

**AGRICULTURAL HEALTH IN THE GAMBIA II:
A SYSTEMATIC SURVEY OF SAFETY AND INJURIES
IN PRODUCTION AGRICULTURE**

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Abstract: This study was undertaken to provide baseline information on the injuries and health and safety conditions in Gambian agriculture. The objective was to produce information to guide the formulation of an agricultural health and safety policy for the country, future investigations, prevention and surveillance of the adverse health effects in agriculture. A cross-sectional survey of 20 farmers, 20 nurses, and 20 agricultural extension workers was conducted in the Central and Upper River Divisions of The Gambia. The survey was implemented by the means of questionnaires, walk-through survey and hazard checklist. Seventy percent of farms reported an injury during the past year. Major sources and contributing factors for the injuries were characterized. Predisposing factors to the injuries were climatic conditions, working in static positions, bending and twisting and carrying heavy objects. Cuts and lacerations were identified as the commonest injury types and the most common sources were hand tools (hand hoe, cutlass, axe and knife) and animal-powered carts. A workshop for the major stake holders in the country's agriculture was also held to identify problems and possible solutions for health promotion of Gambian farmers.

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INTRODUCTION

An estimated 1.3 billion workers are engaged in agriculture worldwide. This figure represents as much as half of the world's labour force [8]. The majority of agricultural workers are found in developing countries, where as much as 60% of the world's agricultural labour force is concentrated [6]. According to Scherf, the world's agricultural population is distributed as follows: Asia, 2,016 million (75.9%); Africa, 350 million (12.8%); Latin America, 112 million (4.1%); Near East, 102 million

(3.7%); Europe, 87 million (3.2%) and North America, 7 million (0.3%) [23]. The agricultural population of The Gambia is approximately 522,000 [31].

The occupational hazards of agriculture in industrialized countries are well documented, but there is very little information on those of developing countries. We found no studies addressing health and safety in Gambian agriculture.

Small-scale, self-employed farmers predominate in production agriculture in Africa [6, 8]. With mining and construction, agriculture ranks as one of the three most

hazardous occupations in the world [11, 22, 27]. About 170,000 farm workers are killed each year and millions more are either seriously injured in workplace accidents or poisoned with pesticides and other agrochemicals [8]. It is likely that under-reporting of deaths, injuries and occupational diseases in agriculture is common and the real numbers are higher than indicated by official statistics [8]. The situation could be even worse in Africa, where data on occupational health and safety morbidity and mortality are mostly lacking [7].

In most African countries, overt occupational diseases caused by exposures to high levels of workplace toxins are encountered frequently [21]. Parasitic infections, acute health effects and deaths from high-level pesticide exposures are common occurrences. Many unnecessary, avoidable injuries and disabilities ensuing from working with unprotected machinery and lack or ineffective personal protective equipment at the workplace still prevail [2, 3, 21, 27]. In South Africa, London *et al.* [15] reported that low educational levels, chronic under nutrition, alcohol related trauma, domestic violence linked to alcohol abuse and pesticide poisonings associated with alcohol use are all problems among farmers in the Western Cape.

Additional hazards in African agriculture include injuries from handling livestock [16], working in extreme temperatures, sunlight, humidity, noise, vibration and many occurrences of slips, falls, sprains and fractures [2, 30]. Agricultural workers also experience musculoskeletal injuries from long work hours, repetitive motions, lifting and carrying heavy objects, and working in awkward positions for extended periods. Snake bites, insect bites and stings, exposure to poisonous plants and attacks by other forms of wildlife are other types of hazards [2, 18, 30]. However, most of these studies have been primarily observational and not analytic.

Other factors unique to third world countries compound to make the control of workplace hazards even more challenging in Africa. Occupational and safety legislations are either lax or absent [35]. The small and hazardous industries of African countries face difficulties operating under the more stringent safety regulations of the developed countries. Most African industries are small-scale establishments that easily encounter economic problems implementing and maintaining health and safety standards [36].

Almost 75% of the rural population of The Gambia is employed in agriculture, but agriculture is not featured in the existing labour laws of the country [4, 12, 31]. Farm work in The Gambia is largely performed with draught animals and hand tools; methods that have inherent risks [7, 13]. Animal-drawn carts are not equipped with restraints or lighting and marking features which creates risks from collisions with motor vehicles and people falling off the carts. Farmers rarely use personal protective devices when engaged in farm work and although efforts are being made, the majority of farmers lack proper training on the techniques of agrichemical

handling including pesticides [9, 10, 17, 33]. Gambian farmers seldom report agriculture-related injuries or illnesses and data on farm injuries are not collected [5, 9, 10, 17, 31, 33].

Although there is evidence that occupational health in agriculture is a major concern in developing countries, there is very little quantitative information upon which a control programme can be developed. This study is the first systematic survey on the health, safety and injury hazards of production agriculture in The Gambia and in all of western Africa. It was undertaken to provide direction for the development of a model occupational health and safety programme and policy for the country. The study is divided into two parts. First, a systematic survey of occupational injuries is described. Secondly, the results and recommendations of a consensus workshop involving multiple stakeholders are reported.

METHODS

The study was conducted in three stages: 1) walk-through survey using a hazard checklist; 2) Cross-sectional survey of extension workers, farmers and nurses; and 3) workshop to solicit recommendations from stakeholders to guide the formulation of training curricula, and a health and safety policy for the country.

The Study Protocol was approved by the Institutional Review Board of The University of Iowa and the Ethics Committee of The Gambia. Informed consent of the farmers was sought by explaining the objectives of the study to the farmer in his/her local language and also assuring confidentiality of the responses.

Walk-through survey and hazard checklist. Ten farms from different districts in the Central and Upper River Division (CRD and URD) of The Gambia were identified by agricultural extension workers for this stage and four out of those farms (one peanut, one rice, one vegetable and one small grain) were selected. In order to capture the primary growing season, this stage was implemented on four different days at 2-month intervals between May–December and lasted about an hour per farm. It was conducted by four extension workers; each with more than five years working experience and fluent in the local languages.

The walk-through survey comprised a field observation to scrutinize the nature and condition of farm tools and equipment, so as to identify occupational stressors, equipment hazards and the routes, frequency and duration of possible exposures. Farmers were questioned about performed tasks, personal protective equipment (PPE) use, and their perceptions of the impact of farming on their health. The hazard checklist covered potential risks, injuries and illnesses in the various steps of the farming process, for each crop farmed, including draught animals, livestock and agrochemicals. With the exception of the demographic data, all items on the checklist were recorded as yes/no alternatives.

Cross sectional survey. This stage comprised three separate sets of questionnaires administered to assess the level of awareness of agricultural safety, illnesses and injuries among: a) agricultural extension workers, b) farmers and c) nurses.

A random sample of 20 agricultural extension workers was recruited from a list provided by the Divisional Agricultural Coordinator (DAC) in URD of extension workers in CRD and URD. Recruits were asked to convene at the divisional agricultural station in Mansa Jang (Basse), the following day, by having their names broadcasted over local radio the previous evening.

The survey population of farmers was selected in two stages. First the extension workers were asked to identify 100 farmers in each of the two divisions (URD and CRD) whom they thought represented typical farmers of the region. The names of the identified farmers were written individually on pieces of paper that were folded and put in a box. The folded papers were thoroughly mixed by vigorously shaking the box. Next, the extension workers took turns drawing names out of the box, one at a time, until the required number of 20 participants was obtained.

The nurses were a convenience sample. They were identified with the help of the Divisional Health Teams (DHTs) of CRD and URD and convened at the DHT headquarters in Bansang, Basse Health Centre and Fatoto Health Centre. However, results from the nurses' survey are not reported here because their survey did not address similar injury questions.

The agricultural extension workers' and nurses' questionnaires were self-administered but each group was given a 2-hour training prior to response. Participants responded to the questionnaires individually but asked for clarifications were necessary.

As the majority of Gambian farmers are illiterate, the farmers' questionnaire was interpreted and administered by interview in the local language of the farmers by four extension workers who were specially trained for it. The farmers' responses were recorded in English.

Items for the questionnaires were selected from those used in the Keokuk County Rural Health Study [20, 34, 37], Certified Safe Farm [28], and Agricultural Health Study [1], and modified to fit The Gambian situation. They included closed- and open-ended questions on personal demographic data and farm characteristics; injuries and accidents; chemical handling, application and equipment; farm-related health and safety; and diseases.

Stakeholders' workshop. A full-day seminar and workshop on agricultural health and safety in The Gambia was organized by The Gambia College and The University of Iowa for the major stakeholders in the country's agriculture and health industries. The workshop was held at The Gambia College, School of Public Health auditorium in Brikama.

Thirty eight participants representing government departments, para-state agencies, agricultural and health institutions, farmer associations, educational and training

institutions, international organizations, aid agencies and non-governmental organizations with agricultural projects in the country were invited; thirty (25 males and five females) actually attended.

In the absence of an existing body of empirical evidence clearly demonstrating the effects of agriculture on the health and safety of farmers in the country, it was necessary to give participants a 2-hour series of lectures and demonstrations on agricultural health and safety, prior to the debates. The lectures were delivered by Dr. Kelley Donham, director of Iowa's Center for Agricultural Safety and Health (I-CASH) and professor of Occupational and Environmental Health at The University of Iowa. For maximum participation and a balanced representation of the discussions, participants were asked to form small mixed groups of 8-10 persons per group. Each group was given six topics (organized in a question format and identical to all groups) to focus their debate and recommendations. Each topic was discussed for 30 minutes, after which, presentations of group recommendations were made to the general body of participants for final and general critique.

The workshop discussed and debated the health and safety problems in Gambian agriculture and rural populations and made recommendations to guide the formulation of agricultural health and safety curricula for educational institutions and targeted special groups (farmers, farmer associations, etc.). The workshop also made recommendations for a comprehensive agricultural health and safety policy for the nation.

Statistical analysis. SPSS package (v. 11.5) was used for statistical analysis. Distributions of key variables were examined and differences in the responses of farmers and extension workers to the same questions were analyzed using the t-test (comparisons of means) and the Chi² test or Fisher's exact test (comparisons of proportions).

RESULTS

Walk-through survey. The majority of the farmers (i.e. 72%) on the four farms surveyed were observed to be inhaling large amounts of smoke and dust, especially during land preparation and harvesting. Eighty six percent worked the fields barefoot either on damp and uneven or dry and dusty ground surfaces.

Almost 80% of those farmers who used fertilizers applied them with their bare hands. Nearly 23% of all farmers were observed to have corns or calluses on their hands which were most probably due to frequent work with hand tools. About 35% of farmers complained of frequent headaches, 13% reported neck pains, 21% spoke of chronic cough and almost 46% said that they suffered from recurrent pains of the lower back. However, it was not very clear whether all reported complaints were related to farm work.

About 62% of the draught animals looked tired, underfed and overworked. Absolutely no animal cart was

Table 1. Walk-through Analysis of Gambian Agriculture: Work Tasks/Exposures Creating Health and Injury Risks.

Farm Work Tasks/Situations	Farmers ^a		Extension ^a Workers		p-value
	Mean ^b	SD ^c	Mean ^b	SD ^c	
Working in hot, cold, humid or wet conditions	8.47	1.26	7.32	3.50	0.18
Working in the same position for long periods	7.89	1.41	7.63	3.00	0.73
Bending or twisting back in an awkward way	7.78	2.37	7.10	3.31	0.48
Carrying or moving heavy materials	7.41	2.67	7.75	2.90	0.72
Land clearing and burning of clearings/debris	7.00	2.76	7.00	2.77	1.00
Lifting, pushing and pulling materials/equipment	6.95	2.63	7.20	3.79	0.81
Insufficient breaks or rest during work	6.94	2.18	7.25	3.04	0.73
Working in awkward or cramped positions	6.80	2.54	4.85	3.12	0.06
Chopping trees or wood with axe or cutlass	6.61	3.13	7.65	2.32	0.25
Working when injured or hurt	6.47	2.87	6.60	3.32	0.90
Hand digging with diggers/sticks/spades/shovels	5.67	3.13	6.45	3.07	0.46
Hits/strikes by equipment	5.38	2.58	4.95	2.93	0.65
Insect bites and stings	5.35	2.96	3.50	2.06	0.03
Repetitive motion	5.27	3.63	5.84	2.85	0.61
Wildlife attacks	5.08	3.63	5.28	2.93	0.87
Slips and falls	4.83	3.27	4.20	3.09	0.59
Working overhead	4.71	2.76	4.47	2.59	0.80
Farm animal kicks and bites	4.60	3.25	5.30	2.77	0.50
Shovelling earth, grain or other materials	4.24	2.54	5.11	2.97	0.36
Pressing/stripping/cutting wire	4.00	3.19	3.89	2.99	0.93
Stored energy release - twisting	3.76	2.41	4.72	2.97	0.30
Hyperextension - over the head	3.63	2.73	4.00	2.56	0.68

^aResponses of farmers and extension workers; ^bGraded on a 10.00 point scale (1 = not a hazard; 10 = major hazard); ^cStandard Deviation.

provided with foot rests or seats for driver and passengers; and about 68% were overloaded. Fifty three percent of the tyres to the carts were not properly inflated and 30% were in disrepair. None of the carts had lighting and marking features.

With the exception of cattle that are usually in the custody of herders, most livestock, including draught animals, were kept in the homestead. Special structures were provided for the housing of livestock in 67% of the homesteads, but in the majority of cases, animals roamed free in residences and animal droppings were observed in the yard of 56% of the homesteads.

Nearly 87% of the homesteads were constructed of mud walls and thatched roofs while natural ventilation and lighting were observed to be inadequate in more than 50%. Almost all of the wells in the homesteads (97%) were hand dug, unlined and found uncovered at the time of the survey. Hand dug latrines were present in 37% of the homesteads. Latrine walls were mostly constructed of sticks and tree branches and none had a roof.

CROSS SECTIONAL SURVEY

Demographics. The farmer study cohort comprised of 20 people (13 males and 7 females) from CRD and URD

and their mean age was 43 years (range: 29–70). The majority of the farmers (65%) were illiterate. About 35% reported to having had some schooling. Of those that reported to have been schooled, 28% claimed some literacy in English and 14% could either read or write Arabic. All had been engaged in agriculture for more than five years.

For the extension workers, the study cohort was also 20 people (19 males and 1 female) from the CRD and URD and their mean age was 39 (range, 24–52). All were literate in English and 85% had a working experience of more than five years.

Participation rate for the two groups was 100% and there were no dropouts. Gender distribution between the groups differed significantly (p-value 0.02) but there was no difference in their age means.

Crops and livestock. The farmers' survey indicated that 90% of farmers cultivated peanuts, 68% farmed millet, 53% maize, 47% vegetables, 37% sorghum and 35% farmed rice. All female farmers reported farming rice and vegetables.

Farm sizes averaged 1.3 hectares for peanuts, 2.3 hectares for millet, 1.0 hectare for maize, 0.45 hectare for vegetables, 1.7 hectares for rice and 1.4 hectares for

Table 2. Occupational Injuries to Gambian Farmers reported by Farmers and Extension Workers: Injured Parts of Body.

Body Part	% Farmers	% Ag Extension Workers	p-value
Head/Neck	–	16.6	
Eye(s)	–	27.7	
Chest/Trunk	–	16.6	
Back	5.3	27.7	0.190
Arm/Shoulder	–	33.3	
Hand/Wrist	10.5	61.0	0.002
Finger	10.5	61.0	0.002
Hip/Knee/Leg	10.5	55.5	0.005
Foot	68.4	88.8	0.230
-- no report			

Table 3. Occupational Injuries to Gambian Farmers reported by Farmers and Extension Workers: Farm Injury Types.

Injury Type	% Farmers	% Ag Extension Workers	p-value
Bruise	15.8	61.0	0.007
Burn	–	22.0	
Cut/Laceration	68.4	89.0	0.230
Crush	5.2	11.0	0.600
Fracture	–	50.0	
Puncture	5.2	55.0	0.001
Sprain/Strain	5.2	50.0	0.003
-- no report			

Table 5. Occupational Injuries to Gambian Farmers reported by Farmers and Extension Workers: Contributing Factors to Farm Injuries.

Factor Contributing to Injury	% Farmers	% Ag Extension Workers	p-value
Hurry	74	89	0.400
Fatigue	32	39	0.740
Stress	16	61	0.007
Illness	21	11	0.660
Previous injury	21	22	1.000
Weather conditions	10	33	0.120
Unwilling draught animal	37	72	0.100

sorghum. Regarding livestock, 57% of the farmers claimed to own cattle, 47% raised sheep and goats, 84% raised chickens, 53% had donkeys and 16% owned horses. The average number of livestock was 8 for cattle, 4 for sheep, 6 for goats, 9 for chickens, 2 for donkeys, and 1.6 for horses.

Farm work. The agricultural extension workers reported that agriculture, as presently practiced in the two divisions of the country, is 12.2% mechanized traction, 51.2% animal traction and 36.6 hand tools but the farmers reported that agriculture in their operations is 3.7% mechanized traction, 30.3% animal tractions and 66% hand tools. About 67% of agricultural extension workers indicated that farmers work the fields for 7-9 months in the year and spend an average of 7.5 hours per day on crop farming and 6 hours per day raising livestock. Respectively, 78% of the farmers reported working the farms for 9-10 months in the year and putting an average of 12 hours per day on crops especially during planting/cultivating and harvesting, and 3.5 hours per day on livestock. Both agreed that over 80% of the labour devoted to livestock is manual. On the way farm materials are transported to, from and around the farm, extension workers reported that 18% of all farm materials are transported either on the back, shoulder, or the head of farmers but the farmers put that figure at 26%. Almost all of the farmers reported having help on the farm. The number of farm help ranged from 1-14 people (average: 5) and comprised wives, children, relatives, friends and hired workers. Thirty five percent of farmers reported having off-farm jobs to which they put an average of 22 hours a week, mostly during the dry season.

Farm injuries. A high percentage of farmers (79%) and extension workers (89%) reported injuries on the farms during the past 12 months. However, the two groups reported differently on the severity of the injuries. Eighty three percent of the extension workers thought that the injuries necessitated taking the victims to the hospital or health center, while 37% of the farmers reported that the injuries were actually serious enough for prompt medical attention (p-value 0.03). On the loss of effective work time due to farm injuries, the farmers and extension workers reported the following: injuries causing only a few hours of lost work time [farmers 5 (26%); extension workers 2, (11%)], injuries causing several days of lost time [farmers 6 (32%); extension workers 8 (44%)], injuries causing several weeks of lost time [farmers 6 (32%); extension workers 4 (22%)], and injuries causing several months of lost time [farmers 0; extension workers 3 (16%)]. The extension workers appeared to report longer disabilities than the farmers, but the differences were not significant. There was also a disparity about the period during which injuries occurred. The extension workers suggested high rates of injuries occurring in four of the five stages of the farming cycle (i.e. land preparation, planting, weeding and harvesting), but the farmers reported close to 50% of all injuries occurring during land preparation and weeding.

The most important tasks/situations predisposing to the injuries were work positions, climactic factors, insufficient rest and tasks involving heavy manual labour (Tab. 1). The responses of farmers and extension workers were quite consistent with the exception of insect bites and

Table 4. Occupational Injuries to Gambian Farmers reported by Farmers and Extension Workers: Reported by Agent of Injury

	Reported Use of Equipment				Reported Injury Sources				p-value*
	Farmers		Extension Workers		Farmers		Extension Workers		
	No	%	No	%	No	%	No	%	
Cutlass	19	100	18	100	4	21	17	94	<0.010
Hand hoe	18	95	18	100	9	47	12	67	0.320
Rake	17	89	16	89	0	0	0	0	
Axe	16	84	17	94	4	21	12	67	0.008
Hand plough	15	79	16	89	3	16	8	44	0.080
Hand knife	15	79	15	83	3	16	8	44	0.080
Sickle	12	63	14	78	0	0	0	0	
Sine-hoe with attachments	11	58	18	100	4	21	12	67	0.008
Spade/Shovel	9	47	6	33	0	0	0	0	
Wheelbarrow	7	37	6	33	0	0	2	11	
Planting stick	7	37	10	56	1	5	0	0	
Tractor with attachments	4	21	11	61	0	0	0	0	
Watering can	3	16	10	56	0	0	1	6	
Power tiller	2	11	4	22	1	5	1	6	1.000
Rice thresher	0	0	3	17	0	0	0	0	
Livestock					0	0	7	39	
Animal drawn cart					1	5	8	44	0.008
Plant/Tree					3	16	3	17	1.000
Human error					3	16	8	44	0.080
Work surface					3	16	6	33	0.270
Pesticide					0	0	3	17	

* Fisher's exact test for the proportion, Reported Injury Sources/Reported Equipment Use between farmers and extension workers.

stings and working in awkward and cramped positions. Table 2 shows those parts of farmers' body that were injured. Both groups reported fairly consistently that the most injured part of the body was the foot and that cuts and lacerations were the most common injury types (Tab. 3). The most common injury sources were human error, hand tools and animal powered carts (Tab. 4). Contributing factors common to most of the injuries were unwilling draught animals and farmers hurrying to complete a task on time (Tab. 5).

Stakeholders' Workshop. Participants made the following general conclusions and recommendations for each of the six topics discussed:

1) Prevailing agricultural health and safety problems in The Gambia.

The groups identified the misuse of insecticides and antibiotics, the lack of awareness on zoonotic and other diseases related to agriculture, clinical exposures, lack of legislations pertaining to the importation and exportation of agrichemicals and other agricultural products, the unavailability of appropriate PPE, and the lack of knowledge on general environmental health issues and farm-related injuries by farmers.

2) Strategies to promote agricultural health and safety in The Gambia.

The groups concluded that research, communication and education are required for the promotion of agricultural health and safety in the country.

3) Potential partners.

Participants identified the National Agricultural Research Institute (NARI), Department of Livestock Services, Department of Fisheries, Department of State for Health, Department of Water Resources, National Environment Agency (NEA), The Gambia College and other tertiary institutions, farmer associations, non-governmental organizations (NGOs) and the executive and legislative arms of The Gambia government.

4) Categories of workers and professionals that need training in agricultural health and safety.

The groups recommended investigators in research institutions, veterinarians, agriculturalists and extension workers, public health, medical and nursing professionals; tutors at The Gambia College and other tertiary institutions, farmers and phytosanitary inspectors.

5) Factors that should be included in an agricultural health and safety training programme in The Gambia.



Figure 1. Preparing farmland with hand tools.



Figure 3. Fire on the farm.



Figure 2. Farmers weeding a peanut farm with hand hoe.



Figure 4. Dust during peanut threshing.

Participants identified the prevailing high rates of farm injuries in the country, the increasing number of tractors that are being used in Gambian agriculture, dust/smoke related diseases, zoonotic diseases, chemical and antibiotic residues in food meat, food related diseases and food inspection practices.

6) Factors that are of relevance to agricultural health and safety in The Gambia.

The groups listed the management of agricultural wastes, conformity with the international animal health code of the Office of International Epizoonosis (OIE) and the establishment of an interdepartmental coordinating committee to coordinate an agricultural health and safety program in the country.

Participants concluded that there is a need for the establishment of an articulated policy and authority that would develop appropriate education and training programs to address health and safety issues in the country's agriculture. They further suggested that a centre for agricultural health and safety be established in the country with expertise guidance and support from the Institute for Rural and Environmental Health (IREH) of The University of Iowa. Finally, they recommended that an interdepartmental coordinating committee be formed

(under the leadership of The Gambia College/University of The Gambia) to identify ways of promoting agricultural health and safety in The Gambia.

DISCUSSION

In this study the farmers self-reporting injuries and extension workers report of injuries to farmers revealed an annual injury rate of 79% and 89% (respectively) in the two divisions studied. When compared to injury rates reported by other studies for other countries, the rates reported here are very high. Amweelo [2, 3] gave a total injury rate of 22/1,000 for agriculture and forestry workers in Namibia. The typical reported fatal injury rate among farmers in industrialized countries is around 20/100,000 and around 20/100 for nonfatal injuries (studies range from 0.5–42/100 person years) [19, 24, 26, 28, 29].

In their assessment of body parts frequently injured, the two groups (extension workers and farmers) concur that the foot is that part of the farmers' body most injury prone; and that cuts and lacerations are the most common injury types that befall farmers. Cuts and lacerations are also among the injury types that McCurdy and Carroll

[19] reported commonly affecting farmers in the United States. Despite divergences in their perceptions on the sources of the other injury types, the farmers and extension workers in this study identified the hand hoe as the principal source of injuries on the farm. They also agree that unwilling draught animals and farmers hurrying to complete a task as the primary contributing factors to injuries. In their study of Iowan farmers in the Certified Safe Farm programme (CSF), Rautiainen *et al.* [28] also cited hand tools as one of the most common injury sources on Iowan farms and reported that farmers hurrying to complete a task on time as the primary contributing factor for many of the injuries. The Gambia practices largely a subsistence type of agriculture that is largely rain fed for only 3–5 months of the year. This causes farmers to hurry which may lead to injuries. The reports of farmers and extension workers on the levels of agricultural mechanization in the area were at variance. It could be that the extension workers by virtue of their profession, tended to assess agricultural developments in the country from a more technologically advanced perspective, while farmers, who are more involved in labour performance, were reporting reality.

In this study, 65% of the farmers could not read or write, indicating a low literacy level of the farming population of The Gambia. But the low literacy and innumeracy levels of the farmers in this study are not very different from those reported for farmers in other parts of the world. London *et al.* [14, 15] reported low literacy rates among farmers in South Africa. McCurdy and Carroll [19] also reported low literacy rates among hired and migrant farm workers in the United States. However, where low educational levels and illiteracy prevail, it is not very easy to readily comprehend and appreciate efforts aimed at promoting health, safety and improved sanitation. It is possible that the low educational level and literacy status of the farmers in this study reflected on the results on the farm injuries; as 83% of the extension workers thought that the injuries deserved taking victims to the hospital or health centre for treatment, but only 37% of the farmers thought that the injuries warranted immediate medical treatment. It could also be true that the low educational and literacy levels of the farmers are negatively impacting on sanitation in their homes, as very serious hazards ensuing from poor environmental conditions were found in many of the homesteads.

On the loss of effective work time due to farm injuries, the higher percentage of farmers (26%) than extension workers (11%) reporting only hours of effective time lost in productive farm work in this study did not seem to differ from those of the Iowa farmers in the CSF study. In that study, Rautiainen *et al.* [28] reported that most of the injuries were not severe as 57% of the injuries resulted in less than one lost workday. A feasible explanation for the divergence of opinions among farmers and extension workers in this study could be that the extension workers, due to their higher level of education, over-judged the severity of the injuries causing them to overestimate time

lost on productive farm work by the farmers. Respectively, the farmers may report low use of health services. They may not have adequate health care available and that can be a reason for not seeking treatment for injuries. The average distance to the hospital or health center was about 15 km. Many farmers also considered poor road conditions as a major problem.

The use of PPE by the farmers was likewise found to be very low. A significant number of farmers were observed inhaling large amounts of smoke and dust during regular work process, and an even higher number were seen applying fertilizers with bare hands. When asked why gloves and masks or respirators were not used, many cited high costs, unavailability, improper fit and unsuitability to weather. A sizeable number resorted to improvising respirators by tying pieces of cloth across their noses to cut down on the amount of dust inhaled while threshing peanuts. Others commented that materials like gloves, shoes, masks and overalls are uncomfortable and often interfere with performance and speed on the job. These findings and comments seem to be consistent with studies in other African countries like South Africa, Namibia and Kenya where the use of personal protective equipment have been reported to be very low [2, 3, 14, 25, 32].

Study limitations. The main limitation of this study is the small sample size (20 farmers and 20 extension workers). But judging from a participation rate of 100% and the randomness of the samples, it might be a permissible presumption that the study participants are representative of farmers and extension workers in the country, and that the results adequately reflect health and safety conditions prevailing in the practice of agriculture in the farming communities of the two divisions and the country as a whole. Many factors could have contributed to the high injury rates reported in this study. Injury was not well defined in the questionnaires which may have made it difficult for the extension workers to translate the full meaning of injury in the local language of the farmers. The farmers may have tended to overestimate (or underestimate) the injuries (recall bias). The farmers could have been anticipating some immediate intervention or benefit by reporting high injury rates. The low level of literacy and multiple languages used by the farmers may have resulted in some inaccuracies as the extension workers were administering the surveys. The injuries were reported for the farms as a unit and not for individual farmers and workers which do not enable rate calculations per person.

CONCLUSION AND RECOMMENDATIONS

The primary objective of this study was to provide baseline data for agricultural health and safety in The Gambia and provoke direction for more investigations on the subject for a comprehensive picture to emerge.

It has revealed high rates of injuries occurring among Gambian farmers. It has also shown that the sources of the injuries are hand tools, human error and animal powered carts. The extension workers to some extent reported on the injuries and hazards differently from the farmers and need to be informed. However, there is presently no official third party data on farm injuries in the country to compare with the results. This study has also revealed that there is generally a low use of PPE by the farmers and that the farmers are exposed to high levels of smoke and dust during farm work.

Based on the study findings the following measures are recommended:

- A policy on agricultural health and safety should be formulated for the country.
- A central authority should be established and charged with responsibility for investigations, data collection, training, publications and prevention of the agricultural health and safety issues in the country.
- Curricula should be developed for the training of farmers, agricultural and health professionals, as well as the students in tertiary institutions.
- Surveillance systems should be developed to collect information on farm injuries and illnesses. This could be implemented by including farm injury and illness questions in the agricultural census and by training nurses to probe and collect farm injury and health data from rural patients, which they report to the department of health by the means of monthly reports.
- A multifaceted approach to increase the use of safety footwear among farmers should be implemented. This may include developing footwear designs that are suitable or appropriate to the Gambian or African climate; promoting the availability of the appropriate footwear in places where farmers can purchase them; and raising awareness on the need and benefits of using them.
- More research on the health and safety of Gambian agricultural should be conducted.
- Interventions should be implemented and the effectiveness of policy, education and preventive approaches should be evaluated. Improvements to agricultural mechanization and the ergonomic conditions of hand tools should be instituted.

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