CHAPTER 4:
DATA COLLECTION AND ANALYSIS OF FOOD GRAIN PRODUCTION AND PESTICIDE USE IN INDIA

4.1 INTRODUCTION:
The world population is likely to grow to 9 billion by 2050 (Fig. 12). At the same time, the cultivable land area is decreasing in an alarming rate. It has been estimated that 1 Hectare of productive land (Arable land, pasture land and forest) is lost every 7.67 second (Fig.13 ). This means that the crop yield per hectare land must improve significantly to feed the world population. (Reference 5,7,22, 44):

FIG. 12: POPULATION GROWTH (WORLD 2010-2050)
4.2 CURRENT SITUATION IN INDIA - DECREASING ARABLE LAND AND INCREASING POPULATION:

The arable land in India is 159.7 million hectares. During last four decades, arable land per person in India has reduced to half (Figure 14) (Reference 60).

FIG. 14: DECREASE IN ARABLE LAND IN INDIA (ha per person), 1971-2011
4.3 FOOD GRAIN PRODUCTION IN INDIA:

The food grain production in India has been growing steadily over the years. The total food grain production from 1950-51 to 2011-12 is shown in Fig. 15. Similarly, from 2004-05 to 2010-11, production of rice (Fig. 16), wheat (Fig. 17), pulses (Fig. 18), maize (Fig. 19), soya (Fig. 20) and sugarcane (Fig. 21) are also shown.

FIG. 15: FOOD GRAIN PRODUCTION IN INDIA, 1951-2011 (MMT)

FIG. 16: RICE PRODUCTION IN INDIA
FIG. 17 WHEAT PRODUCTION IN INDIA

FIG 18 : PULSES PRODUCTION IN INDIA
FIG. 19: MAIZE PRODUCTION IN INDIA

Production (Million Tonnes)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Production</td>
<td>14.18</td>
<td>14.71</td>
<td>15.10</td>
<td>18.96</td>
<td>19.73</td>
<td>16.72</td>
<td>21.28</td>
</tr>
</tbody>
</table>

FIG. 20: SOYA PRODUCTION IN INDIA

Production (Million Tonnes)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Production</td>
<td>5.85</td>
<td>7.00</td>
<td>7.69</td>
<td>9.49</td>
<td>9.10</td>
<td>9.70</td>
<td>9.80</td>
</tr>
</tbody>
</table>
4.4 DEMAND SUPPLY GAP IN KEY FOOD CROPS IN INDIA

The demand supply gap for key food crops in India in 2021 is shown below (Fig. 22)

FIG. 22: DEMAND SUPPLY GAP IN 2021 FOR KEY FOOD CROP (MMT)

4.5 PESTICIDE USAGE IN INDIA - KEY ISSUES:

4.5.1 PRODUCTIVITY IN INDIAN AGRICULTURE:

India has the daunting task of feeding 16% of world population from less than 2% of the land mass, which is further shrinking every year. For 1 billion Indian population, food security is to be ensured. In this scenario, the farm output has to improve drastically. The productivity in Indian agriculture is one of the lowest in India (Reference 48, 60, 69). The yield per hectare for rice and wheat in India as compared to other countries is shown below (Fig. 23 and 24 respectively).

**FIG. 23: COMPARISON OF RICE YIELD IN INDIA AND OTHER COUNTRIES**

![Rice Yield/Hectare Chart]

**FIG. 24: COMPARISON OF WHEAT YIELD IN INDIA AND OTHER COUNTRIES**

![Wheat Yield/Hectare Chart]
The comparison of yield of other food crop like soya, pulses and sugarcane are shown in Tables 25 to 27.

**FIG. 25: COMPARISON OF SOYA YIELD IN INDIA AND OTHER COUNTRIES (Kg/Ha)**

![Figure 25](image)

**FIG. 26: COMPARISON OF PULSES YIELD IN INDIA AND OTHER COUNTRIES (Kg/Ha)**

![Figure 26](image)
FIG. 27: COMPARISON OF SUGARCANE YIELD IN INDIA AND OTHER COUNTRIES (Kg/Ha)

4.6 INFERENCE FROM THE ABOVE DATA:

It is clear from the above data that the productivity of important crops in India are lower than the world average, and significantly lower than the best in the class. It is obvious that there is tremendous scope and need for improvement of yield of different crops in India.

In order to determine if there is any correlation between low crop yield and pesticide use in India, it was decided to collect data on pesticide use in India.
4.7 PESTICIDE USE IN INDIA:

The sequence of use of farm inputs in agriculture is shown below:

4.7.1 CROP LOSSES IN INDIA DUE TO PESTS AND WEED:

As per Government of India estimate, crop losses in India due to pests and weeds were Rs 90,000 crores in 2002. Currently it is around Rs 1,40,000 crore in a year. (Reference 87). Insects contribute 26%, weeds 33%, plant diseases 26% and rodent and others 15%. (Fig. 28)
4.7.2 DISTRIBUTION OF PESTICIDE USE IN INDIA BY PRODUCT CATEGORY:

The distribution of pesticides under different category (Insecticide, Fungicide, Herbicide etc) in 2010 and 2004 are shown below (Fig. 29 and 30) (Reference 71).

FIG. 29: DISTRIBUTION OF PESTICIDE USE IN INDIA BY PRODUCT CATEGORY (2010):
In 2004, large amount of insecticides were used in cotton. After the introduction of BT cotton in 2003, the use of insecticides in cotton has decreased considerably. At the same time, due to less availability of labour for farm work, the use of herbicides has grown steadily. Also, demand for fruits and vegetable in India is growing fast, leading to increase in consumption of fungicides (Reference 86, 19, 38).

4.7.3 CROPWISE PESTICIDE CONSUMPTION IN INDIA:
The crop wise pesticide consumption in India is shown in Figure 31 (Reference 71):

---

FIG. 30: DISTRIBUTION OF PESTICIDE USE IN INDIA BY PRODUCT CATEGORY (2004):

![Pie chart showing pesticide use by product category in 2004.]

**2004**
- Others: 1%
- Fungicide: 17%
- Herbicide: 13%
- Insecticide: 69%

In 2004, large amount of insecticides were used in cotton. After the introduction of BT cotton in 2003, the use of insecticides in cotton has decreased considerably. At the same time, due to less availability of labour for farm work, the use of herbicides has grown steadily. Also, demand for fruits and vegetable in India is growing fast, leading to increase in consumption of fungicides (Reference 86, 19, 38).

4.7.3 CROPWISE PESTICIDE CONSUMPTION IN INDIA:
The crop wise pesticide consumption in India is shown in Figure 31 (Reference 71):

![Pie chart showing cropwise pesticide consumption.]

**FIG. 31: CROPWISE PESTICIDE CONSUMPTION IN INDIA**

- Paddy: 28%
- Cotton: 20%
- Vegetables: 14%
- Fruits: 6%
- Wheat: 6%
- Pulses: 5%
- Oilseeds: 5%
- Others: 16%
4.7.4 SIZE OF INDIAN AGROCHEMICAL MARKET

The size of the Indian agrochemical market over last 7 years is shown in Table 10 below.

**TABLE 10: SIZE OF INDIAN AGROCHEMICAL MARKET ($ Billion):**

<table>
<thead>
<tr>
<th>Year</th>
<th>Domestic</th>
<th>Exports</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>1.0</td>
<td>0.6</td>
</tr>
<tr>
<td>2007</td>
<td>1.1</td>
<td>0.6</td>
</tr>
<tr>
<td>2008</td>
<td>1.2</td>
<td>0.7</td>
</tr>
<tr>
<td>2009</td>
<td>1.4</td>
<td>1.1</td>
</tr>
<tr>
<td>2010</td>
<td>1.6</td>
<td>1.2</td>
</tr>
<tr>
<td>2011</td>
<td>1.7</td>
<td>1.4</td>
</tr>
<tr>
<td>2012 P</td>
<td>1.8</td>
<td>1.6</td>
</tr>
</tbody>
</table>

*Source: FICCI, Frost & Silluvan Research, Komal publications*

4.7.5 STATE WISE PESTICIDE CONSUMPTION IN INDIA:

The state wise pesticide consumption in India is shown in Figure 31.
FIG. 31: STATE WISE PESTICIDE CONSUMPTION IN INDIA (Reference 71).

State-wise pesticides consumption Fy09 (% of total value)

- AP: 22%
- Maharashtra: 12%
- Punjab: 10%
- Gujarat: 6%
- Karnataka: 7%
- Maharashtra: 12%
- Punjab: 10%
- Haryana: 5%
- MP & Chattisgarh: 7%
- Tamil Nadu: 5%
- West Bengal: 5%
- Others: 21%

4.8 COMPARISON OF PESTICIDE USAGE IN INDIA WITH OTHER COUNTRIES:

The usage pesticide in India (kg/hectare) as compared to other countries is shown in the Figure 32 (Reference 71):

FIG. 32: COMPARISON OF PESTICIDE USAGE IN INDIA WITH OTHER COUNTRIES (Kg/Ha)

Source: Industry reports, Tata Strategic analysis
It can be seen from the above data that the usage of pesticides in India is very low as compared to other developed and developing countries.

If we take the average crop productivity of different crops taken together and compare the same with other countries, the results are as follows (Table 11) (Reference 60):

**Table 11: Average crop productivity : India vs Other countries**

(kg/hectare) (Reference 60):

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Country</th>
<th>Average crop productivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>USA</td>
<td>6</td>
</tr>
<tr>
<td>02</td>
<td>China</td>
<td>5</td>
</tr>
<tr>
<td>03</td>
<td>World</td>
<td>3</td>
</tr>
<tr>
<td>04</td>
<td>India</td>
<td>2</td>
</tr>
</tbody>
</table>

If we superimpose this with pesticide use, we notice positive correlation between pesticide use and crop productivity. If the pesticide use in India becomes the world average, crop yield in India is likely to increase by 50% which will have very big impact on food availability and food security in India. It is therefore important to find out the reason for low use of pesticides in India.

**Fig. 33: Correlation of agrochemical use and crop productivity**

(Reference 60)
From the data given in section 5 above, we can see that the crop productivity in India is very low and significantly lower than the best in the world. We also see that the pesticide use in India is also very low compared to other countries. The data also shows that there is good correlation between pesticide use and yield of the crop ($r = 0.76$)

### 4.9 Problem and questionnaire:

When we compare yield of crops in different countries, India ranks low. Data from different sources show that in India, large quantity of crop is lost due to pest attack. At the same time, India is one of the lowest consumer of pesticides per hectare. Scientific studies have established that there is a positive correlation between pesticide use and crop yield.

For the first part of the project, a questionnaire was prepared with the objective of finding the reason for low usage of pesticides. The questionnaire is as follows:

A. In order to ensure increased use of pesticides, the agrochemical companies in India should spend more effort to educate the farmers on the benefits of using pesticides: Agree/Disagree.

B. In order to ensure increased use of pesticides, the agrochemical companies in India should decrease the price of pesticides: Agree/Disagree.

C. In order to ensure increased use of pesticides and become global leader, the agrochemical companies in India should start investing in R&D to discover products relevant to the needs of our country. Agree/Disagree.

D. The use of pesticides in India is significantly lower than the advanced countries. One of the reasons for the same is that the land holding in India is highly fragmented”. Agree/Disagree.

E. One of the reasons for low usage of pesticide in India is: “the farmers in India are dependent on monsoon as the level of irrigation is low.” Agree/Disagree.

F. Worldwide, the use of herbicides is much higher than insecticides and fungicides. Currently, in India, the herbicide use is low. In future, due to shortage in availability of labour, the use of herbicides will increase. Agree/Disagree.
4.10 Data collection on questionnaire and analysis:

It was decided to collect data from at least 125 person connected to Indian agriculture and pesticide. This included dealers of pesticides, marketing staff from pesticide companies, academicians from agricultural universities, farmers and top executives from the industry.

In fact, 138 persons were contacted and data collected. Some respondents did not answer few questions which they were not sure. Those non-responses were deleted in the evaluation of data.

We will now analyse response to each question.

Question 1:
The agrochemical companies in India should spend more effort to educate farmers on the benefits of using pesticides:

<table>
<thead>
<tr>
<th></th>
<th>Agree: 107</th>
<th>Disagree: 21</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Agree: 83.6%</td>
<td>Disagree: 16.4%</td>
</tr>
</tbody>
</table>
We can see from the above an overwhelming majority of the respondents (83.6%) feel that the agrochemical companies should spend more effort to educate farmers on the benefits of using pesticides.

When we further analysed the responses from different categories of respondents like dealers, senior professional from the industry, marketing executives, academicians, the result was as follows:

**Table 13: Response from different group to Q. No. 1**

<table>
<thead>
<tr>
<th>Total</th>
<th>Dealers: 48</th>
<th>Senior professionals: 12</th>
<th>Marketing executives: 12</th>
<th>Academicians: 16</th>
<th>Farmers: 19</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agree</td>
<td>107</td>
<td>Agree: 48</td>
<td>Agree: 12</td>
<td>Agree: 16</td>
<td>Agree: 19</td>
</tr>
<tr>
<td>Disagree</td>
<td>21</td>
<td>Disagree: 10</td>
<td>Disagree: 0</td>
<td>Disagree: 1</td>
<td>Disagree: 4</td>
</tr>
<tr>
<td>Agree 83.6%</td>
<td>Agree: 82.8%</td>
<td>Agree: 100%</td>
<td>Agree: 66.7%</td>
<td>Agree: 94.1%</td>
<td>Agree: 82.6%</td>
</tr>
<tr>
<td>Disagree 16.4%</td>
<td>Disagree: 17.2%</td>
<td>Disagree: 0%</td>
<td>Disagree: 33.3%</td>
<td>Disagree: 5.9%</td>
<td>Disagree: 17.4%</td>
</tr>
</tbody>
</table>
The dealers are in close touch with real life situation. They are constantly interacting with the farmers and agrochemical companies. We see from the above that an overwhelming majority of dealers (82.8%) believe that the agrochemical companies should spend more effort to educate farmers on the benefit of using pesticides.

**Fig. 36: Response from senior professionals from industry (Question no 1):**

The senior professionals from the industry believe that the agrochemical companies in India should spend more effort to educate farmers on the benefits of using pesticides.
Here also we see that the senior professionals of the industry realize that more effort has to be put to educate farmers. This is particularly important as India is losing substantial quantity of crop due to inadequate use of agrochemicals.

**Fig. 37: Response from marketing executives (Question no 1):**

![Bar chart showing response percentages.](chart1)

We find that two thirds of the marketing executives feel more effort is to be put by them to educate farmers on the benefits of using pesticides. One observation is that the % of marketing executives agreeing (66.7%) is less than the dealers (82.8%) and senior professionals from the industry (100%). The reason may be that it is the responsibility of marketing executives to educate farmers and some of them feel that they are doing the right job. Some of them may also think that if they agree, senior management will think that they are not putting sufficient effort.

**Fig. 38: Response from academicians (Question no 1):**

![Bar chart showing response percentages.](chart2)
We see that overwhelming majority of the academicians like University Professors (94.1%) agreed that more effort is required to educate farmers.

**Fig. 39: Response from farmers (Question no 1):**

![Bar chart showing 82.6% agree and 17.4% disagree]

Finally, coming to the farmers, we find that a vast majority of farmers (82.6%) believe that they need more knowledge on the benefits of using the pesticides. The crop is attacked by different types of pests, fungus and bacteria. The farmers do not know what product to use and whether it will work.

**Question 2:**

To ensure increased use of pesticides, the agrochemical companies in India should decrease the price of pesticides:

**Table 14: Overall response to Question no 2**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Agree</td>
<td>94</td>
</tr>
<tr>
<td>Disagree</td>
<td>36</td>
</tr>
<tr>
<td>Agree</td>
<td>72.3%</td>
</tr>
<tr>
<td>Disagree</td>
<td>27.7%</td>
</tr>
</tbody>
</table>
We can see from the above the majority of the respondents (72.3%) feel that the agrochemical companies should decrease the price of pesticides which will lead to increased use of pesticides.

When we further analysed the responses from different categories of respondents like dealers, senior professional from the industry, marketing executives, academicians, the result was as follows:

**Table 15: Response from different group to Question No. 2**

<table>
<thead>
<tr>
<th>Total</th>
<th>Dealers:</th>
<th>Senior professionals industry</th>
<th>Marketing executives</th>
<th>Academicians</th>
<th>Farmers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agree: 94</td>
<td>Agree: 44</td>
<td>Agree: 4</td>
<td>Agree: 12</td>
<td>Agree: 15</td>
<td>Agree: 19</td>
</tr>
<tr>
<td>Disagree: 36</td>
<td>Disagree: 14</td>
<td>Disagree: 8</td>
<td>Disagree: 5</td>
<td>Disagree: 3</td>
<td>Disagree: 6</td>
</tr>
<tr>
<td>Agree: 72.3%</td>
<td>Agree: 75.9%</td>
<td>Agree: 33.3%</td>
<td>Agree: 70.6%</td>
<td>Agree: 83.3%</td>
<td>Agree: 76.0%</td>
</tr>
<tr>
<td>Disagree: 27.7%</td>
<td>Disagree: 24.1%</td>
<td>Disagree: 66.7%</td>
<td>Disagree: 29.4%</td>
<td>Disagree: 16.7%</td>
<td>Disagree: 24%</td>
</tr>
</tbody>
</table>
Fig. 41: Response from dealers (Question no 2):

From the above data, we see that the majority of dealers (75.9%) believe that if the price of pesticides is reduced, it will lead to increase in the consumption of pesticides.

Fig. 42: Response from senior professionals from industry (Question no 2):

Here, we find that majority of the senior professionals from the industry (66.7%) disagree that to ensure increased use of pesticides, the agrochemical companies should decrease the price of pesticides.
Fig. 43: Response from marketing executives (Question no 2):

From the responses received, we find that a majority of marketing executives (70.6%) feel that to ensure increased use of pesticides, agrochemical companies should decrease the price of pesticides.

Fig. 44: Response from academicians (Question no 2):

From the above response, it is observed that a vast majority of academicians (83.3%) feel that the reduction in price of the pesticides will lead to increased use of pesticides in India.
We see from the above data that more than three fourths of the farmers (76%) feel that if the price of the pesticides is decreased, it will lead to more use of pesticides in India.

**Question 3:**
In order to ensure increased use of pesticides and become global leader, the agrochemical companies in India should start investing in R&D to discover products relevant to the needs of our country:

**Table 16: Overall response to Question no 3**

<table>
<thead>
<tr>
<th>Agree: 102</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disagree: 23</td>
</tr>
<tr>
<td>Agree: 81.6%</td>
</tr>
<tr>
<td>Disagree: 18.4%</td>
</tr>
</tbody>
</table>
From the above response, we find that vast majority of the respondents (81.6%) think that the agrochemical companies should start investing in R&D to discover products relevant to the needs of the country.

When we further analysed the responses from different categories of respondents like dealers, senior professional from the industry, marketing executives, academicians, the result was as follows:

<table>
<thead>
<tr>
<th>Total</th>
<th>Dealers:</th>
<th>Senior professionals - industry</th>
<th>Marketing executives</th>
<th>Academicians</th>
<th>Farmers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disagree: 23</td>
<td>Disagree:14</td>
<td>Disagree:0</td>
<td>Disagree:2</td>
<td>Disagree:2</td>
<td>Disagree:5</td>
</tr>
<tr>
<td>Agree: 81.6%</td>
<td>Agree:75.0%</td>
<td>Agree:100%</td>
<td>Agree:87.5%</td>
<td>Agree:88.9%</td>
<td>Agree:78.3%</td>
</tr>
<tr>
<td>Disagree: 18.4%</td>
<td>Disagree:25.0%</td>
<td>Disagree:0%</td>
<td>Disagree:12.5%</td>
<td>Disagree:11.1%</td>
<td>Disagree:21.7%</td>
</tr>
</tbody>
</table>
Fig. 47: Response from dealers (Question no 3):

From the above response, we find that three fourth of the dealers (75%) agree that to ensure increased use of pesticides and become global leader, the agrochemical companies in India should start investing in R&D to discover products relevant to the needs of the country.

Fig. 48: Response from senior professionals from industry (Question no 3):

From the above response, we find that all the senior professionals from industry (100%) agree that to ensure increased use of pesticides and become global leader, the agrochemical companies in India should start investing in R&D to discover products relevant to the needs of the country.
We find from the above data that all the senior professionals from the agrochemical industry feel that Indian companies should start investing heavily in R&D.

**Fig. 49: Response from marketing executives (Question no 3):**

![Chart showing 87.5% agree and 12.5% disagree](chart.png)

MARKETING EXECUTIVES (In order to ensure increased use of pesticides and become global leader, the agrochemical companies in India should start investing in R&D to discover products relevant to the needs of our country)

A vast majority of marketing executives (87.5%) are also in agreement for enhanced investment in R&D.

**Fig. 50: Response from academicians (Question no 3):**

![Chart showing 88.9% agree and 11.1% disagree](chart.png)

ACADEMICANS (In order to ensure increased use of pesticides and become global leader, the agrochemical companies in India should start investing in R&D to discover products relevant to the needs of our country)
From the above data, we find that an overwhelming majority of academicians (88.1%) also feel Indian agrochemical companies should start investing in R&D to discover products relevant to the needs of our country.

**Fig. 51: Response from farmers (Question no 3):**

![Bar chart showing agreement and disagreement percentages]

We find from the above data that farmers also feel that they need new products to fight new pests.

**Question 4:**

One of the reason for low use of pesticides in India is: “Land holding in India is highly fragmented”:

**Table 18: Overall response to Question no 4**

<table>
<thead>
<tr>
<th></th>
<th>Agree: 91</th>
<th>Disagree: 39</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agree</td>
<td>70.0%</td>
<td></td>
</tr>
<tr>
<td>Disagree</td>
<td>30.0%</td>
<td></td>
</tr>
</tbody>
</table>
Fig. 52: Overall response (Question no 4):

![Graph showing overall response](image)

We can see from the above that more than two third of all respondents feel that one of the reason for low use of pesticides India is highly fragmented land holding.

When we further analysed the responses from different categories of respondents like dealers, senior professional from the industry, marketing executives, academicians, the result was as follows:

**Table 19: Response from different group to Question No. 4**

<table>
<thead>
<tr>
<th>Total</th>
<th>Dealers:</th>
<th>Senior professionals - industry</th>
<th>Marketing executives</th>
<th>Academicians</th>
<th>Farmers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agree: 70.0%</td>
<td>Agree: 76.8%</td>
<td>Agree: 66.7%</td>
<td>Agree: 33.3%</td>
<td>Agree: 72.22%</td>
<td>Agree: 80.8%</td>
</tr>
<tr>
<td>Disagree: 30.0%</td>
<td>Disagree: 23.2%</td>
<td>Disagree: 33.3%</td>
<td>Disagree: 66.67%</td>
<td>Disagree: 27.78%</td>
<td>Disagree: 19.2%</td>
</tr>
</tbody>
</table>
We see from the above that more than three fourths of the dealers who agreed that one of the reasons for low use of pesticides in India is that the land holding in India is highly fragmented with each farmer having a small piece of land.

**Fig. 54: Response from senior professionals from industry**

*(Question no 4):*
We see from the above that two thirds of the senior professionals from the industry also agreed with the observation that one of the reasons for low use of pesticides in India is highly fragmented nature of land holding.

**Fig. 55: Response from marketing executives (Question no 4):**

We find that, 66.7% of the respondents do not agree that fragmented land holding is responsible for low pesticide use in India.

**Fig. 56: Response from academicians (Question no 4):**

More than two thirds of the academicians (72.2%) believe fragmented land holding is one of the reasons for low use of pesticides in India.
Majority of the farmers (80.8%) believe that fragmented land holding is one of the causes for low use of pesticides.

**Question 5:**

One of the reasons for low usage of pesticides in India is: “The farmers in India are dependent on monsoon as the level of irrigation is low.”

**Table 20: Overall response to question no 5**

<table>
<thead>
<tr>
<th>Agree: 100</th>
<th>Disagree: 29</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agree: 77.5%</td>
<td>Disagree: 22.5%</td>
</tr>
</tbody>
</table>

**Fig. 58: Overall response (Question no 5):**
We can see from the above that majority of the respondents (77.5%) feel that one of the reasons for low usage of pesticides in India is that the farmers in India are dependent on monsoon as the level of irrigation is low.

When we further analysed the responses from different categories of respondents like dealers, senior professional from the industry, marketing executives, academicians, the result was:

**Table 21: Response from different group to Question No. 5**

<table>
<thead>
<tr>
<th>Total</th>
<th>Dealers:</th>
<th>Senior professionals - industry</th>
<th>Marketing executives</th>
<th>Academicians</th>
<th>Farmers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agree: 100</td>
<td>Agree: 45</td>
<td>Agree: 8</td>
<td>Agree: 17</td>
<td>Agree: 11</td>
<td>Agree: 19</td>
</tr>
<tr>
<td>Disagree: 29</td>
<td>Disagree: 13</td>
<td>Disagree: 3</td>
<td>Disagree: 1</td>
<td>Disagree: 7</td>
<td>Disagree: 5</td>
</tr>
<tr>
<td>Agree: 77.5%</td>
<td>Agree: 77.6%</td>
<td>Agree: 72.7%</td>
<td>Agree: 94.4%</td>
<td>Agree: 61.1%</td>
<td>Agree: 79.2%</td>
</tr>
<tr>
<td>Disagree: 22.5%</td>
<td>Disagree: 22.4%</td>
<td>Disagree: 27.3%</td>
<td>Disagree: 5.6%</td>
<td>Disagree: 38.9%</td>
<td>Disagree: 20.8%</td>
</tr>
</tbody>
</table>

**Fig. 59: Response from dealers (Question no 5):**
We see from the above that more than three fourths of the dealers agree that one of the reasons for low usage of pesticides in India is that the farmers in India are dependent on monsoon as the level of irrigation is low.

**Fig. 60: Response from senior professionals from industry**

(Question no 5):

![Bar Chart](image)

We find from the above data that 72.7% of senior professionals agree that dependence on monsoon is one of the reasons for usage of pesticides in India.

**Fig. 61: Response from marketing executives (Question no 5):**

![Bar Chart](image)
An overwhelming number of marketing executives (94.4%) agree that one of the reasons for low usage of pesticides in India is dependence of farmers on monsoon, as the level of irrigation in India is low.

**Fig. 62: Response from academicians (Question no 5):**

More than 60% of the academicians also agree that one of the reasons for low usage of pesticides in India is dependence of farmers on monsoon, as the level of irrigation in India is low.

**Fig. 63: Response from farmers (Question no 5):**
More than three fourths of the farmers agree that one of the reasons for low usage of pesticides in India is dependence of farmers on monsoon, as the level of irrigation in India is low.

**Question 6:**
Worldwide, the use of herbicides is much higher than insecticides and fungicides. Currently, in India, the herbicide use is low. In future, due to shortage in availability of labour, the use of herbicides will increase. Agree/ Disagree.

**Table 22: Overall response to Question no 6**

<table>
<thead>
<tr>
<th>Agree: 116</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disagree: 12</td>
</tr>
<tr>
<td>Agree: 90.6%</td>
</tr>
<tr>
<td>Disagree: 9.4%</td>
</tr>
</tbody>
</table>

**Fig. 64: Overall response (Question no 6):**

![Graph showing 90.6% Agree and 9.4% Disagree]

We can see from the above that an overwhelming majority (90.6%) of all respondents believe that the use of herbicides will increase in India in future due to shortage of availability of labour.
When we further analysed the responses from different categories of respondents like dealers, senior professional from the industry, marketing executives, academicians, the result was as follows:

**Table 23: Response from different Group to Question No. 6**

<table>
<thead>
<tr>
<th>Total</th>
<th>Dealers:</th>
<th>Senior professionals - industry</th>
<th>Marketing executives</th>
<th>Academicians</th>
<th>Farmers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disagree: 12</td>
<td>Disagree: 5</td>
<td>Disagree: 1</td>
<td>Disagree: 3</td>
<td>Disagree: 2</td>
<td>Disagree: 1</td>
</tr>
<tr>
<td>Agree: 90.6%</td>
<td>Agree: 91.4%</td>
<td>Agree: 92.3%</td>
<td>Agree: 83.3%</td>
<td>Agree: 87.5%</td>
<td>Agree: 95.7%</td>
</tr>
<tr>
<td>Disagree: 9.4%</td>
<td>Disagree: 8.6%</td>
<td>Disagree: 7.7%</td>
<td>Disagree: 16.7%</td>
<td>Disagree: 12.5%</td>
<td>Disagree: 4.3%</td>
</tr>
</tbody>
</table>

**Fig. 65: Response from dealers (Question no 6):**

From the above data we see that an overwhelming % of dealers (91.4%) are of the strong opinion that the use of herbicides in India will increase in future caused by the shortage of labour.
Fig. 66: Response from senior professionals from industry (Question no 6):

Here also we see that the senior professionals from the industry are of the same opinion regarding increase in herbicide use in future.

Fig. 67: Response from marketing executives (Question no 6):

More than 80% of the marketing executives are of the opinion that the use of herbicides will increase in future.
Fig. 68: Response from academicians (Question no 6):

Majority of the academicians have the same opinion regarding increased use of herbicides in future.

Fig. 69: Response from farmers (Question no 6):
Farmers, who are facing problem in getting labour during crop season, are of the strong opinion that they will have to use more herbicides in future as the labour situation will worsen.