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13 July 2009

Online at <https://mpra.ub.uni-muenchen.de/16220/>
MPRA Paper No. 16220, posted 13 Jul 2009 12:57 UTC

Assessing farmer's Pesticide Safety Knowledge in cotton growing area of Punjab, Pakistan

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June, 2009

Abstract. *A pesticide safety knowledge test was developed to assess farmer's knowledge related to pesticide safety. Yes-No (true-false) type 25 item, test, was constructed and used in a sample of 162 pesticide applicator in two districts of southern Punjab Pakistan. The overall mean score was 17.2(72%). More educated and adult respondents performed better than younger and illiterate. Similarly large land holder scored higher than small landholders, indicating their more access to information and extension. Overall ten items received less than 50% correct response. The result shows that farmers have reasonably good knowledge but it still has to see, to what extent that knowledge is being used practically. It could possibly be the future research topic.*

Keywords. Health cost, Environmental cost, Pesticide knowledge, pesticide safety

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INTRODUCTION

All over the world, the use of pesticides is considered the most attractive method of controlling pests involves less labour and characterizes higher output per hectare of land. However, extensive use of such pesticides results in substantial health and environmental threats. Being the principle polluters and victims of pollution, farmers are at the top of this risk. The World Health Organization (WHO) and the United Nations Environment Program estimate pesticide poisoning rates of 2-3 per minute, with approximately 20,000 workers dying from exposure every year, the majority in developing countries (WHO, 1990; Dasgupta 2005). Latest studies showed that the actual deaths may be around 300 000 (Gunnell & Eddleston 2003) and (Buckley 2004; Srinivas 2005). The approximate number of deaths in China alone are 175 000 (Phillips, 2002).

Further Residues in air², water³ and foods; have led to much more concern over the undesirable effects on environment and human health (al-Saleh IA 1994). Many chemical pesticides are known to cause poisoning, infertility and birth defects; they can damage the nervous system and potentially cause cancer. Scientists studying the negative effects of synthetic pesticides have found that exposure to small dosage of these dangerous pollutants during the fetal stage and childhood can cause long-term damage to humans.

Wide spread hazard of pesticide use can be avoided to some extent by education and proper information (Dasgupta, 2005). A number of recent studies exploring farmer's behavior found that insufficient knowledge and farmers' lack of information often lead to widespread hazards of

² Pesticides remain in the air for long time, bioaccumulate and travel globally, leading to ever increasing levels in humans, wildlife and also affect the biodiversity (WHO, 1990).

³ "chemically-polluted runoff from fields has contaminated surface and ground waters, damaged fisheries, destroyed freshwater ecosystems and created growing "dead zones" in ocean areas proximate to the mouths of rivers that drain agricultural regions" (Dasgupta. 2005).

pesticides in developing countries (Dasgupta, 2005; Huan et al., 2000; Dung et al., 2003). These studies emphasized that the health and environmental exposure of pesticides can be partially avoided by adequate information regarding health effects and pesticide safety measures. A clear understanding of farmer's knowledge about safety issues is central to inform policy makers to develop environmental and health cost reduction strategy⁴. The importance of farmer's knowledge however increases when agriculture accounts round about 42% of total labor force in Pakistan ⁵(Economic survey of Pakistan 2007-2008). Unfortunately studies on the issue, to the best of my knowledge are not available in Pakistan. This study is designed to assess farmers' basic knowledge of pesticide use and safety issues, such that policymakers can easily make out challenges and Gaps and then focus on the capacity building efforts accordingly.

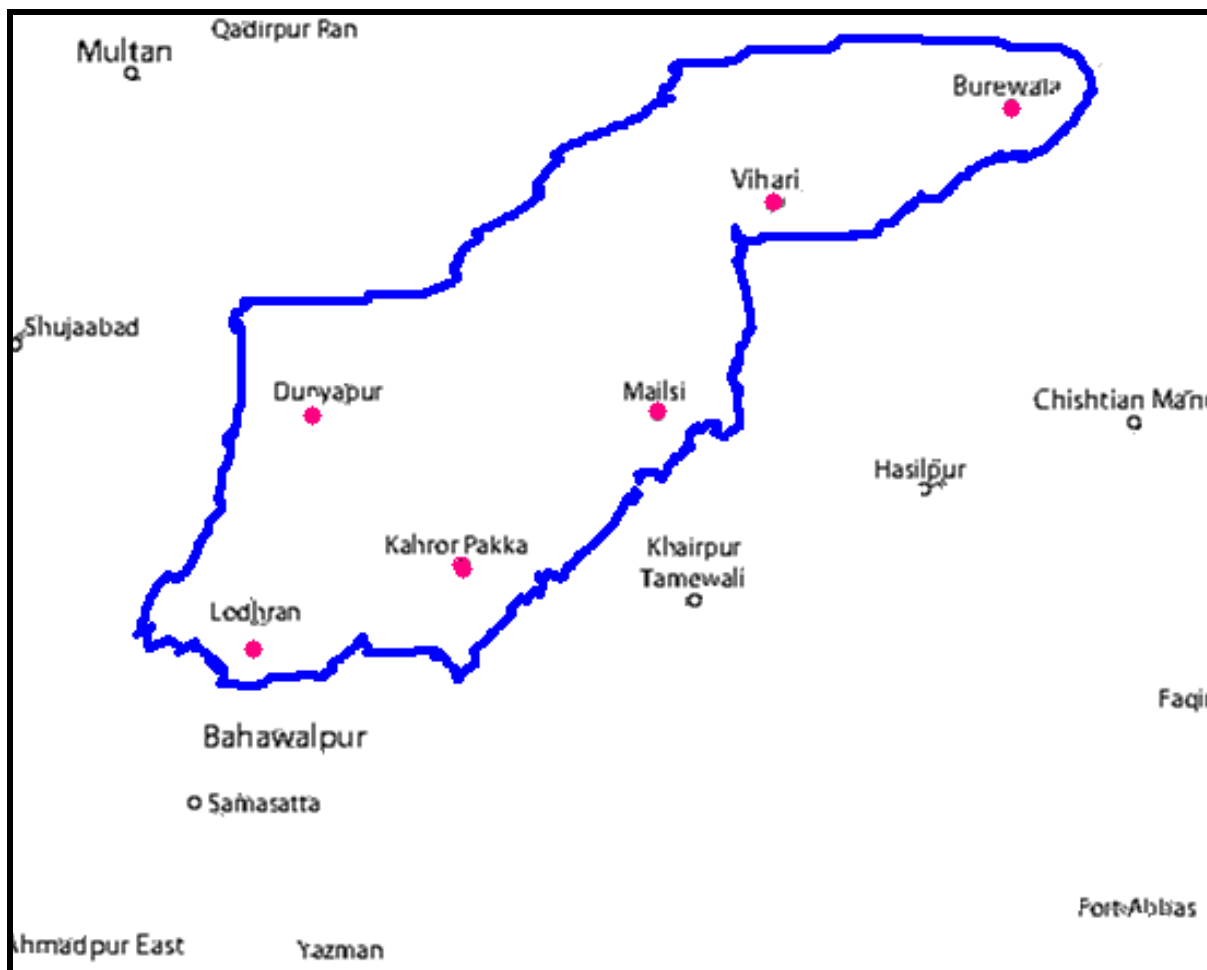
The rest of the paper is structured as follows. In Section II we describe the research design, including Study area and justification. Section III discusses the Methodology employed and Section IV presents main finding of the survey. Section V provides discussion and conclusion.

II. STUDY AREA AND JUSTIFICATION

Over all two districts (Lodhran & Vehari) of the cotton belt in Punjab province is selected for the study. Cotton has been identified as the major crop, which accounts more than 80% of total pesticide use in Pakistan (NFDC pesticide use survey report; 2002). Whereas more than 80% of cotton is produced in Punjab province and being the center of cotton crop, the cotton zone of

⁴ According to Koh and Jeyaratnam 1996, Dasgupta 2005: The first step in developing pesticide's health and environmental hazard reduction policy is to set up the extent of the problem by investigating farmers' knowledge and information regarding safety.

⁵ Koh and Jeyaratnam (1996) noted that agriculture accounts for at least 80% of the active labor force in many countries in sub-Saharan Africa.



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The Punjab has been recognized as the most intensive with respect to pesticide use. The study area within dark lines represents 17.56% of total area under cotton crop in Punjab.

METHODS

The technique of stratified random sampling was used to obtain cross-sectional data for this study in districts Lodhran and Vehari⁷. As a sampling strategy, at least two villages were selected purposively from every tehsil in each district to get the pesticide-related information

⁶ Agriculture census 2000. Procedure and data tables Punjab

⁷ District vehari and Lodhran are chosen for the study, as one of the major cotton producing districts in Punjab province. Also these districts are recognized for higher per acre production. More than 198,000 households are associated with Agriculture in both of these districts. *Agriculture census 2000*

from pesticide applicators. A structured questionnaire containing information on pesticide safety, health effects and background Information, for example, safety training, age, education and experience was used to collect data. The questionnaire contained 24 yes/no type questions. Following McCauley 2004, the items were designed to cover the basic knowledge regarding health effects of pesticide exposure, pesticide-related safety practices, and general knowledge related to the use of pesticides and possible toxic effects of exposure

SURVEY RESULTS

All the farmers surveyed, were male, because men are normally involved in pesticide application, average 35 years in age, ranging 18 – 60 years. The respondents in Lodhran were relatively young and more educated than respondents in Vehari. The mean age was 34 in Lodhran, compared to 36 in Vehari. Most of the farmers (31%, 35%) were in the age groups of 21-30, and 31-40 respectively. The age distribution of the respondents is given in the table 1 below.

Nearly, one-third of the respondents were illiterate, whereas 24% and 29% of them have completed middle and high school education respectively. The distribution of respondents by education level is listed in table II.

Overall mean score was 17.5(73%) regardless of age, education and experience. Any past training including pesticide application and safety is almost non- existent (only five farmers in district Lodhran got training). Most of them also have not access to any institute or organization, which provides training.

Table1. Age of the Respondents

Age	No	%
11-20	09	5.5
21-30	51	31
31-40	57	35
41-50	37	23
51-60	09	5.5
Total	163	100

Table II. Education Level of Respondents

Education Level	No	%
None	47	29
Primary	04	02
Middle	39	24
Metric/Lower secondary	47	29
Higher secondary	15	09
Graduates	11	07

Table iii. Mean scores of respondents by age level

Level of Age	NO	Mean Scores
11- 20	09	16
21-30	51	16.7
31-40	57	17.3
41-50	37	18.7
51-60	09	17

Regression results show that Age significantly impacts (0.07) scores as (p 0.0055). The results are logically consistent with expectations; one would expect that adults are usually more cautious about health and probably interacted extension frequently than their comparison groups. However experience of pesticide application does not significant (p 0.12) impact on scores. As far the impact of education is concerned, on average, a farmer having primary education has 0.20 higher scores, compared to illiterate farmers, however in scores no difference was found between primary and high school educated respondents whereas having secondary education respondents scored higher(0.5) than illiterate. While graduates, although few in number performed much better 3.5 higher score compared to uneducated farmers. Again results are understandable and analogous to priori expectation. The farmers who are more educated would likely to score higher since they can easily understand safety instructions written on the pesticide labels.

Table IV. Mean scores of respondents by education level

Education level	NO	Mean Scores
None	47	17
Primary	04	17.2
High	39	17.2
Upper Secondary	47	17.5
Graduation	15	21
Total	163	17.5

The size of farms also appears to be highly significant (.003), leading to a possible explanation that the large landholders may have better access to extension and they are usually more

educated. Thus if the policy aim is to educate this segment of the rural population, one could include small landholders in the program.

In addition, we also calculated the difficulty of the questions in the pesticide safety knowledge test. The proportion of respondents who answered each question correct ranged from 23%, who answered items correctly ("With time, pesticides degrade in the environment.") to 96.37% who answered the item ("Children shall not apply pesticides because they exposed frequently") correctly. Overall 10 items had less than 50% correct answers, and these are shown in table v.

Table v. PSKT items with less than 50% correct answers

Item	% of correct responses
With time, pesticides degrade in the environment.	23
Pesticide poisonings may have immediate but not delayed effects.	24
Eating, drinking, or smoking in the field increases the possibility of pesticides entering the body.	26
Some people can get sick from pesticides faster than others even though they work in the same place.	35
Pesticides can enter the body through the skin.	41
Mixing of pesticide with bare hands is dangerous.	24
If pesticides get on you, immediately remove any contaminated clothing and rinse your skin with water.	26
Using more pesticide than recommended by the manufactures Increases health effects	24
It is okay to re-enter the field within few hours of spray.	29
It is better to work in shorts, short sleeves, and sandals when it is sunny.	42

DISCUSSION AND CONCLUSION

Farmer's information and knowledge about pesticides are central in providing a sound base for environmental and health cost reduction strategy. Therefore improving farmer's knowledge about safety issues is the first step towards pesticides safety. 25 yes/no type items were designed to cover the basic knowledge regarding health effects of pesticide exposure, pesticide-related safety practices, and general knowledge related to the use of pesticides and possible toxic effects of exposure.

The results presented in this paper underscore that adult and educated farmers in our sample performed significantly better, particularly graduates. The results reported are logically consistent. It is however very important to note that the study did not take into knowledge of more complex aspects of the work safety environment. The study is intended to serve as a starting point to facilitate a detailed and more encompassing evaluation of pesticide safety knowledge. We actually focused on simple true or false type questions to assess the basic knowledge of pesticide applicator and the length of the questionnaire was also short. Further, the study did not allow us to "assess the worker's ability to integrate pesticide safety knowledge into problem-solving situations" which is more important for practical purpose. Future research Studies should examine the relationship between safety knowledge and actual work practices. Studies are also needed to bring out most useful teaching interventions for this segment of people.

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