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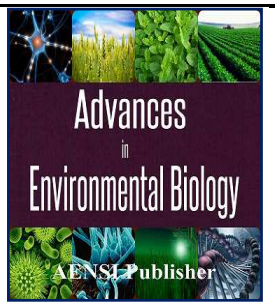

Farmers' Knowledge And Understanding of Pesticide Use And Field Spraying Practices: A Case Study of Rice Farmers In The Municipality of Molave, Zamboanga Del Sur, Philippines

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ABSTRACT

This study was conducted to determine farmer's knowledge and understanding of pesticide use and field spraying practices. A case study was conducted among farmers of a rice-growing area in the municipality of Molave, Zamboanga del Sur, Philippines. One-on-one interviews of concerned farmers were done to gather information on land possession, types of pesticide used, means of exposure, safety measures taken, source of information on the pesticides, disposal practices and illnesses encountered. Results show rice farmer's knowledge on pesticide use and spraying practices vary and many are still not following the protocols in the proper use and applications in the rice fields. These wrong practices pose major health problems and it is deemed important that farmers must be properly informed regarding the danger in the misuse and abuse of these toxic chemicals.

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INTRODUCTION

Pesticides can minimize losses in agriculture but their benefits are twin with human and environmental health risks which cannot be ignored especially in many third world countries [1-17]. Acute and chronic health effects like irritation of eyes, excessive salivation, chronic diseases like cancer, reproductive and developmental disorders are the commonly observable effects [18]. Pesticides also cause death to wild birds, mammal, fish and bees, contaminations to surface and ground water, soil and air, and residues of animal and crop products [19]. While pesticide use has been regulated by the Philippine government and banned chemicals with high toxicity, it is commonly observed that at the level of the farmers, no monitoring was ever made by the agriculture department. Worldwide efforts for the use of less toxic chemicals e.g.from organochlorines and organophosphates pesticides to pyrethroids and for the inclusion of warning labels to communicate risk information to users [20, 21] have not been very successful as many farmers in developing countries use more pesticides in their farms thus exposure to the chemicals still raise concerns for their health impacts. Added to the concerns are the very few environmental impact assessment on pesticides that were conducted in developing countries especially the Philippines where pesticide use is very common in rice and vegetable producing farms all over the country. Many health problems of farmers have never been reported as directly caused by pesticide use. Many Filipinos living in the rural areas are superstitious believers and they mistake their health problems as caused by unknown factors rather than the effects of the toxic chemicals from the pesticides they are using. Many never visited hospitals and health centers for the evaluation of their health problems. In many other developing countries, reports show rising cases of pesticide health effects [3, 6, 17, 22-25]. In the Philippines, a few field studies of the human implications of pesticides among agricultural workers and households have been documented [7] thus more information on human health effects of pesticides use is needed. The information generated will be of importance especially in the formulation of policies for reducing occupational risks from pesticide poisoning among farm population [26]. This study therefore was conducted in one of the largest rice-producing areas in the Philippines located in Molave, Mindanao, Philippines. This area is one of the rice producing areas in the province of Zamboanga del Sur but what is so interesting is that large quantity of

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insecticides, herbicides and fungicides, among others, are applied by the rice farmers in order to surely meet the rice consumption needs.

MATERIAL AND METHOD

Study site:

The study area selected was the municipality of Molave in the Province of Zamboanga del Sur, Region IX of the Zamboanga Peninsula, Philippines Figure 1.

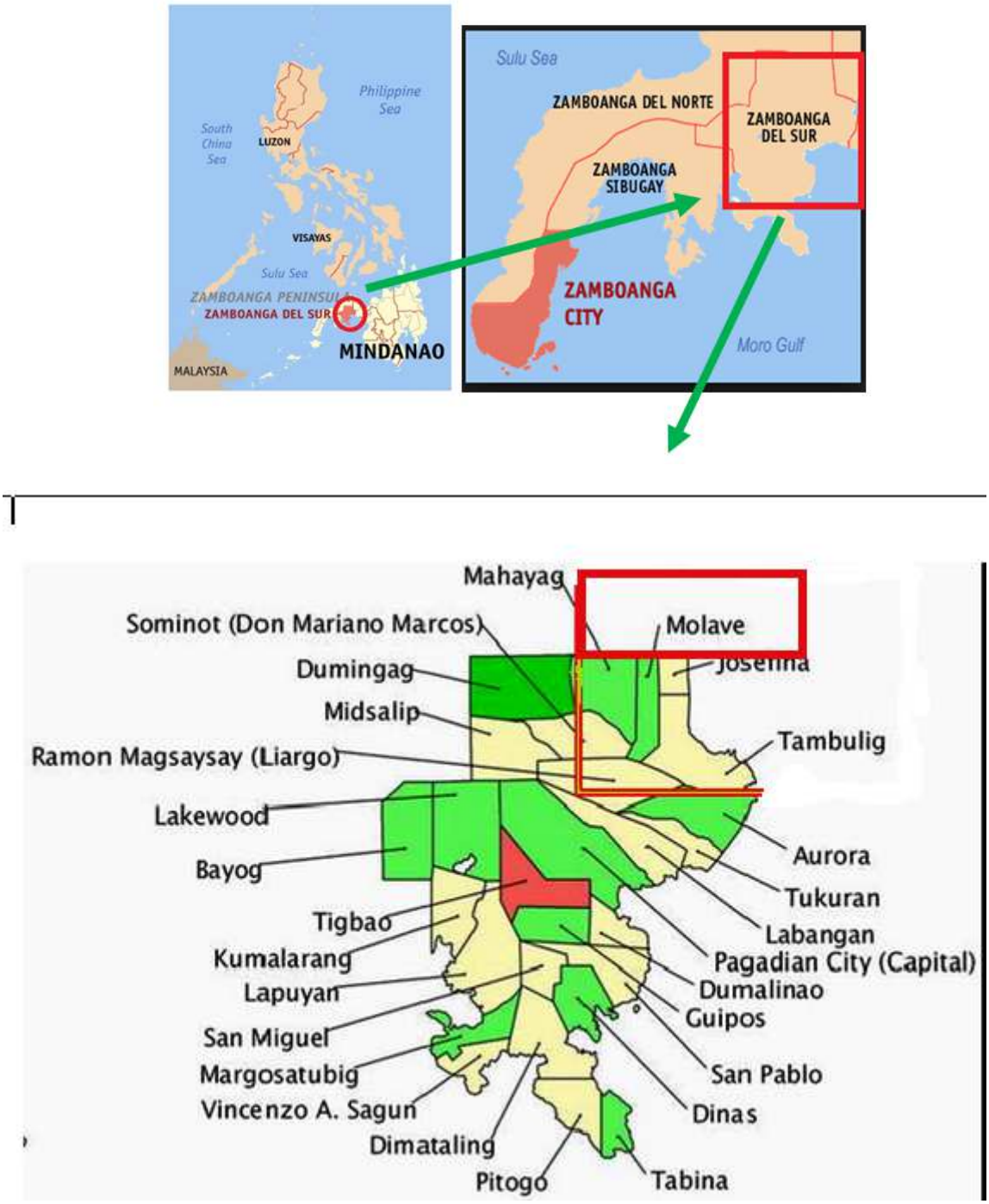

Fig. 1: Geographical location of the municipality of Molave, Zamboanga del Sur marked with a red box. Inset on the upper left portion is the map of the Philippines with a green arrow pointing to Zamboanga del Sur. Inset on the upper right portion is the map of Zamboanga Peninsula with a green arrow pointing to the study area with a red box.

A survey of 300 rice farmers, both men and women who actually used pesticides was purposely selected. One-on-one interview with the farmers was done. A semi-structured questionnaire was designed for gathering information on land possession, types of pesticides used, exposure means, safety measures taken, basis of information about the pesticides, disposal practices and signs of illnesses related to pesticide exposure. It also includes demographic items such as gender, age, education and also the smoking habit of the farmers. The English questionnaire was translated into the local dialect. Courtesy calls were done to the barangay captains to let them be acquainted about the study. The data collected were then tabulated and entered in Microsoft Excel. Statistical mean, frequency and percentage were done for data analysis.

RESULTS AND DISCUSSION

Of the 300 rice farmers surveyed in this study, 244 were men and only 56 were women. A majority of the respondents 77% were sprayers and while the others were involved in other farm works like in preparation of the land, weeding, planting and harvesting. The age of the respondents ranged from 21-70 years where a belonged to age group of 41-50 years old because it was thought that this age range men are physically able compared to younger men [27]. The highest educational attainment of the farmers is the high school level only. Others only attained elementary education and only a few have either attended college or had not attended school at all. Among the rice farmers interviewed, only 28% of them owned the land while others are only tenants Table 1.

Table 1: Farmer's demographic profile N=300

	Frequency n	Percent %
Gender		
• Male	244	81.33
• Female	56	18.67
Age Group		
• < 20	0	0.00
• 21-30	16	5.33
• 31-40	46	15.33
• 41-50	149	49.67
• 51-60	72	24.00
• 61-70	17	5.67
Education		
• No schooling	18	6.00
• Elementary	118	39.33
• High School	120	40.00
• College	44	14.67
Land Ownership		
• Own	84	28
• Rent	216	72
Agricultural Activities		
• Sprayers	231	77
• Non-sprayers	69	23

The farmers named 41 agrochemical products often with similar or the same chemical base they use in the farms. Of these 32 were insecticides, 7 were herbicides and 2 were fungicides Table 2.

Table 2: Types of Pesticides Used by the Farmers Annually and Its Active Ingredient

Pesticide Type & Active Ingredient	Product Name	WHO Class*	Frequency of the farmers
Herbicides			•
• Butachlor	• Rouge	• III	• 116
• Butachlor	• Machete	• IV	• 39
• 2,4-D Amine	• Shelter 2,4-D Amine	• II	• 40
• Butachlor + 2,4-D IBE	• Pogue	• III	• 22
• 2,4-D Isobutyl Ester	• 2,4-D Ester	• II	• 40
• Pendimethalin	• Herbadox 330E	• III	• 6
• Isopropylamine	• Ringside 480SL	• III	• 28
Insecticides		•	•
• Niclosamide	• Parakuhol	• U	• 63
• Cypermethrin	• Bull's Eye	• II	• 37
• Cypermethrin	• Bushwack	• II	• 46
• Cypermethrin	• Cymbush	• IV	• 57
• Cypermethrin	• Magnum	• II	• 50
• Chlorpyrifos + BMPC	• Brodan 31.5 EC	• II	• 38
• Cartap hydrochloride	• Cartap ES	• III	• 23

• Lambdacyhalothrin • Malathion • Imidacloprid • Niclosamide • Beta Cypermethrin • Cypermethrin • Fipronil • Metaldehyde • Niclosamide • Deltamethrin • Lambdacyhalothrin • Endosulfan • Diazinon • Thiophanate-methyl • Chlorothalonil • Chlorpyrifos • Lambdacyhalothrin • Cypermethrin • Cypermethrin • Lambdacyhalothrin • Lambdacyhalothrin • Lambdacyhalothrin • Lambdacyhalothrin • Lambdacyhalothrin • Chlorpyrifos	• Karate 2.5 EC • Malathion • Solomon • Surekill • Chix 2.5 Ec • Attack 5R • Ascend 50SC • Snailkill • Bayluscide • Decis-R • Y-kurat • Thiodan • Parapest • Armor • Blink EC • Paraulod 300EC • Bigboss • Conqueror 5EC • Bugbuster • Sugod • King Arthur • Chaku 2.5EC • Lamda • Torch • Moredan	• II • III • II • U • III • IV • III • II • U • IV • II • II • II • U • II • II • II • II • II • II • II • II • II • II • II	• 53 • 57 • 60 • 20 • 12 • 5 • 2 • 16 • 7 • 9 • 26 • 6 • 12 • 6 • 7 • 6 • 31 • 6 • 26 • 19 • 36 • 8 • 43 • 33 • 20
Fungicide • Benomyl • Cupric Hydroxide	• Protekur • Kocide	• IV • III	• 4 • 32

A majority 70.13% of the farmers rely mostly on one retailer in buying the pesticides they were using. Others bought chemicals from different retailers. Many used the same brands while a few frequently changes the brand of pesticides they were using because they said that it would be dependent on the kind of pests that attacked a particular area and also the brands used were no longer effective since the pests were have become tolerant. While there are farmers who underwent training on safe handling of hazardous chemicals, some do not use any and have resorted to organic production or they underwent the Integrated Pest Management IPM training. Table 3. What is important to know in this study was that a majority of the sprayers rely mainly on retail shop owners as their main source for knowledge concerning the pesticides they used. Some consulted other farmers and only few considered government and agriculture authorities as their source of information.

Table 2: Knowledge and Training on Using Pesticides and Other Pest Control Techniques

	Frequency n	Percent %
Retailers		
• One	162	70.13
• Many	69	29.87
Brands Used		
• Same	196	84.85
• Different	35	15.15
Training on Safe Handling		
• Yes	86	37.23
• No	145	62.77
Pest Control Techniques*		
• Organic Production	12	4.00
• Biological Control	0	0.00
• IPM	28	9.33
Training on IPM		
• Yes	28	9.33
• No	272	90.67

*Note. Percentage on pest control techniques may not add up to exactly 100.0% because of multiple responses among categories.

The use of gloves, masks, protective clothes, personal hygiene, appropriate footwear, head gear and others while important in handling pesticide concentrations and in the application of diluted formulation as a preventative measure against pesticide exposure, many were reported to be using protective masks, wore gloves, wearing full sleeve shirt and e full length trousers while applying pesticides. A few farmers reported using protective footwear because it would be inappropriate, unnecessary and uncomfortable. There were those using

head cover and reported using glasses Table 4 but many were not willing to follow the necessary precautions because of the unavailability and the high cost of these protective gears, and also because of the prevailing hot and humid weather conditions. Tenant farmers uttered their disappointment with not being supplied with individual protective equipment by their employers/masters even if the employers are obliged to supply all farmers not just those who handle pesticides with protective equipment.

Table 3: Protective Measures of the Farmers.

	Frequency n	Percent %
Shoes		
• Yes	27	11.69
• No	204	88.31
Hat/ Head cover		
• Yes	151	65.37
• No	80	34.63
Glasses		
• Yes	69	29.87
• No	162	70.13
Mask		
• Yes	153	66.23
• No	78	33.77
Full sleeve shirt		
• Yes	209	90.48
• No	22	9.52
Full length trousers		
• Yes	137	59.31
• No	94	40.69
Gloves		
• Yes	75	32.47
• No	156	67.53

It was found out that farmers in this study were not conscious of the health hazard caused by the inappropriate handling of these chemicals. Farmers were using their unprotected hands in preparing the agrochemicals for an application. Spills during the mixing process or while pouring into spraying machinations were additional sources of dermal exposure risks, as were the simple and ineffective use of ordinary pants, long-sleeve shirts, improvised capes, and t-shirt masks means to stave off unhealthy pesticide exposure Table 4. Some farmers mixed pesticides by using their bare hands, using stick but wearing gloves in mixing, or directly put the pesticides in the sprayer, spraying pesticides even though it is windy, smoking while spraying, washed their pesticide bottles and sprayers in the nearby canal or washed it in their water pump at home or washed it directly in the field. While a majority reported taking a bath and changing clothes immediately following a pesticide application, only some put a sign/flag in the field after application to warn others. Farmers would re-enter into the field in less than 24 hours which can lead them to be directly exposed to the pesticides as these may be still dispersed in air. Storage of pesticide containers were not normally practiced and these were buried, or stored at home and only a few have separate proper storage.

Table 4: Personal Habits of the Farmers in the Field

	Frequency n	Percent %
Take a bath & change clothes after		
• Yes	190	82.25
• No	41	17.75
Mix Pesticides by		
• Bare hands	64	27.70
• Stick but bare hands	68	29.44
• Stick wearing gloves	78	33.77
• Directly put in sprayer	21	9.09
Spray when windy		
• Yes	84	36.36
• No	147	63.64
Smoking while spraying		
• Yes	35	15.15
• No	196	84.84
Wash bottle or sprayer		
• In nearby canal	179	77.49
• In water pump at home	42	18.18
• In rice field	10	4.33
Put a sign after spraying		
• Yes	80	34.63

• No	151	65.37
Container disposal		
• Buried	151	65.37
• Stored at home	60	25.97
• Separate storage	20	8.66
Put a sign where bottles are buried		
• Yes	59	25.54
• No	172	74.46

Some of the signs and symptoms related to pesticide exposure by the farmers are shown in Table 5. It can be seen that the farmers have experienced complex health issues due to their exposures to the chemicals.

Table 5: Pesticide-Related Health Problems Reported by Farmers

Health Problem	Frequency n
Eye Irritation	78
Headache	65
Dizziness	75
Vomiting	16
Shortness of breath	46
Skin irritation	123
Burning sensation on the back	80
Body pain	66
Fatigue	35
Nail problems	137
Severe dry throat	77
Excessive sweating	73
Salivation	27
Coughing	49
Diarrhea	2

It was also learned from this study that the farmers have observed contaminated air during the application of pesticides indicated by the dreadful smell of the chemicals, contaminated water manifested by the taste and smell of the water flowing from the water pump, death of organisms such as dragonflies, butterflies, bees, small fishes and frogs. Table 6

Table 6: Pesticides Impact to the Environment

	Frequency n	Percent %
Air Contamination		
• Yes	171	57
• No	129	43
Water Contamination		
• Yes	86	28.67
• No	214	71.33
Death of fishes, frogs and birds		
• Yes	174	58
• No	126	42

The use of pesticides in the battle against pests and disease-causing organisms of the farmers in Molave, Zamboanga del Sur may have benefited farmers resulting to the dropping of yield losses but the harmful health impacts of the pesticides are rapidly mounting due to pesticide malpractice applications aside from their potentially high costs [28-30]. The exposure of farmers are in relation to the mixing and applying of these chemicals and the residues in food and in drinking water the issue now is whether the benefits outweighs the risks. Pesticides can be absorbed through the skin and lungs and ingested in drinking water have adverse health consequences such as headaches, dizziness, convulsions, epilepsy, stroke, respiratory disorders, leukaemia, stomach and intestinal upset, spasm, heart attacks, cancer, brain and liver tumours, and death [31-33]. The adverse effects of chemical pesticides on the health of consumers in developed and developing countries are well documented [34-36]. It is important to note also that the the unsafe use or misuse of pesticides include the erroneous beliefs of farmers about pesticide toxicity, lack of attention to safety precautions, environmental hazards, and information about first aid and antidotes given by the label, the use of faulty spraying equipment or lack of proper maintenance of spraying equipment, and lack of the use of protective gear and appropriate clothing during handling of pesticides [37-41]. Despite attempts to limit individual chemical exposure or lessen chemical risks, the relationship of pesticide exposure to widespread diseases cannot be denied and needs to be reexamined for proper implementation of proper pest and disease management policies.

Conclusions:

This study clearly show rice farmers knowledge on pesticide use and spraying practices vary and many are still not following the protocols in the proper use and applications in the rice fields. These wrong practices pose major health problems and it is important that farmers must be properly informed regarding the danger in the misuse and abuse of these poisonous chemicals. Trainings are to be encouraged to have proper knowledge of suitable practices for safe use and handling of chemical pesticides.

REFERENCES

[1] Dawson, A.H., M. Eddleston, L. Senarathna, M. Mohamed, I. Gawarammana, S.J. Bowe, G. Manuweera, and N.A. Buckley, 2010 Acute human lethal toxicity of agricultural pesticides: A prospective cohort study. PLoS Medicine, 7: 1-10.

[2] Pimentel, D., 2005 Environmental and economic costs of the application of pesticides primarily in the United States. Environment, Development and Sustainability, 7: 229-252.

[3] Atreya, K., 2008 Health costs from short-term exposure to pesticides in Nepal. Social Science & Medicine, 67: 511-519.

[4] Mancini, F., van A.H.C. Bruggen, J.L.S. Jiggins, A.C. Ambatipudi, H. Murphy, 2005. Acute pesticide poisoning among female and male cotton growers in India. Int. J. Occup. Environ. Health, 11: 221-232.

[5] Kishi, M., N. Hirschon, M. Djajadisastra, L.N. Satterlee, S. Strowman, R. Dilts, 1995. Relationship of pesticide spraying to signs and symptoms in Indonesian farmers Scandinavian. J. Work Environ. Health. 21: 124-133.

[6] Antle, J.M., D.C. Cole and C.C. Crissman, 1998 Further evidence on pesticides, productivity and farmer health:Potato production in Ecuador, Agricultural Economics Journal, 18: 199-207.

[7] Pingali, P.L., C.B. Marquez, F.G. Palis, 1994. Pesticides and Philippine Farmers' Health: a Medical and Economic Analysis of Impact. Am. J. Agric. Econ., 76: 587-592.

[8] Rola, A.C., P.L. Pingali, 1993 Pesticides, Rice Productivity, and Farmers' Health- an Economic Assessment, International Rice Research Institute, Manila, Philippines.

[9] Ngowi, A.V.F., T.J. Mbise, L. Millinga, A.S.M. Ijani, L. London, O.C. Ajayi, 2007. Smallholder vegetable farmers in Northern Tanzania: Pesticides use practices, perceptions, cost and health effects. Crop Protection DOI: 10.1016/j.cropro. 2007.01.008.

[10] Ajayi, O.C., H. Waibel, 2003. Economic Cost of Occupational Human Health of Pesticides among Agricultural Households in West Africa. In: Wollny C, Deininger, A; Bhandari, N; Maass, B; Manig, W; Muuss, U; Brodbeck, F, Howe I eds Technological and Institutional Inno- vations for Sustainable Rural Development, Book of Abstracts, Klartext publishers, Goettingen, Germany. ISBN: 3-9808714-3-6.

[11] Drafor, I., 2003. Pesticide Use and Consumer and Worker Safety: experiences from Kenya and Ghana, Paper presented at the 25 Triennial Conference of the International Association of Agricultural Economists IAAE, 16-22 August, Durban, South Africa.

[12] Maumbe, B.M., S.M. Swinton, 2003. Hidden health costs of pesticide use in Zimbabwe's smallholder cotton growers Soc. Sci. Med., 57: 1559-1571.

[13] Ngowi, A.V.F., T. Partanen, 2002. Treatment of pesticide poisoning: a problem for health care workers in Tanzania. Afr. Newslett. Occup. Health and Safety, 12: 71.

[14] Rother, H.A., 2000. Influence of pesticide risk perception on the health of rural South African women and children. Afr. Newslett., 2: 42-46.

[15] Hruska, A.J., M. Corriols, 2002. Integrated Pest Management – The Impact of Training in Integrated Pest Management among Nicaraguan Maize Farmers: Increased Net Returns and Reduced Health Risk, Int. J. Occup. Environ. Health, 8 3: 191-200.

[16] Crissman, C.C., J.M. Antle, S.M. Capablo, 1998. Economic, Environmental, and Health Trade-off in agriculture: Pesticides and Sustainability of Andean Potato Production, Kluwer Academic Publishers, Dordrecht, Boston and London.

[17] Crissman, C.C., D.C. Cole, F. Carpio, 1994. Pesticide Use and Farm Worker Health in Ecuadorian Potato Production Am. J. Agric. Econ., 76: 593-597.

[18] Chitra, G.A., V.R. Muraleedharan, T. Swaminathan, D. Veeraraghavan, 2006. Use of pesticides and its impact on health of farmers in South India. International Journal on Occupational Environment Health, 123: 228-233.

[19] Paoletti, M., D. Pimentel, 2000. Environmental risks of pesticides and genetic engineering for agricultural pest control. Journal of Agricultural and Environmental Ethic., 12: 279-303.

[20] Ajayi, O.C. and F.K. Akinnifesi, 2007 Farmers' understanding of pesticide safety labels and field spraying practices: case study of cotton farmers in northern Côte d'Ivoire. Scientific Research and Essays, 2: 204-210.

[21] Rother, H.A., 2000. Influence of pesticide risk perception on the health of rural South African women and children. Afr. Newslett., 2: 42-46.
[22] Corriols, M., J. Marin, J. Berroteran, L.M. Lozano and I. Lundber, 2009 Incidence of acute pesticide poisonings in Nicaragua: a public health concern. Occupational &EnvironmentalMedicine, 66: 205-210.
[23] Ohayo-Mitoko, G.J.A., H. Kromhout, J.M. Simwa, J.S.M. Boleij and D. Heederik, 2000 Self reported symptoms and inhibition of cholinesterase in Kenya.Occupational & Environmental Medicine, 57: 195-200.
[24] Rasoul, G.A.M., M.E.A. Salem, A.A. Mechael, O.M. Hendy, D.S. Rohlman and A.A. Ismail, 2008 Effects of occupational pesticide exposure on children applying pesticides. Neurotoxicology, 29: 833-838.
[25] Balme, K.H., J.C. Roberts, M. Glasstone, L. Curling, H.-A. Rother, L. London, H. Zar and M.D. Mann, 2010. Pesticide poisonings at a tertiary children's hospital in South Africa: An increasing problem. Clinical Toxicology, 48: 928-934.
[26] Garming, H. and H. Waibel, 2009 Pesticides and farmer health in Nicaragua: A willingness-to-pay approach to evaluation. The European Journal of Health Economics, 10: 125-133.
[27] Chris Blauth, Jack Mcdaniel, Craig Perrin, Paul B. Perrin, age-based stereotypes: a silent killer of collaboration and productivity. http://www.aqg-quebec.org/docs/nouvelles/age-based_stereotypes.pdf
[28] Pimentel, D. and H. Lehman, 1992. The Pesticide Question: Environment, Economics, and Ethics, Chapman & Hall, New York, NY.
[29] Pingali, P. and P. Roger, 1995. Impact of Pesticides on Farmer Health and the Rice Environment, Kluwer Academic, Boston, MA.
[30] Yudelman, M., A. Ratta and D. Nygaard, 1998, “Pest management and food production: looking to the future”, Food, Agriculture, and The Environment Discussion Paper 25, International Food Policy Research Institute, Washington, DC.
[31] Alavanja, M.C., M. Dosemeci, C. Samanic, J. Lubin, C.F. Lynch, C. Knott, J. Barker, J.A. Hoppin, D.P. Sandler, J. Coble, K. Thomas, A. Blair, 2004. Pesticides and lung cancer risk in the agricultural health study cohort. Am. J. Epidemiol., 160(9): 876-885.
[32] Tijani, A.A., 2006 Pesticide use and safety issues: the case of cocoa farmers in Ondo State, Nigeria. Journal of Human Ecology, 19: 183-190.
[33] Kedia, S.K. and F.G. Palis, 2008 Health effects of pesticide exposure among Filipino rice farmers. The Applied Anthropologist, 28: 40-59.
[34] Osorio, A., R. Maza, H. Panagos and H. Maibach, 2002. “Evaluation of chemical exposures among papaya industry workers in Belize: final report”, paper presented at the International Conference on Pesticide Exposure and Health, 8-12 July, Society for Occupational and Environmental Health, Bethesda, MA.
[35] Alarcon, W., G. Calvert, J. Blondell, L. Mehler, J. Sievert and M. Propeck, 2005. “Acute illnesses associated with pesticide exposure at school”, The Journal of the American Medical
[36] Thundiyil, J., J. Stober, N. Besbelli and J. Pronczuk, 2008, “Visible pesticide poisoning: a proposed classification tool”, Bulletin of the World Health Organization, 86(3): 205-9.
[37] Hurtig, A.K., M.S. Sebastian, A. Soto, A. Shingre, D. Zambrano, W. Guerrero, 2003. Pesticide use among farmers in the Amazon Basin of Ecuador. Arch. Environ. Health, 14(58): 223-228.
[38] Damalas, C.A., E.B. Georgiou, M.G. Theodorou, 2006a. Pesticide use and safety practices among Greek tobacco farmers: A survey. Int. J. Environ. Health Res., 16: 339-22 348.
[39] Damalas, C.A., M.G. Theodorou, E.B. Georgiou, 2006b. Attitudes towards pesticide labelling among Greek tobacco farmers. Int. J. Pest Manag., 52: 269-274.
[40] Chalermphol, J. and G.P. Shivakoti, 2009. Pesticide use and prevention practices of tangerine growers in northern Thailand. J. Agr. Educ. Ext., 15: 21-38.
[41] Plianbangchang, P., K. Jetiyanon, S. Wittaya-areekul, 2009. Pesticide use patterns among small-scale farmers: A case study from Phitsanulok, Thailand. SE Asian J. Trop. Med. Public Health, 40: 401-410.
[42] Sosan, M.B. and A.E. Akingbohungbe, 2009. Occupational insecticide exposure and perception of safety measures among cacao farmers in southwestern Nigeria. Arch.Environ. Occup. Health, 64: 185-193.
[43] Hammam, A.M., S. Mona Zaki, Refaat A. Yousef and Olfat Fawzi, Toxicity, 2015. Mutagenicity and carcinogenicity of phenols and phenolic compounds on human and living organisms [A Review]. Adv. Environ. Biol., 9(8): 38-48.
[44] Randa Djemil, Kamel Khelili, 2015. Abdennour Cherif, Mohamed Salah Boulakoud, Evaluation of Toluene and Xylene Toxicity on Reproductive Function in Male Rabbits. Adv. Environ. Biol., 9(14): 104-111.
[45] Bourenane Bouhafs, N., M.R. Djebbar and H. Berebbeh, 2015. Elevation of Glutathione-S-Transferaseand Inhibition of Cholinesterase Activity Asbiomarkers of Fungicide Toxicity in Mosquitofish Gambusia affinis. Adv. Environ. Biol., 9(14): 191-197.
[46] Bourenane Bouhafs.N and M.R. Djebbar, H. Berebbeh, 2015. Elevation of Glutathione-S-transferaseand inhibition of cholinesterase activity as a biomarquers of fungicide toxicity in mosquitofish Gambusia affinis. Adv. Environ. Biol., 9(18): 97-102.

[47] Azieana, J., M.N. Zainon, A. Noriham, M.N. Rohana, 2015. Morphological Identification and Toxicity Evaluation of Two Selected Wild Mushrooms. Adv. Environ. Biol., 9(22): 6-10.
[48] Wan Bayani, W.O., A.H. Hazlina and K.R. Nur Hidayah, 2015. Toxicity test of Chlorella vulgaris on protein by lead. Adv. Environ. Biol., 9(25): 61-65.
[49] Benbouzid, H., H. Berrebbah, M.R. Djebar, 2015. Toxicity of the Chlorfenapyr: Growth inhibition and induction of oxidative stress on a freshwater protozoan: Paramecium sp. Adv. Environ. Biol., 9(3): 281-285.
[50] Mohamed Amine Aiche, Leila Mallem, Elkhansa Yahia, Mohamed Salah Boulakoud., 2015. Toxicity of Subchronic Doses of Propiconazole, Propineb and Their Mixture on Reproductive Parameters in Male Rats. Adv. Environ. Biol., 9(3): 885-891.