

## **KNOWLEDGE, ATTITUDES AND PRACTICES ASSOCIATED WITH PESTICIDE USE AMONG HORTICULTURAL FARMERS OF BANJULINDING AND LAMIN OF THE GAMBIA**

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### **ABSTRACT**

This work takes a limited but significant look at knowledge, attitudes and practices (KAP) vis-à-vis pesticide use in two farming communities in The Gambia. Most of the users have no formal education and they never received any formal training related to pesticide use. However, for the most part, there was a very high level of awareness among users about the dangers posed by pesticides. In addition, most of the respondents do not respect pesticide labels. More than 50% of the respondents experienced symptoms of pesticide poisoning, and about one-fifth of these sought medical help. Lack of knowledge, unsafe attitudes and dangerous practices were identified as the leading cause of pesticide poisoning. [*African Journal of Chemical Education—AJCE* 7(2), July 2017]

## **BACKGROUND**

Any substance or mixture of substances intended for preventing, destroying, repelling, or mitigating any pest is called a pesticide [1]. Pesticides are used widely in the agricultural sector to boost productivity by preventing or minimizing the effects of pests on farm produce. Alongside this is, pesticide poisoning in humans. This is prevalent in developing countries.

Lack of knowledge, unsafe attitudes and dangerous practices have been identified as the leading causes of pesticide poisoning. In their joint statement titled “children are facing high risks from pesticide poisoning” in 2004, the FAO, UNEP & WHO pointed out that developing countries use only a quarter of the global pesticide production yet account for 99% of all deaths attributable to pesticides [2]. Most pesticide intoxications may be due to lack of knowledge, unsafe attitudes and dangerous practices. Adherence to instructions on the pesticide is the principal rule in ensuring safe pesticide handling. Once this is deficient, storage, mixing and application of pesticides could result in poor health consequences.

However, it is worth noting that high level of awareness does not always imply positive attitude/practices. For example, in assessing the KAP and toxicity symptoms associated with use and exposure among farm workers in the Gaza strip, Yassin et al [3] found that although the farmers had high knowledge about the adverse health effects of pesticides and many self-reported toxicity symptoms, they however made very poor use of protective measures. This prompted Yassin et al to suggest that it would be useful to encourage the use of alternative measures to conventional pesticides. In Ghana, despite the high level of awareness of the health effects of pesticides [4], the use of personal protective equipment is minimal. This, Clarke [4] noted, was due to financial constraints. Kuye et al [5] found both knowledge and the use of personal protective equipment to be low among cotton farmers in his land research in the Central and Upper River

Regions of The Gambia. On the other hand, in Thailand, found 89.4% of their respondents wore personal protective equipment although majority of them (77.2%) had low level of knowledge.

Illiteracy and limited safety training and practices in face of widespread pesticide use in developing countries especially in small scale farmers is a huge challenge [6]. In a landmark research in The Gambia, Kuye et al [5] pointed out that there is inadequate control of pesticides and other hazardous agrichemicals in The Gambia after concluding that there was a low level of awareness on the toxicity of pesticides. Farmers in developing countries lack training on pesticides. For example, Naido et al, [6] indicated that only 16.4% of sprayers had ever attended a pesticide-training course among study participants in rural KwaZulu-Natal, South Africa. Pesticides can enter the body by one or all of three routes: ingestion, inhalation or absorption.

Unsafe practices that have been found in developing countries include storing pesticides in family bedrooms (where they could be easily reached by children), use of empty containers for domestic purposes, eating/drinking/smoking while handling pesticides [7]. Individuals that have a long working experience with pesticides have been reported to take fewer preventive measures when working with pesticides [8].

Pesticide poisoning can lead to both acute and chronic illnesses. Many of the short-term health effects of pesticides go unreported unless they are life threatening requiring visit to a health center. Fatigue, headache, body ache, skin discomfort, skin rashes, poor concentration, feelings of weakness, circulatory problems, dizziness, nausea, vomiting, excessive sweating, impaired vision, tremors, panic attacks, watery eyes, sneezing, burning sensation especially around the eyes etc. and in severe cases coma and death have been mentioned as immediate symptoms [9].

## **AIMS AND OBJECTIVES**

The goal of this study is principally to explore the knowledge, attitudes and practices (KAP) of farmers in the Banjulinding Women Horticulture and Lamin Horticulture Farms in the Kombo North District of The Gambia. Comparatively, more women are involved in farming compared to men. Banjulinding has a thriving farming community; this is why it was selected for this study.

The objectives of this study were to explore the knowledge, attitudes and practices (KAP) of farmers as regards the use of pesticides.

1. Are they similar to what were obtained in some parts of the sub-region?
2. How well do farmers protect themselves when using pesticides?
3. How knowledgeable are they about the health effects of pesticides?

The researchers in this study hypothesized that farmers have low level of awareness, negative attitudes and unsafe practices regarding the use of pesticides.

The Pestizid Aktions-Netzwerk e.V. Germany, in their document on pesticides and their health effects pointed out that, pesticides can cause chronic illness if incorporated over long periods of time even in relatively small amounts. Non-Hodgkin lymphomas, cancer of the prostate, pancreas, lungs, ovaries, the breasts, testicles, liver, kidneys and intestines as well as brain tumors, disruptions in cognitive and psychomotor functions, depression and damaged central nervous system have all been associated with pesticide use [9].

## **RESEARCH METHODOLOGY AND DATA COLLECTION**

A descriptive cross sectional study design was used. Sixty-six subjects were randomly selected from two community horticultural farms in the Kombo North District of The Gambia.

(*Kombos* is a local term that means urban area). Data was obtained from the respondents through the administration of a semi-structured questionnaire. The informed consent of each respondent was obtained prior to the administration of the questionnaire. A descriptive cross sectional study design was used to explore the KAP of the farmers. Epi Info 7.1.4.0 was used to obtain a representative sample of 66 study subjects.

The study sites are the Banjulinding Women's Horticulture Farm and Lamin Horticulture Farm. They are located in the villages of Banjulinding and Lamin of the Kombo North District respectively in The West Coast Region of The Gambia. Banjulinding and Lamin are communities characterized by successful community gardens. The Banjulinding Women's Horticulture Farm is one of the most successful community farms in the country. It was established in the early nineties. The garden was revitalized in 1996 with advent of the Republic of Taiwan. There were 115 workers in the garden. Only 10 of them were men. Lamin Horticulture Farm was established in 2013. It was funded through the Gambia Agricultural Development Lowland Project under the Ministry of Agriculture. The farm employs 96 workers. Ninety-three of them are female.

Data for the study were collected through the administration of a semi-structured questionnaire. The questionnaire was divided into three sections.

1. Section A looked at the demographic information and general KAP of the respondents.
2. Section B assessed the KAP of the respondents towards personal protective equipment.
3. Section C examined their KAP on the health effects of pesticides.

Informed consent of each respondent was verbally granted before the questionnaire was administered. The purpose of the research was also thoroughly explained to respondents. Respondents were also told of their right to withdraw from the interview at any point they deemed

necessary without any repercussion and that their names will not be written on any part of the questionnaire for any reason.

An obvious limitation of this study is that it was not nation-wide. Availability of resources constrained the researchers to limit their zone of study to the two farming communities.

## **RESULTS**

### **Demographic information**

Of the subjects of this study, 54.55% received non-formal education (Arabic), 24.24% received primary education, 10.61% secondary education and the rest (10.60%) were illiterates. Farming is considered as a job for illiterates. Number of years working with pesticides ranged from 1 to 42 years with an average of 11 years. The vast majority (89.39%) of the respondents receive their pesticides labeled. The majority (55.45%) of the respondents did not attend any training related to pesticide use. A quarter (24.24%) of the respondents could not mention any symptom of pesticide poisoning. However, they all knew pesticides could cause ill health or even death. More than 78% of the respondents knew pesticides can enter the body through the nose, mouth and eyes but less than half (48.48%) knew through the skin. A few (10.61%) of the respondents believed their bodies had developed immunity against pesticides. Most (56.06%) of the respondents do not follow pesticide labels/instructions. Some farmers (10.61%) store their pesticides in their homes and the same percentage used buckets to apply pesticides. None of the farmers eats, drinks, smokes or engages in discussion while working with pesticides; however, 1.52% did admit to chewing kola nut while using pesticides. Only 15.15% always used Personal Protective Equipment (PPE) during pesticide storage, 15.15% during mixing and 33.33% during

application. About half (54.55%) have had symptoms after pesticide use but only 20.59% of them ever went to the hospital after experiencing symptoms.

Of the 66 farmers interviewed, females formed the majority accounting for up to 75.76% (n = 50) of the total respondents. The ages of the respondents ranged from 21 years to 78 years with an average of 48 years.

### **Knowledge**

When asked where they obtained their pesticides, 21.21 (n=14) said they obtain theirs from Gambia Horticultural Garden Center and the rest (n=52) obtain theirs from other shops in the market. 89.39% (n=59) of the farmers acknowledge receiving their pesticides usually labeled and the rest (10.61%) said their pesticides are usually unlabeled. 54.55% of the respondents never attended a training related to pesticide use while 45.45% of the reported to have received training related to pesticide use.

When interviewed about the signs or symptoms of pesticide poisoning, 30.30% of the respondents mentioned sneezing, 3.03 % diarrhea, 6.06% nausea, 7.58% watery eyes, 21.21% irritation, a quarter (25.76%) mentioned burning sensation around the eyes, 6.06% dizziness, 12.12% vomiting, 18.18% headache and 24.24% of them could not mention any correct sign or symptom of pesticide poisoning. All the respondents knew pesticides could enter the body through the nose, 78.79% knew pesticides can enter the body through the skin, 89.39% knew through the mouth and 78.79% knew through the eyes.

About three-quarters (71.21%, n=47) knew other methods for pest control but only 45.45% (n=30) ever used these methods. All (n=66) of the respondents know that pesticides can cause ill health or death. About two-thirds (65.15%) of the respondents use more than one type of pesticide to control pests on their plots while 34.85 indicated that they only use one type of pesticide to

control pests on their plots. However, 92.31% (n=60) of the respondents could not name any pesticide they use.

### Attitudes

When the respondents were asked whether they believe pesticides enter the body through the nose, skin, eyes and mouth, 93.94% (n=62) of them said they believe so while the remaining 6.06% (n=4) said they did not believe so. Some of the respondents (10.61%, n=7) believe that their bodies have developed immunity against pesticides over time and 89.39% (n=59) do not believe that their bodies have developed immunity against pesticides over time. All (n=66) of the respondents think they need to take bath after pesticide use. There was an individual who said that he no longer smells pesticides and he attributed it to long time exposure to pesticides and nonuse of protective equipment particularly the nose mask.

### Practices

About half (56.06%, n=37) of the respondents do not follow pesticide labels (manufacturers prescription) while 43.94% (n=29) of them do not follow pesticide labels. Majority (n=48) of the respondents do receive help from either relatives/coworker (n=8) or someone (n=40) who has received training on pesticides.

### Pesticide storage

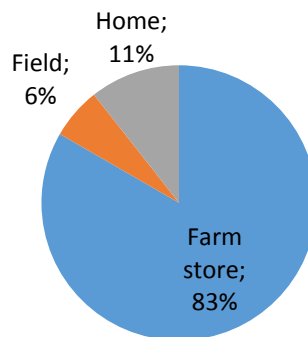
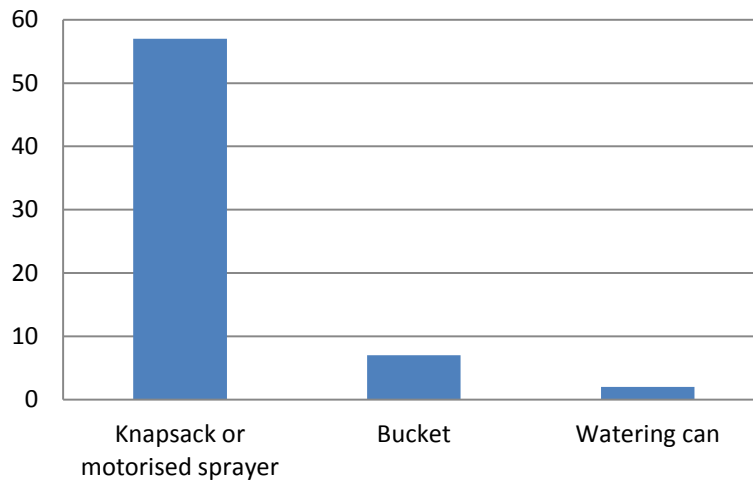


Chart 1: Pesticide Storage



### Pesticide application instrument



*Chart 2: Pesticide Application Instrument*

Three-quarters (75.76%, n=50) of the respondents do not go opposite the wind direction when applying pesticides, however 24.24% (n=16) do go opposite the wind direction when applying pesticides. About one-fifth (21.21%, n=14) of the respondents burn their empty pesticide containers, 7.58% (n=5) bury them in the ground, 27.27% (n=18) discard them in bins/dumpsites, 30.30% (n=20) throw them in toilets while the remaining (13.64%, n=9) do other things with them.

*Table 1: Actions during pesticide use*

Action	Yes	No
Smoke	0% (n=0)	100% (n=66)
Drink	0% (n=0)	100% (n=66)
Eat	0% (n=0)	100% (n=66)
Chew e.g. kola or gum	1.52% (n=1)	98.48% (n=65)
Engage in discussion	0% (n=0)	100% (n=66)

When the respondents were asked whether they take a bath before engaging in other activities after pesticide use, 74.24% (n=49%) of them responded yes while 25.76% (n=17) said

no. Fifty-five (83.33%) of the respondents take at least 24 hours to re-enter their plots to work and 16.67% (n=11) of them take less than 24 hours to re-enter their plots to work after they have been sprayed.

### **Personal Protective Equipment (PPE) use**

All (n=66) the respondents acknowledged that PPE use is important to them because they (PPE) offer protection against pesticide entry into the body.

*Table 2: PPE use among the farmers*

<b>Activity</b>	<b>Always</b>	<b>Sometimes</b>	<b>Never</b>
Storage	15.15% (n=10)	22.73% (n=15)	62.12% (n=41)
Mixing	15.15% (n=10)	28.79% (n=19)	56.06% (n=37)
Application	33.33% (n=22)	33.33% (n=22)	33.33% (n=22)

*Table 3: PPE use frequency*

<b>PPE</b>	<b>Yes</b>	<b>No</b>
Gloves	56.06% (n=37)	43.94% (n=29)
Goggles	31.82% (n=21)	68.18% (n=45)
Hat	15.15% (n=10)	84.85% (n=56)
Face shield	28.79% (n=19)	71.21% (n=47)
Special boots	31.82% (n=21)	68.18% (n=45)
Overall	43.94% (n=29)	56.06% (n=37)
Nose mask	57.58% (n=38)	42.42% (n=28)

### **Experience on the health effects of pesticides**

Out of the 66 respondents, 34 (51.52%) have had symptoms after pesticide use. The table below shows the symptoms that were reported and the number of farmers that reported each.

### Symptoms experienced after pesticide use

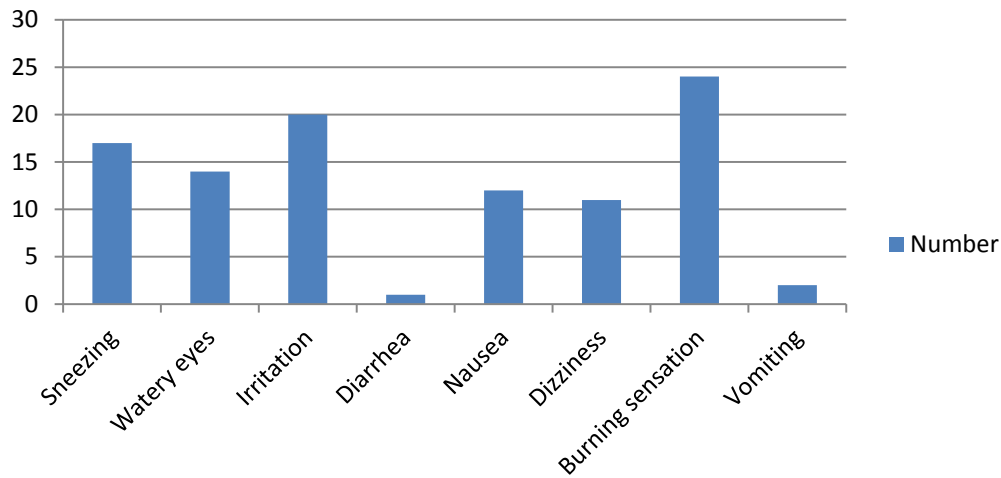


Chart 3: Frequency of Symptoms Reported

Table 4: Actions taken after experiencing symptoms

Actions	Frequency	Percent
Bed rest	5	14.71%
Just drank milk	19	55.88%
Others (take bath)	3	8.82%
Visited a hospital	7	20.59%
Total	34	100.00%

## DISCUSSIONS

### Demography

From the analysis, most of the respondents were married (the rest widowed) and more than three quarters (75.76%) of them are women. This difference in gender is acceptable considering the common Gambian believe that horticultural gardening is more of a feminine activity. This finding is in line with Murphy’s [10] research in Indonesia that highlighted that majority of her respondents were women.

**Knowledge**

Although most (about 71%) of the respondents know other methods for pest control, their use is very low because the farmers believe they are not as effective as chemical pesticides. This finding is different from that of Abang et al's [11] findings in the tropical region of Cameroun. They alluded that the low level of knowledge on other pesticide control measures was due to the farmer's lack of access to information on integrated pest management. Methods for pest control the respondents mentioned include the use of a mixture of soap and neem leaves and the use of ash. They pointed out that they received training on these methods although they hardly use them.

**Practices**

Of the 46 people that received help during pesticide use, majority (82.61%) did so from someone who had received specialized training on pesticide use. The trained helpers mostly only do the application process. During the application process, the farmers' role is to help in pulling the pipe (when a motorized sprayer is used) as the pesticide is being applied on the crops.

Pesticide storage was not a problem for the vast majority of the farmers. However, in conformity with Abang et al's [11] study some of them do store their pesticides in completely unacceptable places - homes. The farmers that store their pesticides at home said they feel their pesticides are safer at home. Even though most of the farmers use appropriate equipment to apply pesticides, some of them use very inappropriate equipment such as buckets and cans. Those using inappropriate equipment do so because they believe that they can apply the pesticide where they exactly want it and will not get into the financial trouble of buying tin milk for another person to apply pesticides for them. About a quarter of the farmers do go opposite the wind direction when applying pesticides and their reason was that that it prevents the pesticides from escaping into the air.

Most of the farmer's practices about empty pesticide containers are poor. Similarly, Naidoo et al [6] reported that women working in small-scale agriculture in South Africa mostly burn, bury or just throw away empty pesticide containers; and these poor practices were associated with limited training on pesticide use. The farmers have a very good practice of not eating, drinking, smoking, chewing or engaging in discussion during pesticide use.

### **Personal Protective Equipment (PPE) use**

There is high level of awareness about the importance of PPE. However, its use is very low among the respondents and even the few that do use them are always inadequately dressed during pesticide use as reported by Kuye et al [5] among cotton farmers in the Central River and Upper River Regions of The Gambia. In this research, the principal reason for not using PPE was unavailability.

### **Experiences on the health effects of pesticides**

Similar to Clarke et al's [4] findings, a good proportion of the respondents reported having had symptoms after working with pesticides. The high proportion of respondents having symptoms could be linked to the very low use of PPE and inappropriate attitudes. Most of the people that had symptoms only drank milk and felt that they were okay. However, some of them reported having gone to the hospital after the symptoms became severe.

## **CONCLUSIONS AND RECOMMENDATIONS**

There is appreciably high level of awareness among the people covered by this study about the harm that pesticides can do. However, knowledge and practices seem to be far apart; the users do not practice what they know. There is a flagrant disregard for caution. Personal protective

equipment use is very low among the farmers and their practices after experiencing pesticide symptoms are worrying; for the most part, they do not seek medical help.

Knowledge regarding pesticide use especially on the potential of causing health problems is high. The attitudes of the farmers have also been at a greater extent positive. However, the farmer's practices during pesticide use have not always been guided by their knowledge and attitudes. Personal Protective Equipment use is very low among the farmers and their practices after experiencing pesticide symptoms are worrying.

From the findings of this research, the following recommendations are hereby made:

1. The responsible department/agency should ensure regular training of farmers.
2. The responsible department/agency should institute and enforce occupational health and safety measures that will protect farmers.
3. There is a need for more research on agricultural pesticide use in The Gambia.

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## APPENDIX - QUESTIONNAIRE

### Section A: Demographic information and General KAP

#### Demographic information

1. Sex:  Male  Female
2. How old are you? .....
3. Marital status:  Single  Married  Divorced
4. What is your educational status?  
 Primary  Secondary  Tertiary  Non formal  Others .....
5. How long have you been using pesticides? .....

#### Knowledge

1. Where do you obtain your pesticides? .....
2. Are they labeled?  Always  Sometimes  Never
3. Have you ever attended a training related to pesticide use?  Yes  No
4. Name any signs or symptoms of pesticide poisoning you know. ....
5. Name the routes of pesticide entry into the body you know.  
 Nose  Skin  Mouth  Eyes
6. Do you know other ways for pest control rather than chemical pesticides use?  
 Yes  No
7. If yes, do you use them?  Yes  No
8. Do you know pesticides can cause ill health or even death?  Yes  No
9. Do you use one type of pesticide to control all pests on your farm?  Yes  No
10. Can you name the pesticides you use? .....
11. Which pest do you use it to control? A. Ants B. Flies C. Both D. Others .....

#### Attitudes

1. Do you believe pesticides enter the body through the nose, skin, eyes and mouth?  
 Yes  No
2. As a farm-worker, do you believe that your body has developed immunity against pesticides over the time?  Yes  No
3. Do you think you need to take bath after pesticide use?  Yes  No

#### Practices

1. Do you follow pesticide labels/manufacturers prescription?  Yes  No
2. Do you receive help during pesticide use?  Yes  No
3. If yes, from who?  
 Relative/co-worker  Expert (someone who has received training on pesticides)
4. Where do you store pesticides? A. Farm store B. Field C. Home D Others, specify.....
5. What do you use to apply pesticides?  
A. Bucket B Knapsack/motorized sprayer C Watering can D Others specify

6. Do you go opposite the wind direction when applying pesticides? Yes No
7. What do you do with empty pesticide containers?  
A. Burnt B. Wash and carry home C. Discard in bin/dumpsite D. Other Specify...
8. During pesticide use, do you do the following?
  - i. Smoke Yes No
  - ii. Drink Yes No
  - iii. Eat Yes No
  - iv. Chew e.g. kola nut or Gum Yes No
  - v. Engage in discussion Yes No
9. Do you take bath before engaging in other activities after pesticide use? Yes No
10. After applying pesticides, how long does it take you to re-enter the plot to work?  
 <24hrs  >24hrs

### Section B: Personal Protective Equipment (PPE) usage

1. Is wearing PPE important to you? Yes No
2. If yes, why? .....
3. Do you use personal protective equipment during the following?
  - i. Storage Yes sometimes No
  - ii. Mixing Yes sometimes No
  - iii. Application Yes sometimes No
4. Which of the following PPE do you use?
  - i. Gloves Yes No
  - ii. Goggles Yes No
  - iii. Wide brimmed hat Yes No
  - iv. face shield Yes No
  - v. Special boots Yes No
  - vi. Overall Yes No
  - vii. Nose mask Yes No

### Section C: Experiences on the health effects of pesticides

1. Have you had any symptoms after pesticide use? Yes No
2. If yes, tick the symptoms. Sneeze, watery eyes, irritation, diarrhea, nausea, dizziness, burning sensation especially around the eyes, others .....
3. What did you do after experiencing those symptoms? A. Just drank milk B. Went to the hospital. C. Bed rest D. Others, specify .....

Thank you very much for accepting to participate in this study!