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RESEARCH ARTICLE

PESTICIDAL TOXICITY STUDY FOR WHEAT AND PADDY FIELDS OF AHMEDABAD DISTRICT

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ABSTRACT

This survey work was based on questionnaire used on the farmers of agricultural zones in selected sites of Ahmedabad District. The work also includes laboratory analysis of the collected soil samples from the fields to analyse physical properties and nutrients present in soil to show partial health status. This paper presents the management strategies practiced on wheat and Paddy fields, its changing crop patterns, quantitative and qualitative use of pesticides and its possible toxic impact on human health and overall good soil health status in District of Ahmedabad, Gujarat. Thus probably changing climate can be one of the reasons for observed changing agricultural pattern in wheat and Paddy fields.

INTRODUCTION

Ahmedabad District is one of the developed districts of the Vibrant Gujarat. The total Geographical area of Ahmedabad District is 8087.59 Sq.Km. Soil types are classified on the basis of colour, depth, pH, productivity, texture and process of formation. Ahmedabad district shows site-wise specific types of soil.The committee appointed by the Indian Council of Agricultural Research (ICAR), classified the Indian soil in the following, Alluvial Soils, Black Soils, Red Soils, Laterite Soil, Mountain Soils, Desert Soils. The different kinds of soils have different impacts of use of pesticides. Pesticide use is high in regions with good irrigation facilities and in areas where commercial crops are grown (Shetty, 2004).

Frampton G, *et al*., (2006) studied species sensitivity distributions (SSD) and 5% hazardous concentrations (HC5) are distribution-based approaches for assessing environmental risks of pollutants. Dr. S Rajendran *et al*., (2003) emphasized that increased use of pesticides has caused economic, environmental, health and social problems in India and unfolded many issues that are confronting the society at large. It is estimated that around 800,000 people in developing countries may have died due to pesticides since the onset of the Green Revolution(Bhardwaj T. *et al*., 2013). The climate change impacts on agricultural pesticides vary and hence, their contribution to changes in aquatic toxicity risk differs (Koleva N.*et al*., 2009).

Kuruganti K. (2005) showed that In India, more than 60 percent of commonly used pesticides have been registered without any assessed tolerance limits. Shetty P. *et al*., (2011), studied that the use of pesticides in Indian agriculture, though beneficial in reducing crop loss both before and after harvest, has been associated with threats to human health often due to the misuse of these chemicals. According to Geoffrey M. *et.al* (2008) acute pesticide poisoning in the agricultural industry continues to be an important problem. Exposure to agricultural pesticides (mainly chronic exposure to organophosphates) produces depression, and depression is a major risk factor for suicide (Parrón T. *et.al,* 1996). Schrecka E. *et al*., (2008), showed a laboratory experiment that reproduced vineyard conditions in France showed that mixture of insecticides and/or fungicides at different environmental concentrations caused a neurotoxic effect in earthworms. Kagan O. *et al*., (2010), showed that the common diseases affecting the public's health are all too well-known in the 21st century: asthma, autism and learning disabilities, birth defects and reproductive dysfunction, diabetes, Parkinson's and Alzheimer's diseases, and several types of cancer.

Toxicity levels for each material and natural enemy species in conjunction with a rating of the persistence of each pesticide's toxic residue (Bartlett *et.al* (1963). The responses of Carbofuran, Diazinon, and Chlorpyrifos to standard acute toxicity identification evaluation (TIE) procedures were characterized by Bailey C. H. *et. al* (1996)whereas DeLorenzo E. M. *et.al* (2001) showed toxic effects of Organophosphate and Organochlorine insecticides on microbial species have also been demonstrated, although their mechanisms of toxicity in such non-target species remain unclear. Bhatnagar V. K *et al*., (2006) carried out three studies on the estimation of residues of organochlorine pesticides in the general population of Ahmedabad at different intervals were carried out. Acute pesticide poisoning is an important public health problem worldwide and accounts for a significant number of deaths occurring each year (Kumar A. *et al*., 2013).

Lang M. *et al*., (2009), studied that other bacterial species, such as nitrification bacteria, are very sensitive to pesticidal influence. Chlorothalonil and dinitrophenyl fungicides such as Mancozeb, Maneb or Zenab have also shown toxic to nitrification and denitrification bacterial processes.

Approaches for Pest Management include chemical treatment, ecological control and integrated pest management (IPM) (Yadav S *et al*., 2010). On-going monitoring of patterns of use and clinical toxicity for new pesticides is needed to identify

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highly toxic pesticides in a timely manner (Dawson H. A. *et.al*, 2010).

MATERIAL NAD METHODOLOGY

Study Area

The chosen area where agricultural fields of Wheat and Paddy crops were adjacent to some of the distinct areas falling under categories like Industry,residential etc. in Ahmedabad District. With the help of GPS System, random sampling was done on the sites like Vatva, Bareja, Chosar, Asalali, Umiya Power, Jetalpur etc.

No	GPS reading	Samples	Site Name	pH	EC $S\ m^2\ mol^{-1}$	Cl^-	P Kg/ha	K Kg/ha
1	N 23° 03′ 25″ E 72° 73′ 861″	0-5cm 5cm-10cm	Ghodasar avakar hall	6.96 7.44	0.29 0.13	29.82 35.5	50 45	282 255
2	N 23° 03′ 25″ E 72° 73′ 861″	0-5cm 5cm-10cm	Ghodasar avakar hall	6.89 7.04	0.13 0.09	34.08 34.08	35 40	269 188
3	N 23° 03′ 25″ E 72° 73′ 861″	0-5cm 5cm-10cm	Ghodasar avakar hall	7.45 7.48	0.03 0.09	45.44 53.96	45 30	202 188
4	N 23° 03′ 25″ E 72° 73′ 861″	0-5cm 5cm-10cm	Ghodasar avakar hall	7.3 7.37	0.03 0.08	35.5 28.4	55 40	242 202
5	N 22°58′471″ E 72° 36′ 644″	0-5cm 5cm-10cm	Shruti mandir	8.24 8.33	0.48 0.36	35.5 39.76	25 40	390 336
6	N 22°58′471″ E 72° 36′ 644″	0-5cm 5cm-10cm	Shruti mandir	7.72 7.65	0.16 0.13	31.24 39.76	50 40	457 255
7	N 22°58′471″ E 72° 36′ 644″	0-5cm 5cm-10cm	Shruti mandir	7.68 7.37	0.04 0.04	35.5 25.26	60 40	349 228
8	N 22°58′471″ E 72° 36′ 644″	0-5cm 5cm-10cm	Shruti mandir	7.3 7.9	0.07 0.12	35.5 31.95	45 35	202 175
9	N 22° 57′ 113″ E 72° 36′ 386″	0-5cm 5cm-10cm	Vatva	7.62 7.71	0.17 0.06	45.44 39.76	40 35	202 228
10	N 22 ° 56′ 538″ E 72° 36 ′500″	0-5cm 5cm-10cm	Vatva	8.11 8.68	0.92 0.53	42.6 71	25 45	497 390
11	N 22° 56 ′092″ E 72° 36 ′ 536″	0-5cm 5cm-10cm	Vatva	7.85 8.12	0.4 0.22	28.4 42.6	50 40	175 175
12	N 22°55′ 704″ E 72 °36 ′536″	0-5cm 5cm-10cm	Vatva	8.52 8.02	0.2 0.27	17.04 51.12	30 25	121 215
13	N 22°55′ 704″ E 72 °36 ′536″	0-5cm 5cm-10cm	Vatva	7.87 8.17	0.2 0.45	28.4 44.96	50 40	376 255
14	N 22°55 ′704″ E 72° 36′ 536″	0-5cm 5cm-10cm	Vatva	7.95 8.1	0.65 0.2	30.42 28.4	60 45	269 282
15	N 22°55′704″ E 72 ° 36 ′536″	0-5cm 5cm-10cm	Vatva	7.56 7.7	0.88 0.23	34.08 42.6	60 35	363 323
16	N 22° 55 ′493″ E 72 ° 36 ′541″	0-5cm 5cm-10cm	Asalali	7.48 7.87	0.6 0.35	90.8 48.28	25 40	349 242
17	N 22° 54 ′243″ E 72 ° 36 ′994″	0-5cm 5cm-10cm	Asalali	8.23 7.96	0.26 0.2	28.4 32.66	35 25	161 188
18	N 22° 54′243″ E 72 °36′ 994″	0-5cm 5cm-10cm	Asalali	8.18 7.94	0.56 0.19	25.56 35.5	50 45	309 255
19	N 22° 54′243″ E 72°36′ 994″	0-5cm 5cm-10cm	Asalali	8.47 8.34	0.17 0.16	35.5 39.76	55 40	148 202
20	N 22° 54′243″ E 72 °36′ 994″	0-5cm 5cm-10cm	Asalali	7.48 8.75	0.4 0.26	46.88 31.24	26 35	632 282
21	N 22 °53′ 910″ E 72 °37′ 094″	0-5cm 5cm-10cm	Bareja	7.89 7.88	0.04 0.08	73.84 22.72	48 50	403 349
22	N 22° 53′910″ E 72° 37′ 094″	0-5cm 5cm-10cm	Bareja	7.96 8.55	0.32 0.1	12.78 21.3	35 30	296 255
23	N 22 °53′ 703″ E 72° 37′ 132″	0-5cm 5cm-10cm	Bareja	7.7 8.1	0.1 0.14	17.04 19.88	40 45	269 188
24	N 22° 53′703″ E 72° 37′ 132″	0-5cm 5cm-10cm	Bareja	7.97 8.1	0.04 0.09	35.5 39.76	27 60	269 255
25	N 22°63′ 297″ E 72 °37′ 164″	0-5cm 5cm-10cm	Chosar	7.64 8.2	0.1 0.03	39.76 21.3	40 30	417 376
26	N 22° 53 ′614″ E 72 ° 37′ 150″	0-5cm 5cm-10cm	Umiya power	7.99 8.06	0.2 0.17	42.6 49.7	46 25	309 470
27	N 22 °53′ 614″ E 72°37′150″	0-5cm 5cm-10cm	Umiya power	8.45 8.39	0.13 0.16	75.26 51.12	32 20	134 161
28	N 22° 53′ 614″ E 72° 37′ 150″	0-5cm 5cm-10cm	Umiya power	7.73 8.02	0.09 0.05	59.64 12.78	40 50	336 67
29	N 22 °52 ′ 755″ E 72° 36′ 875″	0-5cm 5cm-10cm	Chosar	8.05 7.8	0.1 0.05	25.56 35.5	45 45	242 242
30	N 22° 52 571″ E 72°36′ 751 ″	0-5cm 5cm-10cm	Chosar	8.12 8.04	0.09 0.1	42.6 31.24	30 50	228 242
31	N 22 ° 52′ 023″ E 72° °36′ 897″	0-5cm 5cm-10cm	Chosar	7.86 7.54	0.03 0.36	28.4 36.92	40 30	269 336

K= Potassium
P=Phosphorus
Cl^-=Chlorides

Materials Used

The instruments that are used for project: 1) GPS system: used for noting the location of selected sites, 2) Auger for collecting soil samples 3) Digital Analytical Balance : used to weigh the soil samples for test 4) Laboratory Instruments for the Laboratory Analysis like pH meter, EC meter, Colorimeter, Flame photometer.

METHODOLOGY

Step by step Methodology adopted was the following

1. Selection of the site
2. Survey based on the Questionnairein the areas near the sites based on
   a. Use of Pesticide and its practises
   b. Management Practices of Agricultural crops like Wheat and Paddy
3. Laboratory soil analysis: Collected a surface sample (0-5 cm). With the help of Auger or Khurpi to a plough at the depth of 10 cm (after removing surface sample) and remove foreign materials like roots, stones, pebbles and gravels and draw the soil sample. Collect the sub-surface sample in a clean cloth or polythene bag and lastly Label the bag with information. After drying the samples to find the physical and chemical properties like pH (using pH meter), Electrical Conductivity (EC using EC meter) was measured. Micronutrient such as Cl^- in soil and Macro nutrients like available Potassium (Using Flame Photometer) and available Phosphorus (using Colorimeter) was estimated.

RESULTS

Management Practices of Agricultural crops like Wheat and Paddy

Preparation of Soil -This allows the roots to penetrate deep into the soil. The loose soil allows the roots to breathe easily even when they go deep into the soil. The process of loosening and turning of the soil is called tilling or ploughing.

Sowing -Sowing is the most important part of crop production. Before sowing, good quality seeds are selected. Farmers prefer to use seeds which give a high yield. Wheat seeds are usually sown through drilling or broadcasting though hand sowing is also prevalent at some places. For timely sown and irrigated wheat, a row spacing of 15 to 22.5 cm is followed. 22.5 cm is considered to be the maximum spacing

Irrigation -The supply of water to crops at different intervals is called irrigation. The wheat crop should be irrigated a few more times if the soil is very light or sandy. Protection from weeds (In a field many other undesirable plants may grow naturally along with the crop. These undesirable plants are called weeds are sprayed in the fields to kill the weeds

Harvesting -The cutting of crop after it is mature is called harvesting. The wheat crop is harvested after the grains harden and the straw becomes dry and brittle

Storage-If the crop grains are to be kept for longer time, they should be safe from moisture, insects, rats and microorganisms. The fresh crop has more moisture. . The type of rice grown in different parts of India depends on the weather, soil, structure, characteristics and purposes.

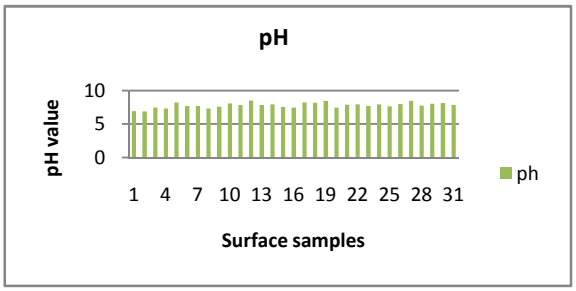
Survey Showing Pesticides Used In The Area

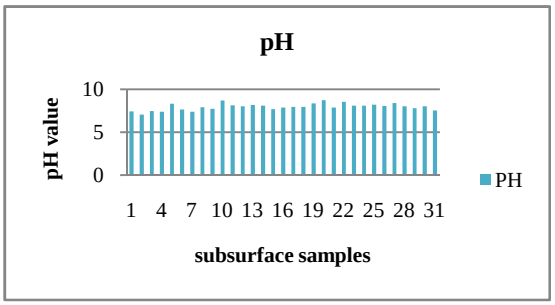
No	Name
1	Phorate
2	Sulphur
3	Monocrotophos 36% Sl
4	Glyphosate 41% SL
5	Pendimethalin 30% EC
6	Chlorpyriphos 20% EC

List of table Showing the Results

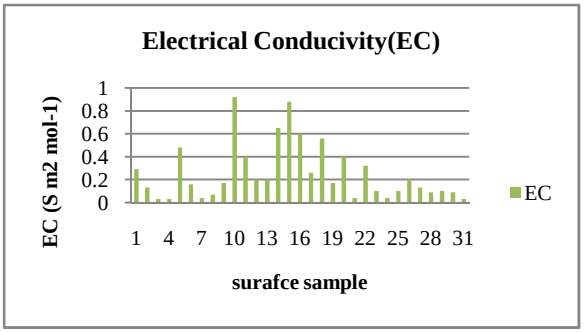
Results obtained are in the form of Annexure I and II. Graphical representation clearly shows the varied amount of pH, EC and micro as well as macro nutrients site-wise.

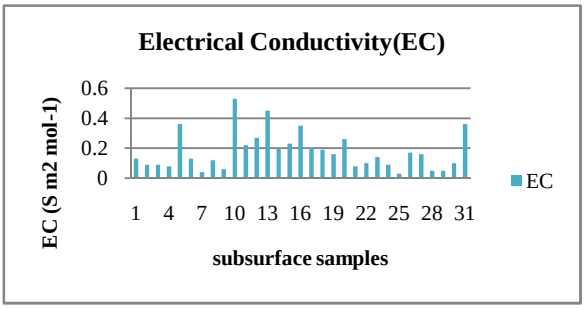
According to result Table, Graph shows below:



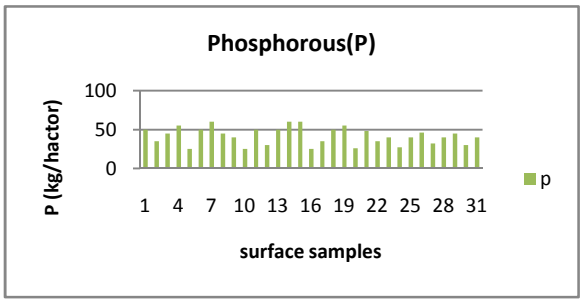


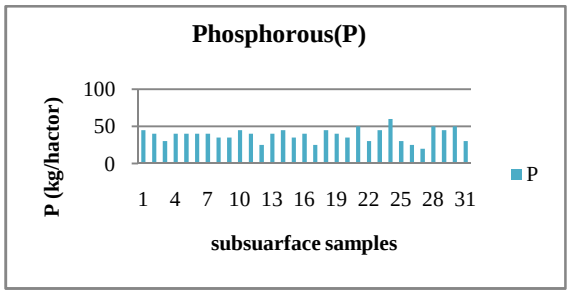
- Our estimates for pH ranges from 6 to 8 for all surface samples and 7 to 8 for all subsurface samples.
- The maximum pH is found to be in site no 5,12,19,27 T surface level and 5, 10, 20& 22 for all subsurface level.



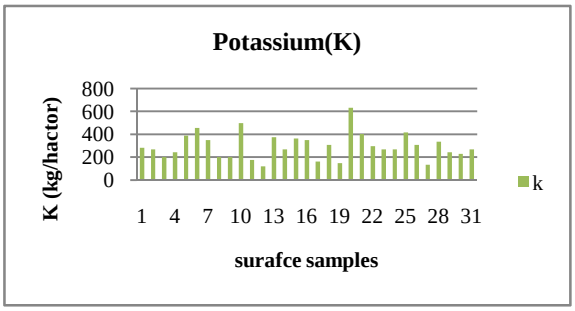


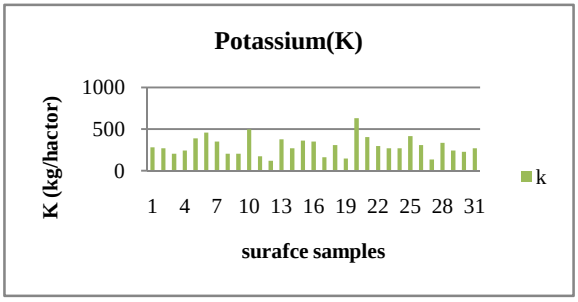
- The EC ranges from 0.2 to 0.9 for all the soil samples.
- The maximum EC is noted in Site 10 at surface level.





- Much higher concentration of P is found in sites 7, 14 & 15 at surface level and sites no 24, 28 &30 at subsurface level. And the rest areas have comparatively low concentration compare to other samples.





- Much higher concentration of K is found in sites 6,10 ,21 & 25 of surface level and sites no 5,10, 15,2126 & 31 at subsurface level. And the rest areas have comparatively low concentration compare to other samples

CONCLUSION

Management for Rice

1. Irrigation land levelling: The purpose is to allow application like irrigation water without causing erosion loss of water quality.
2. Land smoothing: it improves surface drainage and provides effective use of precipitation.
3. Precision land forming: reshaping the surface of land to plant grades.
4. Regulating water in a drainage system: controlling the removal of surface run off.
5. Surface drainage: collecting excess water in a field or for irrigation water drainage.
6. Open channel: it provides discharge capacity required for drainage.
7. Psychology of Farmers: The psychology of growing crops in agricultural practices is different from farmers to farmers. Some farmers want good quality and some want large quantity. Most of the farmer wants large quantity resulting into more usage of pesticides.

Usage of Pesticides

1. Uses of Pesticides benefits economically but have negative impacts such as:
2. It increases the yield but at the same time decreases the quality of crops.
3. It affects the soil quality and also harms human/s in many adverse ways.
4. More the yield more will be the harvesting, and more GHG will be released in the atmosphere.
5. The risk increases as the exposure increased which also lead to increase in toxicity.

Soil Analysis

As per the results obtained, the highest pH (8.15) is seen in area like Umiya power. The study depicts that the soil is alkaline in nature and the quality of soil is good for growing crops. There the farmers grow both wheat and paddy crops as the moisture content is more due to adjacent Kharicut canal.
The maximum Electrical Conductivity is seen in Vatva area i.e. 0.50. This shows that the soil contains large amount of nutrient which is good for growing crops. The minimum EC is seen at Chosar 0.10 which shows least Nutrient present in the area.

At normal soil pH (5.0-8.0), the concentration of H+ ions available for reactions is so low that the phosphate forms mentioned earlier are only a small and transient component of the total soil P reserve. The area Ghodasar avakar hall contributes large amount of Phosphorus content in soil (42.5 Kg/ha.). As soil's main content is nitrogen, phosphorus and potassium, these area shows positive remark for growing crops.

The area Bareja contribute large amount of potassium content in soil which was 285.5mmol/L which is important and beneficial for growing crops.

Survey based on Questionnaire the conclusions are the following:

1. Most of the farmers do not use disposable hand gloves. These may lead to skin diseases and is harmful for humans.
2. Most of farmers dispose their wastes in canal which is passing through it resulting in wastage of water. For using water they only go inside the canal for turning on taps without any precaution which is very toxic for humans.

Farmers	Q-1 : protective clothing when applying pesticides	Q-2 : You work on this farm (that is, tilling the land, planting, harvesting, etc.)?	Q-3 : Pesticide left over is disposed where?	Q-4 : If food prices rise, do farmers get more money?	Q-5 : Usually, what is the most used pesticides for rice?	Q-6 : Times do you spray chemicals on your rice crop	Q-7 : What alternative methods do you use to control pests?	Q-8 : Does use of pesticides affect soil fertility	Q-9 : Is your crop affected by pests	Q-10 : Quality Vs. Quantity.
1	☐ Yes ☐ **No**	☐ **Yes** ☐ No	☐ **in solid waste disposal** ☐ other ☐ In yard ☐in canal	☐ Yes ☐ **No**	☐ **Phorate** ☐ sulphide ☐ Monocrotophos ☐ Glyphosate	☐ **1 time** ☐ 2 times ☐ 3 times	☐**Crop Rotation Method** ☐ Bio-pesticides ☐Chemical Pesticides ☐Integrated Pest Management	☐ Yes ☐ **No**	☐ Yes ☐ **No**	Quantity
2	☐ Yes ☐ **No**	☐ **Yes** ☐ No	☐ **in solid waste disposal** ☐ other ☐ In yard ☐in canal	☐ Yes ☐ **No**	☐ **Phorate** ☐ sulphide ☐ Monocrotophos ☐ Glyphosate	☐ **1 time** ☐ 2 times ☐ 3 times	☐Crop Rotation Method ☐ Bio-pesticides ☐**Chemical Pesticides** ☐Integrated Pest Management	☐ Yes ☐ **No**	☐ Yes ☐ **No**	Quantity
3	☐ Yes ☐ **No**	☐ **Yes** ☐ No	☐ **in solid waste disposal** ☐ other ☐ In yard ☐in canal	☐ Yes ☐ **No**	☐ **Phorate** ☐ sulphide ☐ Monocrotophos ☐ Glyphosate	☐ **1 time** ☐ 2 times ☐ 3 times	☐Crop Rotation Method ☐ Bio-pesticides ☐**Chemical Pesticides** ☐Integrated Pest Management	☐ Yes ☐ **No**	☐ Yes ☐ **No**	Quantity
4	☐ Yes ☐ **No**	☐ **Yes** ☐ No	☐ **in solid waste disposal** ☐ other ☐ In yard ☐in canal	☐ **Yes** ☐ No	☐ **Phorate** ☐ sulphide ☐ Monocrotophos ☐ Glyphosate	☐ **1 time** ☐ 2 times ☐ 3 times	☐Crop Rotation Method ☐ Bio-pesticides ☐**Chemical Pesticides** ☐Integrated Pest Management	☐ Yes ☐ **No**	☐ Yes ☐ **No**	Quantity
5	☐ Yes ☐ **No**	☐ **Yes** ☐ No	☐ in solid waste disposal ☐ other ☐ **In yard** ☐in canal	☐ **Yes** ☐ No	☐ Phorate ☐ sulphide ☐ **Monocrotophos** ☐ Glyphosate	☐ **1 time** ☐ 2 times ☐ 3 times	☐Crop Rotation Method ☐ Bio-pesticides ☐**Chemical Pesticides** ☐Integrated Pest Management	☐ Yes ☐ **No**	☐ Yes ☐ **No**	Quantity
6	☐ Yes ☐ **No**	☐ Yes ☐ **No**	☐ in solid waste disposal ☐ other ☐ **In yard** ☐in canal	☐ **Yes** ☐ No	☐ Phorate ☐ sulphide ☐ **Monocrotophos** ☐ Glyphosate	☐ **1 time** ☐ 2 times ☐ 3 times	☐Crop Rotation Method ☐ Bio-pesticides ☐**Chemical Pesticides** ☐Integrated Pest Management	☐ Yes ☐ **No**	☐ **Yes** ☐ No	Quality
7	☐ Yes ☐ **No**	☐ Yes ☐ **No**	☐ **in solid waste disposal** ☐ other ☐ In yard ☐in canal	☐ **Yes** ☐ No	☐ Phorate ☐ sulphide ☐ **Monocrotophos** ☐ Glyphosate	☐ 1 time ☐ **2 times** ☐ 3 times	☐Crop Rotation Method ☐ Bio-pesticides ☐**Chemical Pesticides** ☐Integrated Pest Management	☐ Yes ☐ **No**	☐ **Yes** ☐ No	Quality
8	☐ Yes ☐ **No**	☐ **Yes** ☐ No	☐ **in solid waste disposal** ☐ other ☐ In yard ☐in canal	☐ **Yes** ☐ No	☐ Phorate ☐ sulphide ☐ **Monocrotophos** ☐ Glyphosate	☐ 1 time ☐ **2 times** ☐ 3 times	☐Crop Rotation Method ☐ Bio-pesticides ☐**Chemical Pesticides** ☐Integrated Pest Management	☐ Yes ☐ **No**	☐ **Yes** ☐ No	Quality

9	☐ **Yes** ☐ No	☐ **Yes** ☐ No	☐ in solid waste disposal ☐ other ☐ In yard ☐**in canal**	☐ Yes ☐ **No**	☐ Phorate ☐ sulphide ☐ **Monocrotophos** ☐ Glyphosate	☐ **1 time** ☐ 2 times ☐ 3 times	☐**Crop Rotation Method** ☐ Bio-pesticides ☐Chemical Pesticides ☐Integrated Pest Management	☐ Yes ☐ **No**	☐ **Yes** ☐ No	Quality
10	☐ **Yes** ☐ No	☐ **Yes** ☐ No	☐ in solid waste disposal ☐ other ☐ In yard ☐**in canal**	☐ Yes ☐ **No**	☐ Phorate ☐ sulphide ☐ **Monocrotophos** ☐ Glyphosate	☐ **1 time** ☐ 2 times ☐ 3 times	☐Crop Rotation Method ☐ Bio-pesticides ☐**Chemical Pesticides** ☐Integrated Pest Management	☐ Yes ☐ **No**	☐ **Yes** ☐ No	Quality
11	☐ **Yes** ☐ No	☐ Yes ☐ **No**	☐ in solid waste disposal ☐ other ☐ **In yard** ☐in canal	☐ Yes ☐ **No**	☐ Phorate ☐ sulphide ☐ **Monocrotophos** ☐ Glyphosate	☐ **1 time** ☐ 2 times ☐ 3 times	☐Crop Rotation Method ☐ Bio-pesticides ☐**Chemical Pesticides** ☐Integrated Pest Management	☐ Yes ☐ **No**	☐ **Yes** ☐ No	Quantity.
12	☐ Yes ☐ **No**	☐ Yes ☐ **No**	☐ in solid waste disposal ☐ other ☐ **In yard** ☐in canal	☐ Yes ☐ **No**	☐ Phorate ☐ sulphide ☐ **Monocrotophos** ☐ Glyphosate	☐ **1 time** ☐ 2 times ☐ 3 times	☐Crop Rotation Method ☐ Bio-pesticides ☐**Chemical Pesticides** ☐Integrated Pest Management	☐ Yes ☐ **No**	☐ **Yes** ☐ No	Quantity.
13	☐ Yes ☐ **No**	☐ Yes ☐ **No**	☐ in solid waste disposal ☐ other ☐ **In yard** ☐in canal	☐ Yes ☐ **No**	☐ Phorate ☐ sulphide ☐ **Monocrotophos** ☐ Glyphosate	☐ **1 time** ☐ 2 times ☐ 3 times	☐Crop Rotation Method ☐ Bio-pesticides ☐**Chemical Pesticides** ☐Integrated Pest Management	☐ Yes ☐ **No**	☐ **Yes** ☐ No	Quantity.
14	☐ Yes ☐ **No**	☐ Yes ☐ **No**	☐ in solid waste disposal ☐ other ☐ In yard ☐**in canal**	☐ Yes ☐ **No**	☐ Phorate ☐ sulphide ☐ Monocrotophos ☐ **Glyphosate**	☐ 1 time ☐ **2 times** ☐ 3 times	☐Crop Rotation Method ☐ Bio-pesticides ☐**Chemical Pesticides** ☐Integrated Pest Management	☐ Yes ☐ **No**	☐ **Yes** ☐ No	Quantity.
15	☐ Yes ☐ **No**	☐ Yes ☐ **No**	☐ in solid waste disposal ☐ other ☐ In yard ☐**in canal**	☐ Yes ☐ **No**	☐ Phorate ☐ sulphide ☐ Monocrotophos ☐ **Glyphosate**	☐ 1 time ☐ **2 times** ☐ 3 times	☐**Crop Rotation Method** ☐ Bio-pesticides ☐Chemical Pesticides ☐Integrated Pest Management	☐ Yes ☐ **No**	☐ **Yes** ☐ No	Quantity.
16	☐ Yes ☐ **No**	☐ Yes ☐ **No**	☐ in solid waste disposal ☐ other ☐ In yard ☐**in canal**	☐ Yes ☐ **No**	☐ Phorate ☐ sulphide ☐ Monocrotophos ☐ **Glyphosate**	☐ 1 time ☐ **2 times** ☐ 3 times	☐**Crop Rotation Method** ☐ Bio-pesticides ☐Chemical Pesticides ☐Integrated Pest Management	☐ Yes ☐ **No**	☐ **Yes** ☐ No	Quantity.
17	☐ Yes ☐ **No**	☐ **Yes** ☐ No	☐ in solid waste disposal ☐ other ☐ In yard ☐**in canal**	☐ **Yes** ☐ No	☐ Phorate ☐ sulphide ☐ Monocrotophos ☐ **Glyphosate**	☐ 1 time i ☐ **2 times** ☐ 3 times	☐**Crop Rotation Method** ☐ Bio-pesticides ☐Chemical Pesticides ☐Integrated Pest Management	☐ Yes ☐ **No**	☐ **Yes** ☐ No	Quantity.
18	☐ Yes ☐ **No**	☐ **Yes** ☐ No	☐ in solid waste disposal ☐ other ☐ In yard ☐**in canal**	☐ **Yes** ☐ No	☐ Phorate ☐ sulphide ☐ Monocrotophos ☐ **Glyphosate**	☐ 1 time ☐ **2 times** ☐ 3 times	☐**Crop Rotation Method** ☐ Bio-pesticides ☐Chemical Pesticides ☐Integrated Pest Management	☐ **Yes** ☐ No	☐ Yes ☐ **No**	Quantity.
19	☐ Yes ☐ **No**	☐ **Yes** ☐ No	☐ in solid waste disposal ☐ other ☐ In yard ☐**in canal**	☐ **Yes** ☐ No	☐ Phorate ☐ sulphide ☐ Monocrotophos ☐ **Glyphosate**	☐ 1 time ☐ **2 times** ☐ 3 times	☐Crop Rotation Method ☐ Bio-pesticides ☐**Chemical Pesticides** ☐Integrated Pest Management	☐ **Yes** ☐ No	☐ Yes ☐ **No**	Quality
20	☐ Yes ☐ **No**	☐ **Yes** ☐ No	☐ in solid waste disposal ☐ other ☐ In yard ☐**in canal**	☐ **Yes** ☐ No	☐ Phorate ☐ sulphide ☐ Monocrotophos ☐ **Glyphosate**	☐ 1 time ☐ **2 times** ☐ 3 times	☐Crop Rotation Method ☐ Bio-pesticides ☐**Chemical Pesticides** ☐Integrated Pest Management	☐ Yes ☐ **No**	☐ Yes ☐ **No**	Quality

3. Even they use large amount of chemicals for large yield which have adverse effect on water content and also the surrounding areas.
4. Some of the farmers use tobacco as pesticides for growing paddy.
5. Most of the farmers follow crop rotation method which is good for soil fertility.
6. The usage of chemicals like Phorate and Monoprotophos for growing paddy is more which have very adverse effects such as skin absorption; vomiting, low blood pressure etc. is seen on humans.
7. In case of quality versus quantity, many farmers prefer quantity and so they use large amount of chemicals. Not now but in future land may degrade and its fertility will be affected.

Future approaches

By analysing the above scenario of Ahmedabad District, the excessive use of chemicals and pesticides will have negative impacts on the district planning. The decreases in soil fertility, land degradation, soil erosion, crop failure, suicidal attempt etc. will be observed.

Farmers, ranchers and farm-workers should receive training on how to apply pesticides safely and make better decisions in selecting pesticides probably with pesticides that have low toxicity or risk. Farmers should be made aware about the negative impacts and health hazards, importance of using precaution like hand gloves and to avoid direct contact with pesticides.

Availability of pure and required quality of seed HYVs(High Yielding Variety seeds) and other inputs like Organic manure and chemical fertilizer at proper time.

Integrated nutrient management system (INM)to be adopted.
Integrated pest and diseases management (IPDM) package are to be promoted exploring the eco-friendly options for biological control of the insect pests.

Integrated pest management (IPM) can be adopted for better yield.

The use of GMO crops, Crop rotation method and integrated pest management are increasing. It not only produce good quality of crops but also beneficial economically. It maintains soil quality, land fertility; land use change is not seen and also good for humanin general.

As suggested, as farmers prefer quantity above quality, and end up using lot of harmful chemicals as pesticides, spreading awareness is the only means to make them aware about the later implications of doing such mal-practices sothat in future land degradation and its fertility will be saved.

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