

Pesticide Residues in Urban Water Bodies- Organic Farming as a Community Based Mitigation Strategy in Hyderabad Peri-Urban Area

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ABSTRACT

The contamination of natural water bodies and tanks by pesticide residues is of great concern in the Greater Hyderabad Area. The rural and peri urban agriculture around Hyderabad is conventional with heavy usage of pesticides and chemicals, highly concentrated on paddy and vegetable cultivation. Agricultural pesticides are mainly of organochlorine and organophosphorous compounds. These pesticides are considered to be dangerous not only for the environment but for human beings as well. Pesticide residue reaches the urban water environment through direct run off, leaching, careless disposal of empty containers, equipment washings. According to a study by School of Chemical sciences, India, pesticide concentrations exceeded allowable levels for drinking water in samples of river water and groundwater in Hyderabad. In order to reduce the levels of agricultural pesticide and chemical residues in urban water bodies, community based 'Organic farming' is being implemented as an alternative strategy. The paper focuses on the case study conducted in two mandals of peri urban areas around Hyderabad, Manchal (Rangareddy district) and Bommalaramaram (Nalagonda district). The community managed sustainable agriculture (CMSA) in these villages was initiated by NGO's, PEACE and Vikasith Bharath foundation in cooperation with Self help group members in the year 2006. About 50 farmers in Manchal and 50 farmers in Bommalaramaram are practicing organic vegetable cultivation. The case study unveiled that due to organic practices in agriculture there is substantial scope for reduction in pesticide residues in common water bodies around Hyderabad, reduction in cost of cultivation of crops and improved health condition of farmers. The case study reveals the significant contribution of community managed sustainable agriculture in safeguarding the urban common property resource (CPR), the water bodies.

Key words: *pesticides, urban water sources, contamination, organic farming, Hyderabad*

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INTRODUCTION:

The Common Property Resources (CPR's) mainly water bodies in and around the metropolitan areas are declining, qualitatively as well as quantitatively. Urban water bodies are getting polluted on one hand by the accumulation of residues from the Industrial wastes and on the other hand by agrochemical residues from the peri urban villages around the urban agglomeration. Peri urban agriculture is highly dynamic and with rapid urbanization farmers are inclined towards intensive agriculture using high level of inputs like chemical pesticides, fertilizers, growth promoters etc. in anticipation of higher yields. This excessive and inappropriate use of pesticides in agriculture is polluting the water bodies and ground water resources by leeching, runoff, careless disposal of empty containers, equipment washings, etc. from the agriculture fields. Environmental contamination of natural waters by pesticide residues is of great concern these days (Kolpin et al., 1998).

Pesticides are one class of compounds that despite their benefits may produce a range of toxic side effects that pose potential hazards to the environment. Pesticides are divided into many classes, of which the most important are organochlorine and organophosphorous compounds. They are very stable substances and it has been cited that the degradation of DDT in soil is 75–100% in 4–30 years. Organochlorine pesticides are known to resist biodegradation and therefore they can be recycled through food chains and produce a significant magnification of the original concentration at the end of the chain (Milidas 1994). Other chlorinated pesticides such as aldrin, endosulphan, HCH, Lindane, endrin and isodrin remain stable in water for many years after their use. Due to the long resistance time of these substances in the environment, there is a great interest in examining the pollution they cause.

About 70% of the Pesticides used in agricultural fields reach adjoining water bodies through rain or irrigation(Ridgway et al., 1978) or by their direct use in the water bodies for control of aquatic weeds(Li 1975). Approximately 2.5 million tons of pesticides are being used in agriculture annually throughout the world (Meena et al., 2008).

According to the Food and Agriculture Organization (FAO) inventory (FAO 2001), more than 500,000 tons of unused and outdated pesticides are threatening the environment and public health in many countries. Exposure of farm workers to pesticides on farm can have detrimental effects on their health conditions. There are many scientific findings on the ill effects of pesticide exposure on human beings (McCauley et al 2006).

An estimate from The World Health Organisation and the UN Environment Programme reveals that 3 million farm workers in the developing world experience severe pesticide poisoning within which 18,000 were in fatal condition annually (Miller 2004). Therefore, public concern over pesticide residue has been increasing during the last decade. Recovering from the euphoria of green revolution, India is now battling from residual effects of extensively used chemical fertilizers and pesticides such as HCH, DDT, endosulfan, phorate, etc and looking forward for organic farming (Rekha and Naik 2006). Organic farming excludes or strictly limits the use of manufactured fertilizers and pesticides, plant growth regulators such as hormones, livestock antibiotics, food additives, and genetically modified organisms.

According to IFOAM (International Federation of Organic Agriculture Movements), "Organic agriculture is a production system that sustains the health of soils, ecosystems and people. It relies on ecological processes, biodiversity and cycles adapted to local conditions, rather than the use of inputs with adverse effects. Organic agriculture combines tradition, innovation and science to benefit the shared environment and promote fair relationships and a good quality of life for all involved.."

Contamination of water bodies by pesticide residues in India:

Peri urban agriculture in India concentrates more on growing fresh food produce like fruits, vegetables and milk products. The usage of pesticides and fertilizers is high in vegetable cultivation and according to a survey by CFTRI Mysore on pesticide contamination indicated that 50 to 70% of vegetables grown in peri urban zone are contaminated with insecticide residues in India. Nationwide reports of ground water contamination from pesticides have been documented (Holden 1986; Calder et al., 1999; Volker et al., 2002). These studies show that microgram per liter levels of several commonly used pesticides can reach ground water even from routine application in the field.

Today, in India, high range of pesticides is in use for agricultural and public health purposes. The debate on pesticide residues in soft drinks and bottled water in India has raised awareness over contamination of water with toxic pesticide residues (Ramanjaneyulu and Ramesh 2008). Pesticides are being detected in almost all food groups for example Hexachlorobenzene (HCB) a fungicide was identified in water, human milk and human fat samples collected from Faridabad and Delhi (Nair 1989).

A study by Shukla et al on determining the levels of pesticide residues in ground water of Hyderabad by dividing Hyderabad city into South, North, Central and East parts, revealed that the Organochlorine pesticides, which were detected, were higher than the qualitative target set by European countries. This is due to possible transfer of Organochlorine pesticides from agricultural and health protection activities carried out

and in near Hyderabad. The results are alarming for the health of the human beings in the Andhra–Pradesh (Shukla et al., 2006).

The pesticides/ fertilizer use in Andhra Pradesh has increased three fold due to intensive agriculture and has resulted in increased food production in spite of decrease in total land area under cultivation. The increase in fertilizer consumption is not a welcome sign since it has an impact on soil fertility and is likely to increase non-point source pollution on surface water.

A comparative study by ICRISAT on residue analysis of vegetable samples from Integrated Pest management (IPM) fields and conventional fields revealed that 0-741% higher residues in Conventional tomatoes, and residues of chloropyrifos and cypermethrin are 21% and 22% higher in the pesticide sprayed ones compared to no pesticide sprayed fields in Kothapalli village of Hyderabad region.

Community Managed Sustainable Agriculture (CMSA) and reduction in pesticide residues:

This form of farming was first initiated in Andhra Pradesh, India. This makes best use of the natural resources both biological and physical resources available naturally on farm by using local knowledge, skills and labor. The main objective of CMSA is to sustain agriculture based livelihoods with special focus on small and marginal farmers, women, tenants and agriculture workers. The main program strategies were to reduce cost of cultivation by adopting practices which involve low or no expenditure like Non Pesticide Management (NPM) and organic farming (<http://www.rd.ap.gov.in>).

Based on the findings by different experiments, it is clear that the water bodies as Common Property resources are getting polluted due to the negative externalities by conventional farming around the city. In this trend an attempt was made to scout for the alternate systems that could reduce the pesticide load on Common Pool Resources, reduces the cost of production without compromising the yield. The case study unveiled that due to organic practices in agriculture there is substantial scope for reduction in pesticide residues in common water bodies around Hyderabad, reduction in cost of cultivation of crops and improved health condition of farmers. The case study reveals the significant contribution of community managed sustainable agriculture in safeguarding the urban common property resource (CPR), the water bodies.

Organic farming and reduction in pesticide residue levels:

Organic farming helps to maintain and improve water quality by reducing the amount of chemicals used in agriculture, which can eventually find their way into common water bodies like lakes, rivers, streams and even to ground water. Runoff is one of the most damaging effects of pesticide use (USDA 2007) which can be substantially reduced by following organic farming. Most organic farms use fewer pesticides than conventional farms and some even completely restrict the synthetic fertilizers and chemical synthetic pesticides, thereby reducing the risk of these chemicals finding their way into lakes, rivers, streams and other bodies of water. The risk of eutrophication – where excessive algae growth is caused by the leakage of nutrients into these bodies of water, reduces the oxygen content and threatens the health of aquatic plants and animals is also reduced (ec.europa.eu).

This paper describes the importance of organic farming in reducing pesticide residues in urban water bodies. The specific objective of this study was to assess the contribution of community managed sustainable agriculture (CMSA) in the form of organic farming towards pesticide residue reduction in urban CPR, the water bodies.

METHODOLOGY:

The methodology consisted of the following components and steps.

- Review of literature: As a starting point, the study sought to understand the nature and patterns of pesticide residues in common property resources through a review of existing literature in the form of research reports, media reports and online sources on the subject which formed the focus of this study.
- Secondary data collection: Collection of secondary data for the study was done from the offices of relevant government departments in Hyderabad such as the Department of Agriculture, NGOs, and Rural Development Department etc.
- Selection of case study area: It was noticed from the review of existing literature and secondary data base that the main cause for contamination of common pool resources/ water bodies in urban areas was through the runoff from the intensive agricultural practices carried out in peri urban areas. Based on this fact the study tried to document the alternative farming methods with institutional support in two mandals around Hyderabad Urban Agglomeration namely Bommalaramaram and Manchal, which can reduce the contamination level of water bodies in the urban premises.
- Collection of primary data: Attempt was made to collate data from farmers, local NGOs, documenting the individual cases. This was combined with a cross section of detailed interviews with activists and local organizations working on the issue as well as discussions with farmers and local communities to understand their experiences in relation to Organic farming.

- A combination of quantitative and qualitative data collection methods were adopted for collection of both primary and secondary data open-ended interviews, group discussions, compilation of case studies, etc to understand and categorize various processes in relation to organic farming
- Photo documentation: Photo documentation was undertaken as part of this study wherever possible/relevant.

IN CONTEXT OF HYDERABAD- A CASE STUDY APPROACH:

Hyderabad, the capital city of Andhra Pradesh is a growing megacity. This city was blessed with a number of natural and man-made water bodies locally known as *Cheruvus*, *Kuntas* etc. These water bodies acted as water storage reservoirs for irrigation, drinking and groundwater recharge, and had been an absolute part of the urban ecology of the city till mid of 1980's (Ramachandraiah and Vedakumar 2007). Today, with increase in population pressure there is major pressure on Common Pool Resources like water bodies in Hyderabad. As a result some lakes were encroached and replaced by concrete buildings; several others got severely polluted with the domestic and industrial effluents and pesticide residues runoff from peri urban agriculture. There has been major shift in land use patterns within the periphery of the Hyderabad Urban Agglomeration (HUA).

The major sources of water supply to Hyderabad Metropolitan are Himayat sagar, Manjira, and other few lakes. The lakes in Hyderabad like Hussain Sagar, Durgamma chervu etc., have already been contaminated with industrial pollution and heavy doses of chemicals and arsenical compounds. Traces of pesticide residues in these lakes especially in Himayat sagar is detected which is mainly due to runoff; wash off from the farmers' fields where high doses of chemicals are applied in the catchment areas of these water bodies.

There are mainly 4 vegetable growing belts which supply vegetables to Hyderabad, namely Manchal (Rangareddy district), Bommalaramaram (Nalagonda district), Shameerpet Mandal (Rangareddy District), Vantimamidi (Medak District). These catchment areas fulfill nearly 75 to 80% of the vegetable demand of Hyderabad. Each vegetable growing belt has got a lake in its periphery, which supplies water for vegetable cultivation. For example, Shameerpet belt is having Shameerpet lake which is inturn connected by different catchment areas.

The farmers in these areas are using high doses of pesticides ranging from 5 to 40 times of sprays per acre on different vegetables. According to the official data from the Agricultural department of Shameerpet mandal of Rangareddy district the farmers are using double or triple quantities than the department data and these fertilizers are leeching into the water bodies leading to the non-point source pollution. The usage of pesticides is increasing by 30% every year and farmers are indiscriminately spraying in the anticipation of high yields. This farming practice has got detrimental effect on the nearby water bodies which demands for immediate attention/ focus and action.

Therefore, this case study was designed to understand the alarming effects of increasing use of pesticides on water bodies. The case study was conducted in two mandals of peri urban areas around Hyderabad, Manchal (Rangareddy district) and Bommalaramaram (Nalagonda district). To overcome the ill effects of chemical usage in agriculture on environment, organic farming is formulated in some mandals around Hyderabad region. The community managed sustainable agriculture (CMSA) in these villages was initiated by NGO, Vikasith Bharath foundation in cooperation with Self help group members in the year 2006. Today, about 50 farmers in Manchal and 50 farmers in Bommalaramaram mandals are practicing organic vegetable cultivation.

Community Managed Sustainable Agriculture (CMSA) in Hyderabad:

In 2004 December, in partnership with SERP (Society for Elimination of Rural Poverty) and federations of women self help groups, pilot project on CMSA (a community managed learning and management system) was officially started in 12 villages of Mahaboobnagar district. In 2005 kharif CMSA was scaled upto 10 districts of the state. By 2007-08 the program reached 7.5 million farmers across 18 districts. This decentralized model with locally adapted production models showed tremendous impact. Though CMSA started with NPM (Non-pesticide Management) later it moved into addressing local pressing problems like seed issues, SRI (System of Rice Intensification), organic production, multiple cropping and integrated farming systems.

RESULTS:

High doses of chemical use in peri urban agriculture around Hyderabad have led to the contamination of Common Property resources like water bodies especially the polluted water flow from Moinabad Mandal to the Osmansagar Lake (a main source of water to the Hyderabad urban people).

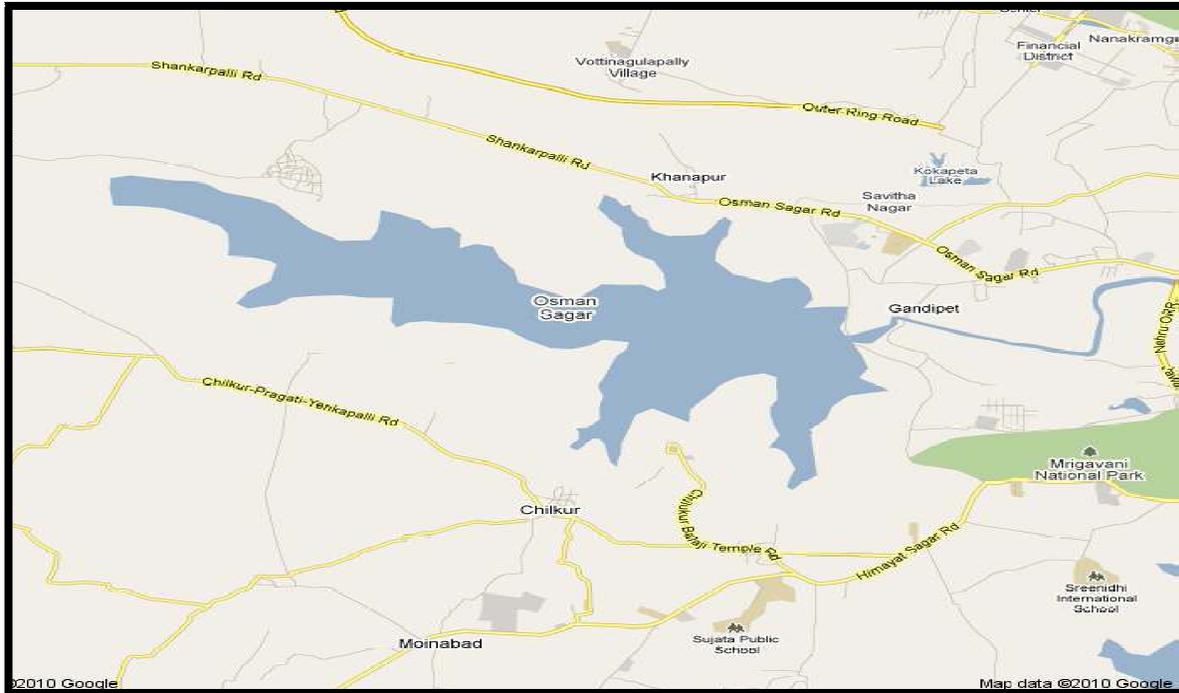


Figure 1: Location of Moinabad mandal and Osmansagar Lake

Source: google maps

Nearly 8300 hectares of vegetables are grown around Moinabad, Shankarpally, Chevella mandals in which farmers use high doses of chemicals that reaches these water bodies by means of runoff, wash off, leeching. This ultimately reaches borewells and open wells in Hyderabad. According to a study done by ICRISAT(International Research Institute for Semi-Arid Tropics, Patancheru, Hyderabad by Ranga Rao et al (2009), residues of 4 major pesticides were found higher in borewell water than open well in Kothapally village of Ranga Reddy district. The major pesticides were Monocrotophos, Chloropyriphos, Endosulfon and Cypermethrin which are highly toxic in nature. Residues of Endosulfan were higher by 300%, Cypermethrin by 89%, Monocrotophos by 50% and chloropyriphos by 9% in borewells compared to the open wells.

Pesticide residues in water bodies around Hyderabad:

The farmers around Hyderabad region are using high doses of pesticides for vegetable cultivation. Table 1 indicates the number of Sprays and volume on different vegetables around Hyderabad. Brinjal, cabbage and beans are the vegetables which are highly infested by pests and demands for more number of pesticide sprays. The investment made on purchasing pesticides to grow these vegetables constitutes the major portion of cost of cultivation. At the same time, use of pesticides on farm has proved to be ineffective in controlling pests and makes agriculture unprofitable.

Table 1: Intensity of pesticide spray in peri urban vegetable cultivation around Hyderabad

Sl. No	Crop	Number of pesticide sprays/ acre*/year	Volume @ 300 to 500 ml/Spray
1	Brinjal	20	10 lit
2	Ridge guard	10	5 lit
3	Beans	20	6 to 7 lit
4	Cabbage	25	15 lit
5	Tomato	12	6 lit
6	Bhendi/ Okra	6	2 to 3 lit
7	Chillies (Green)	15	7.5 lit
8	Other vegetables	10	5 lit

Source: Interview with farmers and input Dealers, *2.5 acres= 1 hectare

According to the chemicals and pesticides dealers in Bommalaramaram area each dealer agency has got around INR 3 millions turn over annually. Important factor is that every year there is 30% increase in pesticide purchase and use in this area. Also there is equal increase in herbicide use every year due to high shortage of labor in the peri-urban villages. The estimate shows that in a village near Bommalaramaram, the farmers are using 4000 liters of weedicides to kill the weeds. Ultimately, these chemicals are reaching the nearby water bodies and contaminating them.

Table 2: pesticide residue levels in water samples collected from open and bore wells in Rangareddy district.

Source of water Sample	Residue Levels (mg/Kg)*				
	Monocrotophos	Chloropyriphos	Endosulfan	Cypermethrin	TOTAL
Bore well	0.003(<0.001-0.004)	0.012(<0.001-0.018)	0.004(<0.001-0.005)	0.017(<0.001-0.029)	0.036
Open well	0.002(<0.001-0.002)	0.011(0.004-0.017)	<0.001(<0.001)	0.009(<0.001-0.009)	0.023

* Mean of four open and two bore wells, values in the parenthesis denote the range

Source: Ranga Rao et al., 2009

Residues of all the four pesticides were found higher in bore well water compared to open well samples (Table 2). This could be due to the degree of environmental exposure of open wells. As it is high with open wells compared to borewells, the degradation process is also high. But the point to note here is in both cases the levels are above respective Acceptable Daily Intake (ADI) values for Humans.



Figure 3: A women from peri urban village mixing pesticides before applying to the field

Source: own archive

It is very interesting to note that after adapting CMSA there is considerable reduction in the amount of pesticide residues in the produce grown in these villages (Table 3).

Table 3: pesticide residues in two vegetable samples collected from IPM and farmers practice plots, Rangareddy district, Andhra Pradesh, 2007

Crop	Treatment(No.of Samples)	Residue Levels (mg/Kg)*			
		Monocrotophos	Chloropyriphos	Endosulfan	Cypermethrin
Tomato	IPM(18)	0.005	0.034	0.012	0.023
Tomato	Non-IPM(5)	0.005	0.041	0.101	0.028
Cucumber	IPM(5)	0.004	0.027	0.011	0.009
Cucumber	Non-IPM(5)	0.005	0.106	0.026	0.012

Source: Ranga Rao etal, 2009

The two main vegetables grown in peri urban areas of Hyderabad, tomato and cucumber were tested for pesticide residues both from IPM and non-IPM fields. Traces of chemicals was found even in IPM field vegetables may be due to left over residues in the soil and water used for the crops before growing vegetables. Another important reason may be the spillover effects from non- IPM fields nearby IPM fields.

Community Managed Sustainable Agriculture (CMSA) an alternative pathway:

An attempt was made by the local NGOs especially PEACE in Bommalaramaram (Nalgonda district) and VIKASHIT BHARAT FOUNDATION in Manchal (Rangareddy District) to organize farmers in the Peri-urban mandals of Hyderabad to produce vegetables organically. In Bhongir village farmers were organized into producer cooperative called BROMACS (Bommalaramaram Organic Farmers cooperative society) under MACS (Mutually Aided Cooperative Societies) act. In Manchal Mandal of Rangareddy District, women with SHG membership and own land were trained in organic production. Under the guidance of NGO, PEACE 50 farmers from 5 villages namely Maryala, Chowderpally, Masanpally, Nayakuni thanda and Chopperichettu thanda were registered as members of Organic farmers cooperative. Later they were trained about organic farming by an agency called Centre for Sustainable Agriculture (CSA) an organisation supporting farmers and NGOs in adopting Sustainable Agricultural practices in the state.

The cooperative started with 50 farmers and offered training to farmers in organic production, institutional building, preparing production and market plans. The main aim was to reduce the load of pesticide and chemicals used in the agriculture inturn facilitating the supply of healthy food to the consumers and to benefit the farmers in getting fair price by direct marketing of vegetables. Each farmer contributed one acre for organic production and vegetables were grown without chemicals. The NGO facilitated the process by organizing the market linkage to the growers to Hyderabad. The farmers were directly linked to a consumer cooperative in Hyderabad city and in the first year the cooperative got a net profit of INR.150000.

Benefits reaped from organic farming:

The shift from conventional farming to organic resulted in economic and health benefits to the growers. There was considerable reduction in the cost of cultivation of vegetables (Table 4).

Table 4: Comparative cost of cultivation between chemically grown and organic tomato

Particulars	Cost incurred in INR ⁴	
	Conventional	Organic
1 Land Preparation	2000	2000
2 Seed Cost	1000	1000
3 Sowing/ Transplantation	600	own
4 Farm Yard Manure	1000	own
5 Weedicides	300	nil
6 weeding by Labour	1200	1200
7 Pesticides	2000	nil
8 Fertilizers	1500	nil
9 Labour	2500	2500
10 Transport	1000	1000
11 Total Cost	13100	7700
12 Yield(Quintals)	20	19
13 Price/Quintal	1000	1200
14 Gross income	20000	22800
15 Net Income	6900	15100
16 BCR	1.53	2.96

Source: Own calculation

There was considerable reduction in cost of cultivation of tomatoes and BCR was found to be 2.96 in organic farming far better than 1.53 of conventional farming. Earlier farmers used to spray 10 to 15 times on vegetables and 12 bags of chemical fertilizers, but this shift to organic farming made them to realize nearly INR 20000/ crop of vegetables and an additional price of INR 5 to 10 by selling directly to the consumers with same market price in the city. Use of natural pest control and organic methods cuts the cost of cultivation drastically. Generally, farmers can save upto INR 2,500 to INR 5,000 per acre by avoiding chemical use. The crop yields without pesticides are the same and fetch better prices. Thus farmers earn more by investing less.

⁴ 1 USD=45 INR



Rami Reddy is a 45 year old vegetable farmer from Chowderpally village in Bommalaramaram mandal of Nalgonda district. He cultivates ridge gourd regularly and spends nearly INR.75000 for production out of which chemicals itself cost INR.35000/ annum. The net profit realized was very low of INR.30000/annum. The extra burden of expenditure was on health costs. Due to ill effects from pesticides he had to spend money on health problems in his family and situation became worse when one farm labor fell ill who was working in his farm. Fed up with these problems, he joined Bommalaramaram Organic Farmers cooperative Society initiated by local NGO PEACE in Bhongir. Here, he got information on importance of organic farming in safeguarding the natural resources and training on organic farming cultivation methods. Today, he is a successful organic farmer motivating other farmers to do the same. He is able to save INR.25000 to 30000 on pesticides and his net profit has gone up to INR.63000/annum. Earlier he was facing problems to sell the produce in the market individually with middle man and high market commission. Now after joining the organic farmer's cooperative he is able to save transport costs and market commission, with better price for his vegetables and assured market.

There is considerable decline in the amount spent on illness due to pesticide exposure in the fields like operational hazards, asthma, miscarriage in women, skin diseases of farm labors etc. The main impact is the positive externality resulted out of organic farming, on environment. The amount of chemicals used in conventional farming was decreased in organic farming reducing the scope for chemical leeching to nearby water bodies' inturn improving the quality of water considerably.

Self Help groups for organic vegetable production and Marketing:

The Self Help groups are mainly meant for thrift and credit activity, the woman members of the group were growing vegetables with high doses of chemicals to get rid of the pest on vegetables. They came to know the program on Community Managed Sustainable Agriculture, promoted by Society for Elimination of Rural Poverty (SERP), an autonomous institution responsible for SHGs and their federations. This is under the Department of Rural Development, Andhra Pradesh. These members were trained on organic farming technologies and completely gave up using chemicals on vegetables.

This has reduced their cost of production and they could able to clear off their old debts in the SHG. The savings in this SHG increased compared to other SHGs not doing organic farming. The SERP, Hyderabad came to know about this group, and it linked the farmers to sell their organic vegetables in the city centre, HACA a government marketing association having outlets in the city. Day by day there is increase in demand for their produce and consumers are willing to buy more vegetables from this woman Self help group.

P. Vani is a vegetable farmer and a member of Self Help Group (SHG) from Manchal village, Manchal Mandal located 50 kms away from Hyderabad. She has been growing vegetables since many years. She came to know about Community Managed Sustainable Agriculture (CMSA) and is practicing it since last 2 years. Earlier, her cost on pesticides was nearly INR 12000/ acre and now because of organic farming it is possible for her to save this component of cultivation cost. Being a member of SHG and practicing organic farming, she was asked to sell her vegetables in Hyderabad by Hyderabad Agricultural Cooperative Association (HACA). She is getting addition market price of INR.5 in HACA compared to local market excluding the transport cost. "I was very fortunate to get to know about organic farming by Vikasith Bharath foundation officials. This enabled me to save costs on chemicals, fertilizers and pesticides for vegetable cultivation. Now, I am also able to market my produce at very competitive price at HACA."

CONCLUSION:

The major problem associated with contamination of CPR's like water bodies in a growing megacity like Hyderabad is in two ways, one is inflow of industrial effluents and other is runoff from agriculture fields, practicing conventional farming. Therefore, this paper focused on studying organic farming as a community based mitigation strategy to overcome the contamination of urban water bodies with pesticide residues.

The study unveiled that due to organic practices in agriculture there is substantial scope for reduction in pesticide residues in common water bodies around Hyderabad and at the same time reduction in cost of cultivation of crops and improved health condition of farmers. The study has also thrown light on the cooperative and collective action approach strategy of NGO's in initiating Organic farmers cooperative in the study area. The results revealed the significant contribution of community managed sustainable agriculture in safeguarding the urban common property resource (CPR), the water bodies through organizing farmers in cooperatives and motivating them to adapt organic farming.

To conclude, there is an urgent need to educate farmers around Hyderabad megacity to practice organic farming to grow vegetables and other crops to minimize the use of chemical pesticides in order to avoid adverse effects of pesticide residues in urban water bodies and also in food chains. The organic farming practices when adopted have demonstrated its effectiveness in reducing the use of pesticides in farming which resulted in lower pesticide residues.

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