evident in Pakistan, where orthopaedic surgeons recorded 507 agricultural machine injuries over six months, about a quarter of which were fatal; fodder cutters and threshers caused nearly four in five of these injuries, and more than a third involved amputation (Raza et al., 2024). As mechanisation expands in Uganda, guarding of such machines at the point of manufacture and sale will be essential.

3.2.4 Administrative controls

Administrative controls comprise practices, procedures and work systems that prioritise the protection of agricultural workers (ILO, 2011). According to the ILO (2011), they may be implemented through the following measures:

i. **Minimising the number of workers exposed and excluding non-essential persons.** This measure was widely applied during the COVID-19 pandemic. The MGLSD (2021) urged employers, employees and self-employed persons to stay at home where possible, hold virtual meetings or work remotely, avoid busy public places, and, in the agricultural sector, stagger employees' work schedules.

ii. **Reducing the duration of workers' exposure.** Ugandan employment law limits normal working hours to 48 hours per week, typically eight hours per day, and entitles employees to overtime pay at one and a half times the normal rate (MGLSD, 2004; Employment Act, 2006). Wekoye et al. (2020) found that workers who worked for more than nine hours a day had higher odds of injury, particularly of a psychological nature. Similar patterns are reported in agriculture: among 990 seasonal and migrant farmworkers in Ethiopia, working more than eight hours a day, work-related stress and thermal discomfort were each associated with higher odds of injury (Gelaye et al., 2021), and longer working hours have been linked to more frequent musculoskeletal pain among agricultural workers in low- and middle-income countries (Shivakumar et al., 2024). Working hours on farms therefore deserve close attention.

iii. **Organising work to reduce heat and ergonomic strain.** Scheduling strenuous tasks for cooler hours, providing drinking water and shaded rest areas, and allowing suitable clothing are among the protective factors identified for heat stress (El Khayat et al., 2022). Ergonomic strain can be reduced by limiting heavy lifting, awkward postures and repetitive movements, which are consistently associated with work-related musculoskeletal disorders in farmers (Akbar et al., 2023).

iv. **Providing safe storage for farm inventory.** Storage should follow the 5S principles of workplace organisation: sort, set in order, shine, standardise and sustain.

3.2.5 Personal protective equipment

Personal protective equipment refers to clothing and devices worn by individuals at risk of exposure to hazards. PPE should not be preferred over the measures higher in the hierarchy; rather, it should serve as a supplementary measure that reinforces them (NIOSH, 2024). The ILO (2011) groups PPE into head protection, face and eye protection, upper and lower limb protection, and protection against falls from height, and states that PPE should be provided to agricultural workers by employers free of charge. Because of the nature of some agricultural work, consistent use of PPE can be difficult; nonetheless, workers have an obligation to use the PPE available to them correctly, without creating additional hazards through its misuse.

Recent studies from East Africa show that PPE use remains very limited. In the Mwea Irrigation Scheme in Kenya, none of 246 pesticide handlers used a complete set of PPE; while most wore trousers and long-sleeved clothing, fewer than 3% used gloves or gumboots, and PPE use was associated with training, safety knowledge and attitudes towards PPE (Kinyua et al., 2023). Among smallholder farmers in northwestern Ethiopia, high cost was the most common reason for not using PPE, cited by about two-thirds of respondents, followed by limited knowledge of the health effects of pesticides and discomfort when wearing the equipment (Chekol, 2025). Risky handling practices are also common: Ethiopian applicators reported mixing pesticides with a stick without gloves and dumping empty containers in open fields (Tessema et al., 2022). These findings show that the least effective level of the hierarchy is itself poorly implemented.

Among farm workers, PPE is often perceived as the most effective hazard control measure, a perception that reflects the information gap on OSH in the sector. The authors propose that this perception could be turned to advantage: the provision of PPE could serve as an entry point for engaging workers in training on more effective control measures, so that "PPE users become OSH learners". This proposition requires empirical investigation. It is consistent, however, with the observation by Vigoroso et al. (2021) that poor safety attitudes, which contribute to unintentional injuries, should be addressed not only through training but also through targeted multi-level interventions. Economic pressure further limits workers' ability to demand PPE, as a key informant in the study by Atusingwize et al. (2019) explained:

> *"So, with this high rate of unemployment, there is no way you can demand for protective gear, yet other people are waiting to be employed. Most of the workers are ignorant, sometimes thinking that they are at the mercy of the employers that even if they have not been given protective gear, they still work." (Key Informant, Ministry of Gender, Labour and Social Development, cited in Atusingwize et al., 2019)*

3.2.6 Application of the hierarchy of controls on farms

Table 2 summarises how each level of the hierarchy of controls can be applied to common agricultural hazards, based on the examples discussed above.

Table 2: Application of the hierarchy of controls to agricultural hazards

Level of control	Principle	Agricultural examples
Elimination	Physically remove the hazard	Vaccination of animals and people against zoonoses such as rabies; proper disposal of animal and human waste; separate water supplies for animals and people.
Substitution	Replace the hazard with a safer alternative	Granular or pelleted agrochemical formulations in place of volatile or dusty ones; less toxic products in place of highly hazardous ones.
Engineering controls	Isolate people from the hazard	Guards on gears, belts, chains and sprocket drives; filleted and chamfered edges specified at the machine design stage.
Administrative controls	Change the way people work	Limiting the number of exposed workers and restricting access; respecting working-hour limits; staggered schedules; 5S-based storage of farm inventory.
Personal protective equipment	Protect the worker with protective equipment	Head, face and eye, upper and lower limb, and fall protection, provided free of charge by the employer and used as a supplementary measure.

Source: Compiled by the authors from ILO (2011) and NIOSH (2024).

3.3 Gender in agricultural occupational safety and health

Women constitute about 43% of the agricultural labour force in developing countries, ranging from about 20% in Latin America to about 50% in Eastern Asia and sub-Saharan Africa (Global Agriculture, n.d.). Agricultural OSH concerns, risk groups and specific risks must therefore be addressed with the recognition that a large proportion of agricultural workers are women (ILO, 2011). Case studies from agricultural value chains in the Global South show that gendered differences in OSH outcomes, for example in oil palm production, arise from differences in the tasks performed by men and women, from sex stereotyping and from workers' self-perceptions, which are embedded in the organisation of production (Scherrer & Radon, 2019).

Evidence from Uganda points in the same direction. In a gender-stratified analysis of the effect of recent pesticide exposure on sleep among smallholder farmers in Uganda, Fuhrimann et al. (2022) found that women appeared to be more susceptible than men to the effects of pesticide exposure on sleep, despite applying pesticides less frequently. This finding suggests that exposure assessment and protective measures designed around male workers and male application patterns may underestimate the risks faced by women. It also underlines the importance of including women in OSH training and of ensuring that PPE is available in sizes and designs suitable for them.

Qualitative evidence from neighbouring Tanzania adds depth to this picture. In focus group discussions with 46 women working on horticultural farms, Olirk et al. (2025) found that, although spraying is usually done by men, single and poorer women also apply pesticides, often for lower pay. Few of the women had received formal training, PPE was rarely used because of its cost, pesticides were often stored inside homes within reach of children, and pregnant women continued farm work until late in pregnancy and resumed it soon after giving birth. The authors conclude that economic necessity and gender norms keep women exposed despite their awareness of the risks. Gender also appears among the risk factors for heat-related illness among farmworkers (El Khayat et al., 2022). These findings support gender-sensitive OSH education, affordable PPE and safer work arrangements for women in agriculture.

3.4 Literacy and agricultural occupational safety and health

Given the integrated nature of the 17 SDGs, SDG 4, Quality Education, can contribute to addressing OSH challenges. SDG 4 seeks to ensure inclusive and equitable quality education and to promote lifelong learning opportunities for all, so that the global population attains high levels of literacy and numeracy (United Nations, 2015). Evidence from Indian tea plantations shows that workers' vulnerability is determined not only by age, caste, religion and gender but also by their level of education (Scherrer & Radon, 2019). Because of low literacy (Wekoye et al., 2020) and limited government support, workers often do not know their basic labour rights or the preventive measures related to OSH (Scherrer & Radon, 2019; Wekoye et al., 2020).

People with higher levels of education are more likely to understand harmful exposures and to seek to avoid them; in Kampala, workers with secondary or higher education were more likely than those without formal education to practise OSH (Wekoye et al., 2020). A meta-analysis covering developing countries similarly found that farmers with formal education were about five times more likely to follow safe pesticide-use practices, and that good knowledge, positive attitudes and longer farming experience were also associated with safe practice (Desye et al., 2024). Fuhrimann et al. (2022) observe that poorly educated smallholder farmers in low-income countries are highly exposed to pesticides, which is a serious social and public health concern. In the study by Atusingwize et al. (2019), key informants reported limited public awareness of the right to a safe working environment, and noted that most workers lack the training, sensitisation and empowerment needed to make decisions about their safety and health at work. The effect was reported to be greatest among less-educated wage earners and to be compounded by the shift towards technologically complex working environments. As one key informant put it:

> *"High-risk jobs are normally handled by illiterate and low-paid individuals. These are uninformed about OSH and hence put their lives at risk. Today we have very sophisticated systems in an unsophisticated culture. We have to develop with the world, yet our systems are not yet ready to handle the safety issues that come with some technologies." (Key Informant, National Agricultural Research Organisation, cited in Atusingwize et al., 2019)*

The higher compliance with OSH among literate than among illiterate workers may also be partly explained by the fact that most international and national labour laws and policies are published in English rather than in local languages. Workers who cannot read these instruments are less able to understand, claim or exercise the rights and duties they establish.

Digital technologies offer new opportunities to close this gap. The use of digital platforms grew markedly during the COVID-19 pandemic and has proved to be an effective way of

training workers (Vigoroso et al., 2021). Digital training approaches such as serious games and three-dimensional virtual reality, which are more engaging than traditional methods, have been reported to produce higher levels of knowledge and satisfaction after training (Vigoroso et al., 2021). A feasibility study in the United States found that an augmented reality simulator depicting farm accidents was well accepted by farm parents and their children, who considered it realistic, easy to use and useful (Namkoong et al., 2023). Such approaches, adapted to local languages and to low-literacy users, deserve to be explored as a means of improving the understanding and visualisation of agricultural OSH among farming communities. Peer learning is a further option: O'Connor et al. (2021) show that farmer discussion groups create space for peer learning about safety and health, and they emphasise that access to, and understanding of, relevant information is an important aspect of OSH promotion. The role of literacy in promoting agricultural OSH therefore cannot be overstated.

Training must, however, be designed and sustained carefully. A scoping review of 19 studies concluded that OSH training in agriculture generally improves safety awareness and reduces risky behaviour, but that the knowledge gained needs regular reinforcement and updating (Vaher & Merisalu, 2023). Training alone may not change practice: in Ethiopia, many applicators who had attended training still followed unsafe practices (Tessema et al., 2022). Training content should also reflect how farmers actually reason about risk. In livestock-handling scenarios, farmers tended to rate stress and fatigue as low risks and weighed safety against animal welfare and a sense of duty, which suggests that safety messages aligned with farmers' own priorities, and training in non-technical skills such as situational awareness, could be more persuasive (Tone & Irwin, 2022).

4. Summary of Key Findings

The four themes reviewed are closely interlinked: general legislation leaves agricultural hazards under-regulated; weak regulation and limited awareness result in a reliance on PPE rather than on more effective controls; and gender and literacy shape who is exposed and who is able to act on OSH information. Table 3 summarises the key findings, the gaps identified and their implications.

Table 3: Summary of key findings of the review

Theme	Key finding	Gap identified	Implication
Legal and policy framework	OSH law is anchored in the Constitution (1995), the OSH Act (2006), the Workers' Compensation Act (2000) and the Employment Act (2006).	Laws are general, partly outdated and not agriculture-specific; child labour persists in farm settings.	Need for agriculture-specific OSH regulations and stronger enforcement.
Hierarchy of controls	Farmers apply some controls through indigenous knowledge; PPE is widely perceived as the most effective measure, yet few farmers use it fully.	Elimination, substitution and engineering controls are underused; PPE is costly and often unavailable.	Integrate the hierarchy of controls into machine design, extension services and farm management.
Gender	Women form a large share of the agricultural workforce, may be more susceptible to some exposures, and face economic and social pressures that sustain exposure.	OSH measures and exposure assessment rarely account for gender differences.	Gender-responsive OSH training, PPE provision and research.
Literacy	Formal education is strongly associated with safe practice; training improves awareness but needs reinforcement.	OSH instruments are mainly in English; many workers do not know their rights.	Translation into local languages; digital and peer-learning approaches.

Source: Authors' synthesis of the reviewed literature.

5. Conclusion

Uganda has a number of labour instruments and active trade unions, with the Constitution of the Republic of Uganda (1995) as the supreme legal framework for OSH. However, the review of the literature shows that it is not enough simply to amend these laws; they must also become sector-specific in order to address the diverse hazards found in sectors such as agriculture. At farm level, hazard control remains concentrated at the bottom of the hierarchy of controls, while the more effective measures of elimination, substitution and engineering controls are underused. Women's distinct exposures and the low literacy of many farm workers further limit the effectiveness of current OSH efforts.

In implementing ILO standards and the United Nations 2030 Agenda for Sustainable Development, in particular SDG 3 (Good Health and Well-being), SDG 4 (Quality Education), SDG 5 (Gender Equality) and SDG 8 (Decent Work and Economic Growth), these commitments should be interpreted, contextualised and translated into local languages so that they are clearly understood and relevant to agricultural OSH. Doing so would support a policy framework for better-quality jobs in rural areas and for inclusive and sustainable economic growth, employment and decent work for both literate and illiterate workers.

6. Recommendations

6.1 Recommendations for policy

i. The Ministry of Gender, Labour and Social Development, in collaboration with the Ministry of Agriculture, Animal Industry and Fisheries and the Ministry of Health, should develop agriculture-specific OSH regulations under the Occupational Safety and Health Act (2006), drawing on the provisions of ILO Convention No. 184 (ILO, 2001).

ii. Child labour provisions in the Constitution should be operationalised in the agricultural sector through community-level monitoring and awareness campaigns on the hazards of farm work for children.

iii. Key OSH instruments and guidelines should be translated into major local languages and disseminated in simplified, illustrated formats suitable for low-literacy users.

6.2 Recommendations for practice

i. Agricultural extension services should incorporate the hierarchy of controls into farmer training, emphasising elimination, substitution and engineering controls before PPE.

ii. Designers and fabricators of farm machinery should integrate engineering controls, such as guarding of moving parts and the removal of sharp edges, at the design stage.

iii. Employers should provide appropriate PPE free of charge, including PPE suitable for women, and use its distribution as an opportunity to train workers on broader OSH measures.

iv. Farmer groups and cooperatives should use peer-learning platforms and digital tools to share OSH knowledge.

v. Farm managers should apply participatory hazard-prioritisation tools, such as TIERRA, and introduce heat-stress and ergonomic measures, including work scheduling, drinking water, shade and limits on heavy lifting.

6.3 Areas for further research

i. Empirical studies of the prevalence and causes of occupational injuries and diseases among agricultural workers in Uganda, disaggregated by gender, age and education level.

ii. Evaluation of whether the provision of PPE can be used effectively as an entry point for broader OSH training among farm workers.

iii. Assessment of the effectiveness of digital, local-language OSH training tools for low-literacy farming communities.

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Conflict of Interest

The authors declare that they have no conflict of interest.

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