

Modern Agricultural Practices: a Dilemma of Farmers and Farm Workers' Health in the Cash Crop Zone in the Maharashtra State.

Dhere Amar M.

Indira College of Commerce and Science, Pune, India.

Javadekar Prahcee P.

Indira Institute of Management Studies, Pune, MS, India.

Jagtap Mahesh P.

Indira College of Commerce and Science, Pune, MS, India.

ABSTRACT

Modern agriculture practices have a great promise for the economic development of a nation. In cash crop zones, modern agriculture tools and techniques have enriched farmers. The chemical pesticides and fertilizers (agrochemicals) are commonly used in Indian agriculture. Farm productivity is directly proportional to use of agrochemicals observed from the first green revolution. Improper and unsafe use of these agrochemicals especially pesticides are not only harmful to environment but also human health. The present study explores the hygienic problems of farmers and farm-workers caused by agrochemicals. For present study Kolhapur district's four villages were selected for drawing the facts of toxic effects of pesticides on farmers and farm worker's health. For the present study data resources were collected from pilot tested structured interview techniques and group discussions. To make this study more authentic, data from the pesticide poisoning cases of respective villages were collected from department of Medicine, CPR District Govt. Hospital Kolhapur. It is a surprise to find that, some banned pesticides in the developed nations are still used in the study region. Illiteracy among the farmers and farm workers is greatly responsible for improper handling and application of the toxic pesticides. It is reported that out of 50 poisoning cases, 23 poisoning cases occurred because of accidents. Four farm workers died owing to accidental poisoning of chemical pesticide. This shows that farmers and farm workers have high risk of pesticide poisoning. The present work offers suggestions for reducing the risk of pesticides poisoning of farmers and farm workers.

Keywords: pesticides, human health, agrochemical, farming system, human health.

Introduction

Agriculture is the mainstay of Indian economy. Agriculture and agriculture allied sectors contribute nearly 22 % of Gross Domestic Product (GDP) of India, while about 65 -70 % of population depends on agriculture for livelihood¹. The scenario of Indian agriculture has changed drastically after first green revolution in 1960. Now a days synthetic pesticides and fertilizers (agrochemicals) have become inevitable part in Indian agriculture especially in the cash crop growing zones. Indian farmer is using wide ranges of chemical pesticides to limit the losses from pests and diseases, in which insecticides account for 73%, herbicides14%,

fungicides 11% and other 2%². Present study conducted in the four villages of cash crop area at Shirol thesil, Kolhapur district in Maharashtra State. Pesticides like Endosulfan, Methoxychlor, Lindane and Dicofof from Organochlorine category are commonly found in the study areas. Organochlorine group pesticide was used widely in the U.S. from 1960's to 1970's; this impart acutely toxic and very persistent pollutants in the environment. In this category many pesticides are proven to carcinogen, reproductive toxicants or both³. Some Organophosphates group pesticides were found to be used in the study area, these are Malathion, Methyl parathion, Chloropyrifos and Diazinon. The pesticides used in study area are Methyl Carbamate which contains the chemical formulations Aldicarb and Carbaryl along with this synthetic Pyrethroid is used in the study area very extensively. The Pyrethroid includes Permethrin and Cypermethrin formulation. Herbicides are used for the control of weeds this having the different chemicals such as Alachlor, Atrazine and Simazine. Herbicides designed to kill the plants rather than animals and they less acutely are toxic to humans than the insecticides. But many of them are classified as probable or possible carcinogens by US and EPA⁴. Fumigants are also used as agrochemicals but its use is very rare in the study area and only for sterilizing soil and in structural pest control. Fumigants have ability to diffuse organic matters in the soil. Fumigants tend to be rapidly absorbed across the pulmonary membrane and through skin⁵. Fumigants are classified under the deadly poisonous and they act as a carcinogen^{3, 6} and found to be used in the study region especially in the green house agricultural commodities.

Chemical pesticides are associated with risk and health hazards if not handled properly. Improper handling and unsafe spraying of the agrochemical cause high risk of health hazards reported in the pat studies. Centre for Science and Environment (CSE) reported that pesticide exposure causes acute poisoning, cancer and neurological impairment, reproductive and developmental problems⁵. According to Takagi⁷ (1997), risk of the pesticide associated with its use and this can be divided into two categories:

- i) Risk associated with human beings: These are acutely toxicity, chronic toxicity, tetragenicity and have ability of biological concentrations. Human health problems are ranging from muscle weakness, difficulty in breathing, vomiting, headache, respiratory distress, leukemia, brain and liver damage and even death in case of ingestion of high dose. Common in year from 1991 to 1996 in California 3991 people suffered from pesticide poisoning⁸. Majority of them are farmers. There are many cases of pesticide poisoning which are unreported. It has been estimated that 3 million acute pesticide poisoning cases occurred in one year at world level⁹.
- ii) Risk associated with Environment: This is because of entry of the agrochemicals in the river water, ground water, drinking water, soil and

air. This has direct impact on the aquatic animals and wildlife, as well as destruction of ecosystem.

Pesticides use in India: Pesticides Actions Networks (PAN) a consortium of 600 NGO's from 90 countries have identified the 'Dirty Dozen' as the most deadly pesticides and advocated for a worldwide ban. Majority of them are Persistent Organic Pollutants (POP's) and they were banned all over the world under the Stockholm Convention in 2002, of which India is a signatory¹⁰.

It is a well accepted fact that Indian farmers have inadequate knowledge of agrochemical like exact dosage, handling and storage of pesticides, methods of application, after use disposal of packaging materials¹². In Nigeria poor literacy and ineffective regulatory measures have a impact on public health. This is in particular with the exposure and poisoning cases are found among the farmers and farm worker¹³. Present research work ascertains the health risk of the agrochemicals in connection with the application of the pesticides in the four villages in Kolhapur district of Maharashtra state.

Present study went a long way in assisting farmers, farm workers and government policy makers to find out way to minimize the health hazard faced by occupational groups of farmer and farm workers, who contribute significantly to the nation's economy.

Scope and Objectives:

This study attempts to analyze the handling of agro-chemicals and health related problems arising in the farmers and farm workers in the cash crop zone in Maharashtra state. There are several issues related with the application of agrochemicals for research inquiry. In this research article some of the core issues were tested to investigate the health problems and pesticide poisoning related death cases are well narrated. This study helps in shaping and designing of the policies. Major objectives are enlisted below.

1. To find the socio-economic characteristics and precautionary measures adopted by farmers and farm workers in the study area.
2. To analyze pesticide poisoning cases among the farmers and farm workers.
3. To suggest policies for safely handling of agrochemicals by farmers and farm workers.

Materials and Methods:

Four villages were selected for conducting the research work. These villages were selected purposively, with irrigation and cash and vegetable cropping. This is because the number of respondents are available easily and result of this study had more coverage. The accidental sampling method is used to collect the information through structured and pilot tested interview schedule. Total fifty (50) farm workers and fifty (50) farmers were interviewed. Some focus group

discussions were carried out to find the micro level observations and health hazard aspects related with use of agrochemicals. There are six group discussions attempted to analyze the pesticide poisoning cases of farmers and farm worker for drawing the reliable results. Pesticides poisoning data is collected from the Department of Medicine, Chhpt. Pramila Raje(CPR) District Govt. Hospital, Kolhapur Maharashtra. Basic statistical technique like Frequency, Distribution and Percentage proportion are used in this research work.

Results and discussion

This section discusses the major findings within three categories:

- i. Socio-economic characteristics of farmers and farm workers
- ii. Agrochemical handling safety issues.
- iii. Agrochemical consuming and poisoning affected farmers and farm workers in study region.

Table 1 : Distribution of respondents by Socio-Economic characteristics			
Sr. No.	Socio – Economic Characteristics	Respondents from four villages N=100	
		Farmers N=50	Farm workers N=50
1.	Sex		
	i) Male	38(76%)	29(58%)
	ii) Female	12 (24%)	21(42%)
2.	Marital Status		
	Unmarried	2(4%)	7(14%)
	Married	48(96%)	43(86%)
3.	Land holding pattern		
	i) Landless farmers	----	42(84%)
	ii) Marginal farmer up to 2.5 Acre	31(62%)	8(16%)
	iii) Small farmer (2.5 to 5 Acre)	9(18%)	----
	iv) Medium farmer (5 to 10 Acres)	6(12%)	----
	v) Big farmer (10 and above Acers)	4(8%)	----
4.	Age (in year)		
	21-30	3(6%)	13(26%)
	31-40	4(8%)	22(44%)
	41-50	8(16%)	10(20%)
	51-60	24(48%)	4(8%)
	Above 60	11(22%)	1(2%)
5.	Education		
	1) Illiterate	9(18%)	27(56%)
	2) Merely Read and Write Marathi (Local Language)	21(42%)	14(28%)
	3) Fluently Read and Write Marathi	12(24%)	8(16%)
	4) Fluently Read and Write Marathi and English	8(16%)	1(2%)
6	Annual income		
	i) Low Income (Below Rs.15,000)	3(6%)	28(56%)
	ii) Medium Income (15,000-30,000)	7(14%)	20(40%)
	iii) High Income (30,000-70,000)	11(22%)	2(4%)
	iv) Very High (above high)	29(58%)	----

Pesticides- Essence in agriculture:

More number of male respondents was selected because of their resistive physique than female.

Sex distribution indicates that 8 (16%) women are involved in the other farm works relative to use of agrochemical viz. filling, carrying. Common cash crops seen in study region are Tomato, Chilli, Grapes, Cabbage and sugarcane, banana, grapes. The mean and median of the farmer's age is 55 and 60 years and farm worker's is 42 and 45 years respectively. The level of education and illiteracy have contributed to the poor awareness on use of agrochemicals especially pesticides¹³. The 41 (82%) farmers are literate while 9 (18%) are *illiterates*. Out of the 41 (82%) literate farmer 3 (6%) respondents claimed that they merely read and write in Marathi language (mother tongue language), while 30 (60%) claimed that they read and write both Marathi and Hindi language (regional language) and only 8 (16%) of them were found to read and write English language. Farmers are growing cash crops from last 25 to 27 years continuously with the continuous rotation of the sugarcane in major cash crop. But from last 10 years they are engaged in production of fruit vegetables, leafy vegetables and few of them have grow vegetable in green house.

The sizes of the farms are so diverse and these are categorized as marginal land, adequate land and big land. In the present study more number of the respondents are belong to the marginal farms. Majority of the farmers have procured workers and they actually not do any tasks. It is noted that only 11 (22%) farmers provide the accommodation facility to their farm workers. Nature of the work done by these farm worker are irrigating crops, spraying of agrochemicals and other related tasks.

Handling of the agrochemicals:

All of the interviewed farmers use agrochemicals because of the vitality for sure crop production and reduce crop losses by diseases and pests. It is found that maximum amount of the pesticides are sprayed on the fruit vegetables, leafy vegetables and vegetables grown in green house. It is found that only 31 (62%) farmers received proper information how to use agrochemical from the marketing agents and village agriculture extension officer. Other farmers have received pesticide use information from other farmers and relatives. On the other hand farm workers have less awareness about the handling of agrochemical and their toxicity. This is because farmers purchase the agrochemical and they give this to farm worker without any precautionary measures. Contrary to this only 7 (14%) farm workers are well aware of the agrochemical hazards from past experiences. These farmer workers said that they had taken necessary precautions during application of the agrochemicals.

Powdery pesticides are generally packed in the hard plastic bags, while liquid pesticides are packed in metal, glass and in plastic containers. After use of these agrochemicals farmers dispose pesticides containers unsafely. It is found

that among all respondents 35% have burn these empty cans, 32% are resealing the scrapper, 33% are washed these container and reused for various purposes. Before use of pesticides, farmers are keeping it in different places at home. It is interesting to analyse that 8 (16%) farmers kept pesticides in store houses; while 13 (26%) farmers kept them in the bedroom or common room and rest of the farmers are not serious about storage of the pesticides. While 11 (22%) farmers and 33 (66%) farm workers have children's between the age group 1-15 years; thus there might be the possibility of the mishandling of these pesticide and resulting in poisoning cases.

Literate 41 (82%) farmers and 23 (46%) farm workers said that they read instructions and warning on the agrochemicals before use. All the respondents have common complaints as 'whatever matter written on label is not readable because of small font size'. Majority of the respondents are found not to have followed instructions and application methods given by manufacturers.

Agriculture development, pesticide use and human health:

Present study foresee that 38 (76%) farmers and 49 (98%) farm workers are more exposed to pesticide hazards because of inadequate or no protective apparels. Farmers and farm workers in the study region reported that, they feel discomfort after spraying of pesticides. Nature and symptoms of pesticides toxicity depend on exposure time, quantity of poison ingested and category of pesticides i.e. hazardous, toxic, moderately hazardous. It is pointed out that 11 (22%) farm workers have experienced discomfort such as vomiting, headache, nausea, restlessness, loose motions feeling of suffocation, unconsciousness, giddiness during and after spraying.

Table 3 : Record of Pesticide affected patients (1995, 2000 and 2006)

Year and types of impact	Type of patient				Total admitted patient N=50
	Farmer N=50		Farm worker N=50		
	Live	Dead	Live	Dead	
Year 1995					
i) Accidental	5 (10%)	1 (2%)	9 (18%)	4 (8%)	18 (36%)farmer 32 (64%)farm worker
ii) Suicidal	3 (6%)	9 (18%)	7 (14%)	12 (24%)	
Total	8 (16%)	10 (20%)	16 (32%)	16 (32%)	50 (100%)
Year 2000					
i) Accidental	5 (10%)	2 (4%)	13 (26%)	4 (8%)	23 (46%)farmers 27 (54%)farm worker
ii) Suicidal	5 (10%)	11 (22%)	2 (4%)	8 (16%)	
Total	10 (20%)	13 (26%)	15 (30%)	12 (24%)	50 (100%)
Year 2006					
i)Accidental	9 (18%)	2 (4%)	19 (38%)	4 (8%)	19 (38%)farmers 31(62%)far worker
ii)suicidal	2 (4%)	6 (12%)	2 (4%)	6 (12%)	
Total	11 (22%)	8 (16%)	21 (42%)	10 (20%)	50 (100%)

Source: - Department of Medicine, CPR District Govt. Hospital, Kolhapur (MS).

There are only three year's agrochemical poisoning cases received from the CPR governmental medical hospital. In a year 1995, 2000 and 2006 fifty agrochemical poisoning cases were reported from the study region. In the year 2006 out of fifty admitted patients 19 are farmers and 31 are farm workers having agrochemical poisoning. Among these farmer there are 11 cases are occurred because of accidental poisoning occurred and 8 suicidal poisoning attempts were reported. In detail 7 cases were caused by chloropyrifos poisoning, 2 by endosulfan while one each by zinc phosphate and baygon. Out of 8 suicidal poisoning attempts 6 people died. Among these patients 3 cases were caused by chloropyrifos and others by endosulfan, zinc phosphate and cypermethrin. According to the medical report it is found that the agrochemical poisoning death occurred because of high intake dose and toxic chemicals in the pesticides.

Results related with farm workers show that there are total 31 pesticide poisoning cases reported. It is important to note that 23 cases are recorded as accidental poisoning and 8 as suicidal poisoning. In case of 23 accidental poisoning, 4 patients are died while 19 patients suffered from various discomforts and illness. Out of 4 deaths there are 2 caused by chloropyrifos, 1 by endosulfan and 1 by benzene-hexa-chloride.

CONCLUSION

Farmers and farm workers in the study region use not only toxic pesticides for agriculture but also in suicide cases. The accidental poisoning has occurred in the present investigation. The low level of education of pesticide users are coupled with lack of formal training in handing and applying pesticide. The most

important fact is that some of these pesticides manufacturers do not give more adequate pesticide handling and precautionary information on the label. This has led to the toxic effect of the pesticides on farmers and farm workers. For more detail investigation of pesticide hazards, the pesticide hazards not only related with user but indirectly with, millions of buyers.

Present study draws vital suggestions to prevent agrochemical health hazards.

- 1) Strengthening of existing regulatory mechanism including the Insecticide Act 1964. To incorporate ADI (Acceptable Daily Intake) in addition to MRL (Maximum Residue Limit), strengthening the registering and re-registering procedures for agrochemical manufacturers. Modifying the existing laws including deterrent punishment of violation, as the exposure leads to death or damage to unsuspecting peoples. Dr. M.S. Swaminathan appeals for effective legislations and laws for agrochemicals with special reference to sale of spurious chemicals¹².
- 2) A wide range of biopesticides and natural agrochemicals are available in the Indian market encouraging the research and extension of natural agrochemicals.
- 3) To establish single independent nodal agency including adequate testing laboratories, which will follow the guidelines of USEPA (United States Environment Protection Agency) for technical evaluation, enforcement, licensing of all chemical use in agriculture / public health / allied sectors¹².
- 4) Past mastery of Indian farmers in organic farming government encourage policies to be biased in favor of 'organic farming'.
- 5) Making a comprehensive programme for creating the awareness of pesticide and its impact on human health and environment. Regularly publish banned and restricted pesticides list for public domain through of media.
- 6) Bodies like IPHA and IAPSM take on the role of consultancy to public and policy advisory to the Government on pesticide related issues. A chapter on pesticides should be formed¹³.
- 7) Banning of Class I (a) agrochemicals like arsenic acid, arsenic pentoxide, chromic acid and complete phase out of pesticides especially I (b) category, which having carcinogenic impacts over human health.

REFERENCES

- 1) Sachdeva S. (2007), "Pesticides and their Socio-Economic impact on agriculture", *Southern Economist*, Feb 15, p 5-6.
- 2) Publication Division, Ministry of Information & Broadcasting, GOI, India, (2006), New Delhi, "Agrochemicals in India", p64.
- 3) California Environmental protection Agency (1998), "Assessment list of Chemicals known to the state of cause cancer or reproductive toxicity".
- 4) "List of Chemicals Evaluated for Carcinogenic potential" U.S. E.P.A." (1999), *Office of Pesticide Programs*, California.
- 5) Arora P.B. (2007), "Pesticide and Human Health", *A Resource for Health Professionals*, p 7.
- 6) Takagi, K, Kazuhiro, O, Lleji. M. and Masako, A. (1997), "Use Research and development of pesticides in relation to sustainable Agriculture in Japan", *Japan Agricultural Research Quarterly*, **31**, p13-20.
- 7) M. Reeves, K Schafer, K. Hallward and A. Katter (1999), "Fields of poison, California farm workers and pesticides", *California Rural Legal Assistance Foundation*.
- 8) Pimental. D., Andrew D., Dyson Hudson R.O., Gallahan D, Jacobson S, Irish M, Kroop S., Moss A. and Vinzant, B. (1980), "Environmental and Social Cost of pesticide : A preliminary assessment", *Agriculture, Ecosystems and Environment*, **34** , p127-140.
- 9) Pawar V.M., Borikar P.S.(2004), "Impact of Indiscriminate use of Pesticides." Environmental Impact of Agriculture Activities, *Indian Society of Env't Sci. and Technology, Mumbai*, p 70-84.
- 10) G. P. I Singh (2006), "Green revolution and After- A Public Health perspective", *Indian Journal of Public Health* ,**3** ,p138-146.
- 11) Tijani A (2006), "Pesticides use practices and Safety Issues: The case of Cocoa farmers in Ondo State, Nigeria," *Journal of Human Ecology*, 2006, p.183-190.
- 12) S. Jayraj, "Use and Abuse of chemical pesticides-Need for safer pesticide for sustainable pest management" Anonymous.
- 13) Dhere A. M., Pawar Janardan,(2008) "Globalization Induced Agro-Environmental Problems and WTO's role", Research Article presented at international Conference on "Globalization, Technology and Economic Transformation" organised by Deptt. of Regional Planning, Barkatulla University, Bhopal, MP.

Acknowledgements: Researchers are thankful to Prof. Jaywant B. Ambeakr, Emeritus Professor, Deptt. of Sociology, Shivaji University, Kolhapur, MS for sketching the appropriate researcher methodology. Author is also thankful to the Indira Group of Institutes, Pune, MS for providing the funds to this project. Without the help of CRP Govt. Hospital, Kolhapur, MS this study would not be complete.

Amar M Dhere is Faculty, Environmental Science, Indira College of Commerce and Science, Pune, MS, India. Email: prof.amardhere@gmail.com

Javadekar Prahcee P. is Director, Indira Institute of Management Studies, Pune, MS, India. Email: jprachee@indiraedu.com

Jagtap Mahesh P is Faculty, Indira College of Commerce and Science, Pune, MS, India. Email: mahesh_jagtap@iccs.ac.in
