CHAPTER VI
SUMMARY AND CONCLUSION

In this chapter, a core description of the study in respect of the summary, conclusion, implication and suggestions for the further research is included. This chapter has been divided into the following subheads.

6.1 Summary
6.2 Major findings and conclusions
6.3 Implications
6.4 Suggestions for the further research

6.1 Summary

6.1.1 Introduction

Economic status of the people in country like India mostly depends upon the agricultural production. Need for more intensive and economic agricultural production led to indiscriminate use of high doses of chemical fertilizers, pesticides etc., Relentless use of these chemicals not only alter the eco-system but also claim death to many lives every year due to their hazardous nature.

Biofertilizers are defined as preparations containing living cells or latent cells of efficient strains of microorganisms that help crop plants uptake of nutrients by their interactions in the rhizosphere when applied through seed or soil. They accelerate certain microbial processes in the soil which augment the extent of availability of nutrients in a form easily assimilated by plants. In arid and semi-arid area where the moisture is limiting factor there is no chance or sometime less chances of giving top dressing of fertilizers. In such situation biofertilizers are the cheap source to maintain fertility as well as soil moisture.

In semi-arid regions of tropical and subtropical countries, the soils are nutritionally deficient and due to moisture limitation, chemical fertilizers cannot be applied in adequate quantities. Crops grown in such areas, therefore, the supply of N is largely dependent on biological nitrogen fixation. In rainfed agriculture, these inputs gain added importance in view of their low cost, as most of the farmers are small and
marginal and cannot afford to buy expensive chemical fertilizers. Biofertilizers are also ideal input for reducing the cost of cultivation and for practicing organic farming.

Biopesticides are certain types of pesticides derived from such natural materials as animals, plants, bacteria, and certain minerals. Microbial pesticides consist of a microorganism (e.g., a bacterium, fungus, virus or protozoan) as the active ingredient. Microbial pesticides can control many different kinds of pests, although each separate active ingredient is relatively specific for its target pests and disease.

Biopesticides are ecofriendly pesticides which are obtained from naturally occurring substances (Biochemicals), microbes and plants. Biopesticides fall into three major classes. The potential benefits to agriculture and public health programmes through the use of biopesticides are considerable. Not all natural products are biopesticides. Some are chemical pesticides if they act on nervous system of the pest. Through the use of biopesticides in a wider way, agriculture and health programmes can be beneficially affected. There are many disadvantages associated with the use of chemical pesticides like genetic variations in plant populations, reduction of beneficial species, damage to the environment or water bodies, poisoning of food and health problems such as cancer which makes biopesticides to come into picture. India has a vast potential for biopesticides. Some biopesticides currently being developed may be excellent alternatives to chemical pesticides. Biopesticides being target pest specific are presumed to be relatively safe to non-target organism including humans. However, in India, some of the biopesticides like BT, NPV, Neem based pesticides, Trichoderma, Beauveria etc. have already been registered and are being practiced.

The biofertilizer and biopesticide technology is basically a microbial technology. The field extension workers are the link between the newly recommended technology and farmers. They have a major role to communicate this specialized technology to farmers. Accordingly, in order to acquaint about the developments towards biofertilizer and biopesticide technology, the extension officials of the state governments are being trained in the project, about the current developments of biofertilizer and biopesticide technology.

Government has to ensure that the bio-organism based product entering the market must meet with the quality standard. In the initial years government subsidized the biofertilizers and biopesticides so that small and marginal farmers could easily be
adopting it. A proper marketing strategy depending on the socioeconomic condition, market heterogeneity and buying capacity of the consumer need to be planned to decide on various intermediaries for distribution and adoption of new technology by the farmers. Later on awareness on the proper application procedures, limitations of product, and long term benefits of product needs to be created in farmers especially in interiors of the country. The government could also encourage the private firms and research institutes to come together, cooperate and promote training and extension activity at farm level for farmers. Junagadh Agricultural University developed *Rhizobium, Azotobacter* and Phosphate Solubilizing Bacteria while two type of biopesticide as trade name *Trichoderma harzianum* and *Beauveria bassiana* as ‘Sawaj’ trade name.

There is great need to increase farm production to overcome the requirement of food for increasing population without damaging the environment. The more use of chemical fertilizers are harmful to living soil and therefore the use of biofertilizers and are required which improve the soil fertility without any harmful effect to the soil as well as biopesticides are require to control of pest without harmful effect to environment.

Looking to above facts a study entitled, “*Knowledge and attitude of farmers towards ‘Sawaj’ biofertilizers and biopesticides in Junagadh district of Gujarat state*” will be undertaken with following objectives.

1. To study the selected characteristics of the respondents.
2. To measure the knowledge level of the respondents towards ‘Sawaj’ biofertilizers and biopesticides.
3. To know the attitude of the respondents towards ‘Sawaj’ biofertilizers and biopesticides.
4. To ascertain the association between the selected characteristics of the respondents and their knowledge and attitude level towards ‘Sawaj’ biofertilizers and biopesticides.
5. To study the evaluative perception about ‘Sawaj’ biofertilizers and biopesticides.
6. To identify the constraints perceived by the respondents in use of ‘Sawaj’ biofertilizers and biopesticides and to seek suggestions

6.1.2 Review of literature

A brief account of literature reviewed were presented under different heads viz., selected characteristics of ‘Sawaj’ biofertilizers and biopesticides users, knowledge and attitude of about farmers about biofertilizers and biopesticides practices, association between characteristics of farmers. Appropriateness of methods and techniques used constraints faced by ‘Sawaj’ biofertilizers and biopesticides users in practices and suggestions to overcome the constraints faced by them were included in review of literature.

6.1.3 Methodology

Ex-post facto research design was followed for carrying out the study. For drawing the sample for the study a proportionate random sampling technique was followed for this study. The study was conducted in Junagadh district of Gujarat state. Junagadh consisted total nine talukas, out of nine talukas three talukas were selected which are more nearer to Junagadh Agriculture University. From each selected taluka four villages were selected randomly. Total twelve villages from three talukas were selected randomly and list of farmers of these villages and taluka of Junagadh district collected from Department of Agricultural Entomology and Department of Plant Pathology of College of Agriculture, J.A.U., Junagadh.

The dependent variables undertaken in this study were extent of knowledge and attitude about ‘Sawaj’ biofertilizers and biopesticides. To measure the extent of knowledge and attitude of ‘Sawaj’ biofertilizers and biopesticides users, a teacher made scale developed for the purpose was used.

The twelve independent variables undertaken in this study viz; age, education, Social Participation, herd size, land holding, annual income, cropping intensity, farm mechanization index, extension participation, cosmopolitaness, innovativeness and scientific orientation were measured with the help of suitable scale and procedures with due modification. The constraints faced by ‘Sawaj’ biofertilizers and biopesticides users and suggestion to overcome the constraints were also studied.

An interview schedule was developed in accordance with the objectives of the study and it was pre-tested and translated into Gujarati. The data of this study were
collected with the help of structural interview schedule. The collected data were classified, tabulated, analyzed and interpreted in order to make the findings meaningful. The statistical measures such as percentage, mean, standard deviation and correlation co-efficient were used in the study.

6.2 Major findings and conclusions

The conclusions which were drawn based on the findings of the study are as under.

6.2.1 Characteristics of beneficiaries

6.2.1.1 Personal characteristics

In respect to personal characteristics for Sawaj’ biofertilizers users, more than one third (38.30 per cent) of respondents belonged to middle age group, about 66.60 per cent of respondents belonged to secondary school level of education.

While respect to personal characteristics for Sawaj’ biopesticides users, more than half (53.30 per cent) of respondents belonged to middle age group, about 40.00 per cent of respondents belonged to middle school level of education.

6.2.1.2 Socio-economical characteristics

As regards to socio-economical characteristics of ‘Sawaj’ biofertilizers more than half (58.33 per cent) of the respondents belonged to medium social participation, nearly half (46.66 per cent) of the respondents had buffalo/cow in herd size, majority of farmers (40.00 per cent) had semi marginal size of land holding, about one-third (38.30 per cent) of the ‘Sawaj’ biofertilizers users belonged to medium annual income (₹ 1,00,001 to 1,50,000), half (50.00 per cent) of the the ‘Sawaj’ biofertilizers users were from the category of medium cropping intensity and more than half (58.33 per cent) of the the ‘Sawaj’ biofertilizers users were from the category of medium Farm mechanization index.

Whereas in respect to communication characteristics of ‘Sawaj’ biopesticides more than half (58.33 per cent) of the respondents belonged to medium social participation, more than half (60.00 per cent) of the respondents had buffalo/cow, nearly one third of farmers (35.00 per cent) had semi marginal size of land holding, about half (46.70 per cent) of the ‘Sawaj’ biopesticides users belonged to medium annual income (₹ 1,00,001 to 1,50,000), majority (53.33 per cent) of the the ‘Sawaj’ biopesticides users
were from the category of medium cropping intensity and majority (65.00 per cent) of the the ‘Sawaj’ biopesticides users were from the category of medium farm mechanization index.

### 6.2.1.3 Communication characteristics

In respect to communication characteristics of ‘Sawaj’ biofertilizers users majority (63.33 per cent) of the ‘Sawaj’ biofertilizers users had medium extension participation while about half (46.67 per cent) of the ‘Sawaj’ biofertilizers users had medium level of cosmopolitaness.

Whereas In respect to communication characteristics of ‘Sawaj’ biopesticides users majority (65.00 per cent) of the ‘Sawaj’ biopesticides users had medium extension participation more than half (56.67 per cent) of the ‘Sawaj’ biopesticides users had medium level of cosmopolitaness.

### 6.2.1.4 Psychological characteristics

The respondents with relation to psychological aspects, more than half ‘Sawaj’ biofertilizers users (53.33 per cent) of respondents were under the category of medium level innovativeness whereas more about half (43.33 per cent) of the ‘Sawaj’ biofertilizers users had high scientific orientation.

The respondents with relation to psychological aspects, more than half ‘Sawaj’ biopesticides users (51.67 per cent) of respondents were under the category of medium level innovativeness, while about half (48.33 per cent) of the ‘Sawaj’ biopesticides users had high scientific orientation.

### 6.2.2 Knowledge level of the respondents about ‘Sawaj’ biofertilizers and biopesticides.

Majority (61.67 per cent) of the respondents had medium level of knowledge about the ‘Sawaj’ biofertilizers. Whereas, 20.00 per cent and 18.33 per cent respondents had low and high level knowledge about ‘Sawaj’ biofertilizers, respectively.

Whereas majority (66.67 per cent) of the respondents had medium level of knowledge about the ‘Sawaj’ biopesticides. Whereas, 20.00 per cent and 13.33 per cent respondents had high and low level knowledge about ‘Sawaj’ biopesticides, respectively.
6.2.3 Attitude towards ‘Sawaj’ biofertilizers and biopesticides of the respondents

Nearly two fifth (61.67 per cent) of the farmers had medium level of attitude towards ‘Sawaj’ biofertilizers, remaining 21.67 per cent of farmers had high level of attitude. While 16.67 per cent of farmers had low level of attitude.

Whereas, nearly one third (68.33 per cent) of the farmers had medium level of attitude towards ‘Sawaj’ biopesticides, remaining 16.67 per cent of farmers had low level of attitude. While 15.00 per cent of farmers had high level of attitude.

6.2.4 Relationship between characteristics of the respondents and their knowledge about ‘Sawaj’ biofertilizers.

The characteristics of the respondents namely education, land holding, farm mechanization index, extension participation and scientific orientation had positive and highly significant relationship with knowledge about ‘Sawaj’ biofertilizers.

The characteristics of the respondents namely social participation, herd size, annual income and innovativeness were positively and significantly related knowledge about ‘Sawaj’ biofertilizers.

There was no significant relationship with the knowledge of respondents about ‘Sawaj’ biofertilizers with their cropping intensity and cosmopoliteness.

There was negative and significant relationship with knowledge about ‘Sawaj’ biofertilizers with age of respondents.

6.2.5 Relationship between characteristics of the respondents and their knowledge about ‘Sawaj’ biopesticides.

The characteristics of the respondents namely cropping intensity, extension participation, innovativeness and scientific orientation had positive and highly significant relationship with knowledge about ‘Sawaj’ biopesticides.

The characteristics of the respondents namely education, social participation, herd size, farm mechanization index and cosmopoliteness were positively and significantly related knowledge about ‘Sawaj’ biopesticides.

There was no significant relationship with the knowledge of respondents about ‘Sawaj’ biopesticides with their land holding and annual income.
There was negative and highly significant relation with knowledge about ‘Sawaj’ biopesticides with age of respondents.

**6.2.6 Relationship between characteristics of the respondents and their attitude about ‘Sawaj’ biofertilizers.**

The characteristics of the respondents namely land holding, farm mechanization index, innovativeness and scientific orientation had positive and highly significant relationship with attitude about ‘Sawaj’ biofertilizers.

The characteristics of the respondents namely education, social participation, extension participation and cosmopoliteness were positively and significantly related attitude about ‘Sawaj’ biofertilizers.

There was no significant relationship with the attitude of respondents about ‘Sawaj’ biofertilizers with their annual income, cropping intensity and herd size.

There was negative and significant relation with attitude about ‘Sawaj’ biopesticides with age of respondents.

**6.2.7 Relationship between characteristics of the respondents and their attitude about ‘Sawaj’ biopesticides.**

The characteristics of the respondents namely herd size, extension participation, cosmopoliteness and scientific orientation had positive and highly significant relationship with attitude about ‘Sawaj’ biopesticides.

The characteristics of the respondents namely education, social participation, land holding, annual income and innovativeness were positively and significantly related attitude about ‘Sawaj’ biopesticides.

There was no significant relationship with the attitude of respondents about ‘Sawaj’ biopesticides with their cropping intensity and Farm mechanization index.

There was negative and significant relation with attitude about ‘Sawaj’ biopesticides with age of respondents.

**6.2.8 Evaluative perception of respondents about ‘Sawaj’ biofertilizers**

It is observed from that nearly two fifth (61.67 per cent) of the farmers had medium level of evaluative perception towards ‘Sawaj’ biofertilizers, remaining 20 per cent of farmers had low level of evaluative perception. While 18.33 per cent of farmers
had low level of evaluative perception. Thus, it can be concluded that all most all farmers had medium to low level of evaluative perception towards ‘Sawaj’ biofertilizers.

6.2.9 Evaluative perception of respondents about ‘Sawaj’ biopesticides

It was observed that nearly two fifth (68.33 per cent) of the farmers had medium level of evaluative perception towards ‘Sawaj’ biopesticides, remaining 16.67 per cent of farmers had high level of evaluative perception. While 15 per cent of farmers had low level of evaluative perception. Thus, it can be concluded that all most all farmers had medium to high level of evaluative perception towards ‘Sawaj’ biopesticides.

6.2.10 Constraints and Suggestions

6.2.10.1 Constraints perceived by the farmers in use of biofertilizers and biopesticides

Out of 10 constraints identified in adoption of recommended practices, the most important constraints faced by the ‘Sawaj’ biofertilizers and biopesticides users were:

1. No visual difference in the crop growth and crop protection immediately as that of chemical fertilizers and pesticides.
2. Not so beneficial in every season.
3. Non-availability of biofertilizers and biopesticides from all dealers.
4. Poor shelf life of biofertilizers and biopesticides.
5. Lack of technical knowledge about biofertilizers and biopesticides.

6.2.10.2 Suggestions to overcome the constraints faced by the respondents in use of biofertilizers and biopesticides.

Out of 10 suggestions given by the respondents to overcome the constraints in use of ‘Sawaj’ biofertilizers and biopesticides, the most important suggestions expressed by respondents were,

1. Research on use of biofertilizers and biopesticides should be taken urgently
2. Sound marketing network for biofertilizers and biopesticides should be established
3. Successful farms and farmers be identified and designated for farmers training
4. Training should be provided about the use of biofertilizers and biopesticides by university.
5. Quality biofertilizers and biopesticides should be made available

6.2.11 Empirical model

The tentative paradigm was developed in the beginning of the thesis while arriving at the conceptual framework of this study (Fig.1 and 2). Now final form of paradigm based on the findings of this study is presented in the (Fig. 16, 17, 18 and 19) showing only those independent variables which had significant relationship with respondents’ knowledge and attitude of recommended practices of biofertilizers and biopesticides.
Factors related with Knowledge of respondents about ‘Sawaj’ biofertilizers

Factors related with

Independent variables
- Education
- Social Participation
- Herd size
- Land holding
- Annual income
- Farm mechanization index
- Extension participation

Dependent variables
- Innovativeness
- Scientific orientation

Levels of Knowledge

Fig. 16 Factors related with Knowledge of respondents about ‘Sawaj’ biofertilizers (The final paradigm)
Factors related with knowledge of respondents about ‘Sawaj’ biopesticides

Independent variables

- Education
- Social Participation
- Herd size
- Cropping intensity
- Farm mechanization index
- Extension participation
- Cosmopoliteness
- Innovativeness
- Scientific orientation

Dependent variables

Levels of knowledge

Fig. 17 Factors related with knowledge of respondents about ‘Sawaj’ biopesticides (The final paradigm)
Fig. 18 Factors related with attitude of respondents about ‘Sawaj’ biofertilizers (The final paradigm)
Factors related with Attitude of respondents about ‘Sawaj’ biopesticides

Factors related with

Independent variables

Education

Social Participation

Herd size

Land holding

Annual income

Extension participation

Cosmopoliteness

Innovativeness

Scientific orientation

Dependent variables

Levels of Attitude

Fig. 19 Factors related with attitude of respondents about ‘Sawaj’ biopesticides (The final paradigm)
6. 3 Implications

1. The study facilitated in knowing the characteristics of the ‘Sawaj’ biofertilizers and biopesticides users which will serve as a guideline for the planners and extension agencies for planning and implementing more use of biofertilizers and biopesticides.

2. Extension workers and researchers can make use of knowledge test and attitude test constructed in this study to measure the biofertilizers and biopesticides user’s level of knowledge and attitude about biofertilizers and biopesticides in other areas.

3. More efforts should be made by the extension agencies to establish in depth extension contact with farmers. Field demonstration/farmer’s day, campaign etc. should be organized at village level for this purpose.

4. Improve the knowledge of respondents about recommended practices of biofertilizers and biopesticides, the extension agencies should make more efforts to bring up the positively related characteristics such as education, social participation, annual income, extension participation, innovativeness and scientific orientation in order of its priority.

5. Improve the attitude of respondents about biofertilizers and biopesticides, the extension agencies should make more efforts to bring up the positively related characteristics such as education, social participation, annual income, extension participation, innovativeness and scientific orientation in order of its priority.

6. Raise the biofertilizers and biopesticides users knowledge and attitude of ‘Sawaj’ biofertilizers and biopesticides should be facilitated and motivation to participate in extension activities to increase their latest technical knowledge. They should also be advised to participate more actively in the social organizations.

6.4 Suggestions for the further research

The present study threat light on the new areas, where further research work needs to be carried some of them are as under:

The area of research could be extended further and size of sample of respondents can also be increase to draw more valid and generalized conclusions. Similar studies may also be conducted from time to time in different areas.
Moreover on the basis of the perception about adoption of biofertilizers and biopesticides, training needs of the respondents about recommended practices biofertilizers and biopesticides may also be emphasized. Some characteristics of respondents other than those considered in this study might be affecting knowledge and attitude about biofertilizers and biopesticides. These characteristics can be identified and their relationship with the knowledge and attitude of the respondents can be ascertained.