GAPS IN THE ADOPTION OF PLANT PROTECTION PRACTICES BY COMMERCIAL VEGETABLE GROWERS OF THRISSUR DISTRICT

By

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THESIS

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DECLARATION

I hereby declare that the thesis entitled `**Gaps in the adoption of plant protection practices by commercial vegetable growers of Thrissur district'** is a bonafide record of research work done by me during the course of research and that the thesis has not previously formed the basis for the award to me of any degree, diploma, fellowship or other similar title, of any other University or Society.

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Certified that the thesis entitled '**Gaps in the adoption of plant protection practices by commercial vegetable growers of Thrissur district'** is a record of research work done independently by **Mr.Manoj, M.**, under my guidance and supervision and that it has not previously formed the basis for the award of any degree, diploma, fellowship or associateship to him.

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INTRODUCTION

Indian sub continent is endowed with salubrious climate which permits growing of vegetables throughout the year. Vegetables play an important role in balanced nutrition as they are valuable sources of carbohydrates, proteins, vitamins and minerals.

Vegetable crops are more prone to attack of insects and pests and hence these crops are to be protected from those hazardous organisms. Here comes the importance of the use of plant protection chemicals on vegetables.

Many scientists have reported that in contrast to the package of practices recommendations for protecting vegetable crops from insect pests the farmers were found to apply chemicals of their own choice. They have also pointed out that transfer of technology to the commercial farmer needs to be improved by strengthening the rapport between scientists and farmers.

The need of the hour is to think about an environmentally biased pest control strategy with numerable control tactics which are practical and effective in a given ecosystem. The present study was formulated as a pioneer attempt with an intention to study the gaps in the adoption of plant protection practices in vegetable crops, realising the felt needs at the grass roots level and also to provide an insight into the major constraints in their effective use.

1.1 Objectives of the study

1. This study aims to assess the knowledge and adoption of plant protection practices by commercial vegetable growers of Thrissur district.

2. It also desires to assess the relationship between selected characteristics of farmers (psychological, social, situational and system variables) and knowledge and adoption of plant protection practices by vegetable growers.
3. Further, it is meant to study the constraints in the adoption of plant protection practices by vegetable growers in Thrissur district.

1.2 Statement of the problem

Indian agrarian scene engulfed in traditions has presented an apparent stagnation. Major break through in agricultural production is lost in the complicated and difficult problem of transfer of technology. In Kerala, where land holdings are small and possibilities of enlarging them are non-existent, more intensive land use through multiple cropping is recommended. Vegetable cultivation finds an ideal prospect in terms of the states agroclimatic and edaphic conditions.

Vegetable production in the state is a meagre 1.5 lakh tonnes against a current requirement of 3 lakh tonnes (Directorate of Economics and Statistics) ie., about 50 per cent of our requirements are met by procurement from other states. Hence the need for intensification of vegetable cultivation for attaining self sufficiency in Kerala is high.

Of the various production technologies, plant protection practices are probably the one that is subjected to substantial manipulation by the farmers. Therefore, the analysis of gaps in adoption of plant protection practices by vegetable growers will provide useful database to reorient the extension strategies targeted at bridging the deficit between demand and production in the state and hence the present study.

1.3 Scope of study

The study is an attempt to identify the various practices falling under different methods of plant protection in vegetables, which could be utilised as a ready recockner for information.

Further, the study tries to reveal the prevailing condition with regard to the level of knowledge, extent of adoption and constraints encountered by farmers about plant protection methods which would indirectly bring to light the gaps in current extension strategies. These revelation would be of help to the planners, policy makers, scientists and administrators in designing and popularising effective plant protection technology in the field of agriculture.

1.4 Limitations of the study

The present research formed a part of the post graduate degree programme which was a single student investigation and hence it has all the limitations of time, finance, mobility and other resources. These limitations determined the restricted selection of sample size. In spite of these limitations, every effort was made by the researcher to carry out the study as systematic and objective as possible.

1.5 Presentation of the study

Apart from the present chapter introduction, the second chapter viz., Review of literature deals with the conceptualization of the different variables included in the study and the review of studies related to those variables.

Materials and methods has been discussed in the third chapter. The location of the study area, sampling prcedure followed, quantification of the

variables selected for the study, statistical techniques employed etc. are dealt with in this chapter.

The fourth chapter brings out the Results and Discussion of the study. The last chapter summarises the study, with a brief resume, implications of the study and suggestions for future research.

Review of Literature

CHAPTER-II
REVIEW OF LITERATURE

A review of the nature and quantum of research studies already undertaken in the area of investigation helps the researcher in designing the theoretical frame work for the study. The theoretical frame work presents the conceptual background for the investigation, explaining the ways and significance of the problem under study.

In accordance with the objectives of the present study, the literature collected is furnished under the following sub heads.

2.1 Commercial vegetable growers

2.2 Knowledge of farmers about plant protection technology

2.3 Extent of adoption of plant protection technology

2.4 Methods of plant protection technology

2.5 Relationship between selected characteristics of farmers and their level of knowledge

2.6 Relationship between selected characteristics of farmers and extent of adoption

2.7 Constraints in the adoption of plant protection technology

2.8 Conceptual frame work for the study

2.1 Commercial vegetable growers

Tindall (1968) explained a commercial vegetable grower as one who grows his crops for reward and if his marketing is organised on a sound basis, he should be able to make satisfactory profit.

For the present study commercial vegetable grower was operationally defined as one who has taken up cultivation of vegetables in an area of at least 50 cents mainly for the purpose of market to make profit.

2.2 Knowledge of farmers about plant protection technology

Jayakrishnan (1984) found that 61.82 per cent of the paddy farmers had medium level of knowledge, 21.82 per cent high level of knowledge and 16.36 per cent low level of knowledge about plant protection practices.

Adalla and Rola (1988) elucidated that the level of knowledge and perception of farmers regarding pests and their subsequent damage to crops was relatively very low. In addition, farmers knowledge about rice pest control appear very limited that even natural enemies are being sprayed on sight.

Juliana *et al.* (1991) reported that most of the marginal and small farmers possessed only medium level of knowledge about integrated pest management practices. More than half of the big farmers possessed high level of knowledge. In contrast to this, only 2.50 per cent of marginal farmers and one-fourth of small farmers had high level of knowledge.

Bonny (1991) observed that majority (67%) of commercial vegetable growers had medium level of knowledge of improved vegetable cultivation practices.

From the above studies it is clear that farmers possess different levels of knowledge. Since knowledge about plant protection practices plays an important role in shaping the behavioural pattern of farmer's knowledge about improved plant protection practices knwoledge was included in the study as a dependent variable.

2.3 Extent of adoption of plant protection technology

Wilkening (1952) postulated adoption of innovation as a process composed of learning, deciding and acting over a period of time. The adoption or a decision to act has a series of actions and thought decisions.

According to Ramsey *et al.* (1959) adoption behaviour involved two components - behavioural, which involves the actual use of the practice and cognitive which includes obtained knowledge and critical evaluation of the practice in terms of individual situations.

Rogers (1962) defined adoption process as the mental process through which an individual passes from first hearing about an innovation to its final adoption.

Litsinger *et al.* (1982) reported that 47.00 per cent of the rice farmers used insecticides in the pre-green revolution area of Philippines. The most flaring fact regarding insecticide was the low dosage. Farmers used dosage 10.70 times less than recommended, and applied insecticides in very low spray volumes on an average of 80 litres per hectare which was sublethal to insects.

Saxena *et al.* (1990) reported that 17.60 per cent of wheat farmers adopted the recommended practices in full while 49.60 per cent adopted partially and 32.80 per cent followed recommendations to the minimum level in their fields. He also reported that the plant protection measures had been adopted by lesser percentage of farmers.

Govind (1992) reported that there was wide variation in the adoption level of cultural, chemical and specific IPM practices of selected pests among IPM and non IPM farmers for paddy cultivation. For the present study, the term adoption was used to refer to the observable action of a farmer in the form of acceptance and use of various plant protection practices in vegetable cultivation.

2.4 Methods in plant protection technology

Boutwell and Smith (1981) studied five sub items viz., field monitoring, utilizing treatment thresholds and beneficial insects, utilising proper insecticide application techniques, and utilising recommended control practices that affect insect management practices for Alabama Cotton production. Ganesan (1982) studied the pest management practices for paddy farmers under cultural, mechanical, physical, biological, chemical and traditional methods.

Krishnaiah (1986) studied pest surveillance and timing of pesticide application, chemical control, resistant varieties, conservation of natural enemies and natural control as components of IPM in paddy. Theodre (1988) identified the components of the adoption of cultural methods viz., summer ploughing, application of farm yard manure, use of variety, seed rate, direct sowing conversion into wet paddy and fertilizer application.

Govind (1992) identified 20 plant protection practices and grouped under four methods viz., cultural, chemical, biological and physical methods of IPM technology while studying the achievements and opportunities of IPM in rice.

2.5 Relationship between selected characteristics of farmers and their level of knowledge

2.5.1 Age

Kamarudeen (1981) reported a negative and non-significant relationship between age and knowledge level of paddy farmers.

Vijayakumar (1983) stated that a negative and non-significant relationship existed between age and level of knowledge of coconut farmers.

Sanoria and Sharma (1983) reported that age and knowledge level of beneficiaries of farm development programmes were negatively related.

Chenniappan (1987) reported that age was negatively and significantly correlated with level of knwoledge of cotton farmers.

Aziz (1988) revealed that age had a negative and significant relationship with the level of knowledge on draught management practices by farmers.

Bonny (1991) also revealed that age had a negative and significant relationship with the level of knowledge of commercial vegetable growers about improved cultivation practices.

Though the findings were not consistent, it was postulated in the present study that there would be a positive relationship between level of knowledge about improved plant protection practices and age of commercial vegetable growers.

2.5.2 Education status

Kaleel (1978) noted positive and significant influence of education on knowledge of paddy growers.

Ganesan (1982) found a positive and significant influence between education and knowledge about pest management practices in paddy and cotton.

Jayaramaiah (1987) revealed that education had significant influence on the knowledge about recommended levels of fertilisers by cotton farmers.

Venugopalan (1989) stated a positive and significant influence between education and knowledge on dry land technology by maize farmers.

Anantharaman (1991) found a positive relationship between education and knowledge about improved cultivation practices by cassava farmers.

Jnanadevan (1993) also established a positive relationship between farmers education level and knowledge about related development programmes in coconut.

Based on the above findings, it was postulated in the present study also, that there existed a positive and significant influence between educational status and knowledge of commercial vegetable growers about improved plant protection practices.

2.5.3 Annual income

Haraprasad (1982) reported a positive and significant relationship between annual income and knowledge of paddy farmers about improved farming practices.

Patil (1985) interpreted that annual income showed a significant relationship with level of knowledge of bidi tobacco cultivators of Nippani area of Karnataka State. Venkitapirabu (1988) reported a significant and positive relationship between annual income and knowledge of farmers cutlivating sugarcane and turmeric.

Saxena *et al.* (1990) reported that a significant association existed between annual income and knowledge level of wheat farmers.

Tantray and Nanda (1991) found that annual income showed a non-significant relationship with level of knowledge of rice farmers.

Govind (1992) also confirmed that annual income showed a non-significant relationship with level of knowledge of rice farmers about integrated pest management practices.

Though the above findings could not derive any valid conclusions, it was postulated in the present study, that there existed a significant relationship between annual income and knowledge level about improved plant protection practices by commercial vegetable growers.

2.5.4 Farm size

Nair (1969) found that a significant relationship existed between farm size and knowledge level of farmers about high yielding varieties of paddy.

Ahamed (1981) observed that a significant association existed between farm size and knowledge level about various farm implements among rice farmers.

Singh and Ray (1985) study revealed non-significant relationship between farm size and knowledge level about fertilizer use among the wheat farmers.

Viju (1985) reported that the non-significant relationship between farm size and knowledge level of paddy growers about the improved agricultural practices.

Godhandapani (1985) and Baadgaonkar (1987) found that there existed no significant relationship between farm size and knowledge level of groundnut farmers about cultivation practices.

Sangha and Dhammu (1989) found that there existed no significant relationship between farm size and knowledge level of farmers about package of practices in winter maize.

Ramachandran (1992) found that there existed no significant relationship between farm size and knowledge of rice farmers.

Though the findings were not consistent, it was postulated for the present study that there would be a significant relationship between knowledge level of commercial vegetable growers about improved plant protection practices and their farm size.

2.5.5 Availability of farm inputs

Ahamed (1981) observed a significant positive relation between availability of farm input and knowledge level of rice farmers about various farm implements.

Senthil (1983) confirmed a significant relationship between availability of farm inputs and knowledge about hybrid cotton seeds.

Selvakumar (1988) stated that a significant relation existed between availability of farm inputs and knowledge about control of white flies by cotton farmers.

Theodre (1988) observed that a significant relationship existed between availability of farm inputs and knowledge about contingency farming practices by paddy contact farmers.

Singh (1990) reported that there existed a significant relationship between availability of farm inputs and knowledge about fertilizer use in wheat.

Based on the above findings, it was assumed in the present study that there existed a positive significant correlation between availability of farm inputs and level of knowledge about improved plant protection practices by commercial vegetable growers.

2.5.6 Farming experience

Farming experience is related to the farmers exposure and experience in farming and related activities. It influences the farmers in taking decisions affecting their behaviour.

Sohal and Tyagi (1978) found that there was negative relationship between farming experience and knowledge level of rice farmers about fertilizer use.

Chandrasekharan (1981) reported a significant positive relationship between knowledge level of small tea growers and their farming experience.

Haque and Ray (1983) stated that there was a significant positive relationship existed between farming experience and knowledge level of recommended species in composite fish culture.

Bhaskaran and Thampi (1986) found out a positive and significant relationship between knowledge level of paddy farmers about high yielding varieties and their farming experience.

Vijayan (1989) observed a positive and significant relation between farming experience and knowledge level of banana farmers.

Anantharaman (1991) revealed a positive relation that existed between farming experience and knowledge level of cassava farmers.

Jaleel (1992) also confirmed that a positive significant relationship existed between farming experience and knowledge level of Kanikkar tribal farmers.

Though the findings were not consistent, it was assumed for the present study, that there existed a positive and significant relation between farming experience and extent of adoption of improved plant protection practices by commercial vegetable growers.

2.5.7 Economic motivation

Economic motivation provides the impetus to a farmer to make money out of his farming and other related activities.

Janakiramaraju (1978) observed positve relationship between economic motivation and knowledge level of farmers about fertilizer application.

Sinha and Sinha (1980) observed that a significant positive relation existed between knowledge level of maize farmers about high yielding varieties and their economic motivation.

Jayakrishnan (1984) observed positive relationship between economic motivation and level of knowledge about low cost technology among paddy growers.

Mahadevaiah (1987) showed a positive relation between economic motivation and knowledge about sugarcane cultivation practices.

Singh (1990) reported that a significant positive relation existed between knowledge level of farmers about rainfed technology and their economic motivation.

Bonny (1991) found a significant positive relationship between knowledge level of commercial vegetable growers about improved agricultural practices and their economic motivation.

Jnanadevan (1993) reported a positive and significant relationship of economic motivation with knowledge of coconut farmers.

Based on the above findings, it was assumed for the present study that there would be a positive significant correlation between economic motivation and knowledge level of commercial vegetable growers about improved plant protection practices.

2.5.8 Risk preference

Farmers operations suffer from certain inherent risks. Farmers are forced to plan, procure and use the resources in a situation banking on uncertainity.

Somasundaram and Singh (1978) reported that there was no correlation between risk preference and knowledge level among small farmers cultivating rice.

Sohal and Tyagi (1978) showed that there was no correlation between risk preference and knowledge about fertilizer management practices in paddy.

Desai (1981) revealed a positive and significant correlation between risk preference and knowledge level of cotton farmers.

Ganesan (1982) found a significant positive correlation between knowledge level of paddy and cotton farmers about pest control measures and their risk preference.

Aziz (1988) reported that there was a positive correlation between risk preference and knowledge about draught management practices.

Venugopalan (1989) stated that risk preference showed a non-significant relationship with level of knowledge among dry land farmers.

Govind (1992) confirmed a positive and significant relationship between risk preference and level of knowledge about IPM in rice.

Though the findings were not consistent, in the present study it was assumed that there would be a significant positive relationship between risk preference and knowledge level of commercial vegetable growers about improved plant protection practices.

2.5.9 Scientific Orientation

Tripathy *et al.* (1982) reported that there was a positive correlation between scientific orientation and knowledge level of farmers about high yielding rice technology.

Tyagi and Sohal (1984) found out a positive and significant association between scientific orientation and level of knowledge about dairy innovations.

Singh (1990) observed that scientific orientation showed a positive and significant correlation with level of knowledge about rainfed technology by tribal farmers.

Saxena *et al.* (1990) reported a positive and significant correlation between scientific orientation and knowledge level of wheat farmers in rainfed areas.

Juliana *et al.* (1991) found positive and significant correlation between scientific orientation and knowledge level of IPM practices of cotton farmers.

Ramachandran (1992) reported that scientific orientation had a positive and significant association with level of knowledge of rice farmers.

Based on the above findings, it was postulated in the present study that there existed a positive and significant relationship between scientific orientation and level of knowledge about improved plant protection practices by commercial vegetable growers.

2.5.10 Management orientation

Alexander (1985) revealed that management orientation had positive and significant correlation with level of knowledge of smal rubber growers.

Patil and Jadhav (1987) observed a positive and significant relationship between management orientation and level of knowledge of onion farmers.

Theodre (1988) reported that management orientation showed significant positive association with the knowledge level of contact farmers about contingency farming practices in rice.

Singh (1990) observed a positive and significant relationship between management orientation and level of knowledge of tribal farmers in respect of rainfed technology.

Anantharaman (1991) found that managerial efficiency of the sugarcane farmers was related to their knowledge level.

Govind (1992) reported that there existed a positive relation between management orientation and knowledge level of farmers about integrated pest management technology.

Based on the above findings, it was postulated that there existed a positive relation between management orientation and level of knowledge about improved plant protection practices by commercial vegetable growers.

2.5.11 Extension contact

Kamarudeen (1981), Senthil (1983), Jayakrishnan (1984), Krishnamoorthy (1984), Jayaramaiah (1987), Govind (1992) and Jnanadevan (1993) observed positive and significant correlation between contact of farmers with extension agency and their level of knowledge about various aspects related to agriculture.

Venugopalan (1989) reported that contact with extension agency showed a non-significant relationship with extent of knowledge among dry land farmers.

Based on the above findings, it was assumed in the present study that there existed a positive relationship between extension contact and level of knowledge about improved plant protection practices by commercial vegetable growers.

2.5.12 Information source utilisation

Perumal and Duraiswamy (1972) observed that information source utilisation showed a positive relation with level of knowledge of hybrid maize cultivators.

Alexander (1985) found that information source utilisation showed a positive relation with level of knowledge of small rubber growers.

Balan (1987) reported that there existed a positive and significant association between information source utilisation and level of knowledge of coconut farmers about soil test recommendations.

Ramachandran (1992) stated that information source utilisation had a significant positive association with level of knowledge of rice farmers.

Jnanadevan (1993) also reported that information source utilisation had a positive and significant association with level of knowledge of coconut farmers.

Based on the above findings, it was assumed in the present study that there existed a positive relation between information source utilisation and level of knowledge about improved plant protection practices by commercial vegetable growers.

2.5.13 Personal guidance in better farming

Ahamed (1981) noted positive and significant association between personal guidance in better farming and level of knowledge of rice farmers about various farm implements.

Chandrasekharan (1981) noted positive and significant association between personal guidance in better farming and level of knowledge of small tea growers.

Viju (1985) noted that personal guidance on better farming had significant influence on the level of knowledge of tribal farmers towards improved agricultural practices.

Vijayan (1989) reported that personal guidance on better farming had significant positive relationship with knowledge of banana farmers.

Anantharaman (1991) revealed that personal guidance on better farming had a positive and significant influence with level of knowledge of cassava farmers.

Based on the above findings, it was postulated in the present study that there existed a positive relationship between personal guidance in better farming and level of knowledge of commercial vegetable growers about improved plant protection practices.

2.5.14 Cosmopoliteness

Ahamed (1981), Kamarudeen (1981), Ferreria *et al.* (1983), Vijayakumar (1983), Viju (1985) and Uddin (1987) reported positive relationship between level of knowledge about improved agricultural practices and cosmopoliteness.

Anandarao (1988) observed that cosmopoliteness showed a positive relation with level of knowledge of rice farmers about contingency farming practices.

Vijayan (1989) found that cosmopoliteness showed a positive relation with level of knowledge of banana farmers.

Anantharaman (1991) stated that a significant positive association existed between cosmopoliteness and level of knowledge of cassava farmers.

Jnanadevan (1993) also observed that a significant positive association existed between cosmopoliteness and level of knowledge of coconut farmers.

Based on the above findings, it was assumed for the present study that there would be a significant positive association between cosmopoliteness and level of knowledge about improved plant protection practices by commercial vegetable growers.

2.6 Relationship between selected characteristics of farmers and extent of adoption

2.6.1 Age

Babu (1980) stated that age of groundnut growers had no association with extent of adoption.

Balasubramaniam and Kaul (1982) found positive and significant relationship between age and adoption by dairy farmers.

Godhandapani (1985) and Wilson and Chaturvedi (1985) found negative and significant correlation of age with adoption behaviour of groundnut and tobacco cultivators respectively.

Though the findings are not consistent to draw any valid conclusion it is postulated in the present study that there would be a positive relationship between extent of adoption of improved plant protection practices by commercial vegetable growers and their age.

2.6.2 Educational status

Hussain (1971) had established positive relationship between farmers education level and adoption of package of practices of IR-8 paddy in Nedumangad block of Trivandrum District.

Supe and Salode (1975) reported that formal education had significant relationship with adoption of demonstrated farm practices in paddy. Similar results were also obtained by Prasad (1978) and Sinha and Sinha (1980).

Deepali (1979) found that educational status was positively related with the degree of participation of rural women in the adoption of agricultural practices in paddy.

Vijayan (1989) reported that education had positive and significant relationship with adoption of technology for the cultivation of nendran variety of banana in Trichur district.

Jnanadevan (1993) found a significant relationship between education and adoption by coconut farmers.

Based on the above findings, it is concluded that in the present study also there would be a positive and significant relationship between extent of adoption of improved plant protection practices by commercial vegetable growers and their educational status.

2.6.3 Annual Income

Annual income has an important role in making available the required amount of money essential for various farming practices. Availability of money may influence the various farming and related activities of the farmer.

Viju (1985) reported a significant relationship between annual income and adoption behaviour of tribal farmers with respect to improved agricultural practices in paddy. Baadgaonkar (1987) confirmed a significant positive relation between annual income and adoption behaviour of groundnut cultivators of Uttara Kannada districts of Karnataka State.

Aziz (1988) found that annual income was positively related to adoption of drought management practices by farmers.

Bonny (1991) indicated that annual income had a significant relationship with adoption of improved agricultural practices by commercial vegetable growers of Ollukkara block in Trichur district.

Based on the above findings, it is concluded for the present study that there would be a positive relationship between extent of adoption of plant protection practices of commercial vegetable growers and their annual income.

2.6.4 Farm size

Manivannan (1980) reported a significant relationship between farm size and extent of adoption of sunflower growers.

Balan (1987) confirmed a significant positive relationship between farm size and adoption of soil test recommendations by the farmers in Trivandrum district.

Vijayan (1989) also confirmed a significant positive relationship between farm size and extent of adoption of technology for cultivation of banana variety nẽndran in Trichur district.

Jnanadevan (1993) reported a non-significant relation between farm size and extent of adoption by coconut farmers.

Though the findings were not consistent, it was postulated for the present study that there existed a positive correlation between farm size of commercial vegetable growers and their extent of adoption of improved plant protection practices.

2.6.5 Availability of farm inputs

Kamarudeen (1981) observed a significant positive relation between availability of farm inputs and adoption by paddy farmers in Thrissur district.

Anantharaman (1991) confirmed a significant relation between availability of farm inputs and adoption by cassava farmers.

Jnanadevan (1993) also confirmed a significant positive relation between availability of farm inputs and adoption by coconut farmers.

Based on the above reviews, a positive relation was assumed in the present study between availability of farm inputs and extent of adoption of improved plant protection practices by commercial vegetable growers.

2.6.6 Farming experience

Balasubramaniam and Kaul (1982) observed that no significant relation existed between farming experience and adoption of improved practices in fish curing.

Jayakrishnan (1984) reported a positive and significant association between farming experience and extent of adoption of low cost technologies in paddy.

Godhandapani (1985) observed negative relationship between farming experience and adoption by farmers in irrigated groundnut cultivation.

However, Sanjeev (1987) reported that farming experience had a significant relationship with the extent of adoption of improved cultivation practices by paddy farmers.

Bonny (1991) observed that experience in vegetable cutlivation had positive association with extent of adoption of improved vegetable cultivation practices.

Jnanadevan (1993) also confirmed a positive correlation between farming experience and adoption among coconut farmers.

Though the findings were not consistent, it was postulated in the present study that there would be a positive relation between farming experience and extent of adoption of improved plant protection practices by commercial vegetable growers.

2.6.7 Economic motivation

Economic motivation acts as a striving force to a farmer to make more money out of farming and other related activities.

Beal and Sibley (1967) reported a positive relationship between economic motivation of the Indians of Gautemala and their adoption behaviour.

Tyagi and Sohal (1984) reported that economic motivation had positive and significant relationship with adoption of dairy innovations.

Singh and Ray (1985) found that economic motivation had direct influence on the use of fertilizers by farmers cultivating wheat.

Vijayan (1989) also stated a positive relationship between economic motivation and extent of adoption of technology for cultivation of banana variety nendran in Thrissur district.

Bonny (1991) indicated that economic motivation had a significant relationship with adoption of improved agricultural practices by commercial vegetable growers of Ollukkara block in Thrissur district.

Based on the above findings, it was concluded for the present study that there would be a positive relationship between economic motivation and extent of adoption of improved plant protection practices by commercial vegetable growers.

2.6.8 Risk Preference

Sachidananda (1972) found that there was a negative correlation between risk taking and adoption of improved agricultural practices in cotton.

Majumdhar (1976) reported that there was no correlation between risk preference and the extent of adoption of complex fertilizers.

Kamarudeen (1981) found positive and significant correlation between risk preference and extent of adoption by paddy farmers. Jayakrishnan (1984) also reported that risk preference showed positive and significant relationship with adoption behaviour among paddy growers.

Anandarao (1988) showed a positive and significant relationship between risk preference and adoption of contingency practices for rice.

Venugopalan (1989) reported that risk preference showed a non-significant relationship with extent of adoption among dry land farmers.

Govind (1992) reported a positive and significant relationship between risk preference and adoption of Integrated Pest Management practices in rice.

Though the findings were not consistent, it was postulated in the present study that there existed a positive correlation between extent of adoption of improved plant protection practices by commercial vegetable growers and their risk preference.

2.6.9 Scientific Orientation

Scientific orientation of farmers helps to motivate them to attain excellence in cultivation.

Krishnamoorthy (1984) reported a positive and significant correlation between scientific orientation and adoption by dry land farmers.

Jayapalan (1985) confirmed a positive and significant relationship between scientific orientation and extent of adoption by farmers in certified rice seed production.

Nanjaiyan (1985) showed a positive relation between scientific orientation and extent of adoption among small farmers growing cotton.

Wilson and Chaturvedi (1985) observed a positive and significant relationship between scientific orientation and extent of adoption of improved technology of flue cured virginia tobacco in Andhra Pradesh.

Jnanadevan (1993) also reported a significant relation between scientific orientation and extent of adoption by coconut farmers.

Based on the above findings, it was assumed in the present study that there existed a significant relationship between scientific orientation and extent of adoption of improved plant protection practices by commercial vegetable growers.

2.6.10 Management Orientation

Farmers differ in the degree to which they are oriented towards scientific farm management. Farmers orientation to management may in turn influence behavioural patterns.

Kamarudeen (1981) found positive and significant relation between management orientation and adoption of demonstrated practices in paddy.

Patil (1985) confirmed positive and significant correlation between management orientation and adoption behaviour of farmers in relation to recommended practices of Bidi Tobacco cultivation.

Sreekumar (1985) reported a positive and significant relation between management orientation and adoption behaviour of borrowers of bank credit.

Baadgaonkar (1987) confirmed a significant correlation between adoption behaviour of groundnut cultivators of Uttara Kannada districts of Karnataka State and their management orientation.

Ramachandran (1992) reported that management orientation showed positive and significant relationship with the adoption of recommended practices by the participant farmers.

Based on the above review, positive relation was assumed in the present study between management orientation and adoption of improved plant protection practices by commercial vegetable growers.

2.6.11 Extension contact

Contact of farmers with extension agency could influence very much their farming behaviour.

Gangappa (1975) found that farmers contact with extension agency and their participation in extension activities had a positive influence in the adoption behaviour of small farmers of Mysore district.

Mahadevaswamy (1978) reported a significant association between adoption behaviour of small, marginal and other farmers of Bangalore district and their contact with extension agencies.

Haraprasad (1982) reported a positive and significant relation between contact with extension agency and adoption behaviour of SFDA beneficiaries.

Sanoria and Sharma (1983) reported a significant association between adoption and contact with extension agencies of beneficiaries of Lab-to-Lab Programmes.

Juliana *et al.* (1991) and Govind (1992) also observed a positive and significant relationship between extension agency contact of farmers with their adoption behaviour of integrated pest management technology.

From the above findings, it was assumed that in the present study too, there existed a positive and significant relation between extension agency contact and extent of adoption of improved plant protection practices by commercial vegetable growers.

2.6.12 Information source utilisation

Various plant protection practices evolved at research stations are often different from farmers actual practices. Information sources have important role in shaping the behaviour of farmers.

Choudhary (1970) reported positive and significant correlation of mass media and personal cosmopolite sources with the adoption behaviour of nitrogenous and phosphatic fertilizers in a progressive village.

Jayakrishnan (1984) reported that mass media participation was positively and significantly associated with extent of adoption of low cost technology among paddy growers.

Vijayan (1989) reported a positive and significant relation between mass media participation and adoption level of cultivation of banana variety Nendran by farmers.

Bonny (1991) observed that information source utilisation was significantly correlated with adoption behaviour with respect to improved practices in vegetables.

Govind (1992) reported the positive relationship between information source utilisation and adoption behaviour of integrated pest management technology by the farmers.

Based on the above findings, it was postulated in the present study that there existed a positive and significant relation between information source utilisation and adoption behaviour of improved plant protection practices by commercial vegetable growers.

2.6.13 Personal guidance in better farming

Ferreria *et al.* (1983) noted positive and significant influence of personal guidance on the extent of adoption of maize production technology.

Sangha and Dhammu (1989) reported that personal guidance on better farming was significantly related to the adoption of package of package of practices of winter maize.

Saxena *et al.* (1990) revealed that personal guidance on better farming had a positive and significant relationship with extent of adoption of rainfed wheat technologies.

Tantray and Nanda (1991) noted positive and significant influence of personal guidance on better farming and extent of adoption of rice technology.

Bonny (1991) also confirmed a positive and significant relationship between personal guidance on better farming and adoption of improved agricultural practices in vegetables.

Based on the above findings, it was postulated in the present study, that, there existed a positive relation between personal guidance on better farming and extent of adoption of improved plant protection practices by commercial vegetable growers.

2.6.14 Cosmopoliteness

The extent of contact of farmers with outside village such as visiting the nearest town, the purpose of visit and the membership in organisation outside the village may influence their behavioural pattern.

Vijayakumar (1983) reported that conmopoliteness had a significant relationship with the extent of adoption of recommended paddy cultivation practices.

Viju (1985) reported that cosmopoliteness was non-significantly related with the adoption of improved agricultural practices among tribal farmers.

Chenniappan (1987) revealed that cosmopoliteness had a negative and significant relationship with the extent of adoption of improved practices of irrigated cotton.

Mahadevaiah (1987) stated that cosmopoliteness and adoption of sugarcane cultivation practices by farmers were significantly correlated.

Anantharaman (1991) reported that cosmopoliteness was negatively and significantly related to the adoption level of cassava farmers.

Govind (1992) also reported that cosmopoliteness was non-significantly related with the adoption of integrated pest management practices in rice.

Though the findings were not consistent, it was postulated in the present study that there existed a significant relation between cosmopoliteness and extent of adoption of improved plant protection practices by commercial vegetable growers.

2.7 Constraints in the adoption of plant protection technology

Lanjewar and Kalantri (1985) had treated many problems faced by farmers in their farming activities of production, credit and marketing as managerial problems.

Pandya and Trivedi (1988) defined constraints as those items of difficulties or problems faced by individuals in adoption of technology.

Prakash (1989) identified high wage rate, small sized holdings, incidence of pests and diseases and non-availability of inputs in time as the major constraints in rice cultivation.

Tantray and Nanda (1991) identified that the major constraints felt by rice farmers in employing the full potential of advanced technology were economic difficulties and lack of timely input availability.

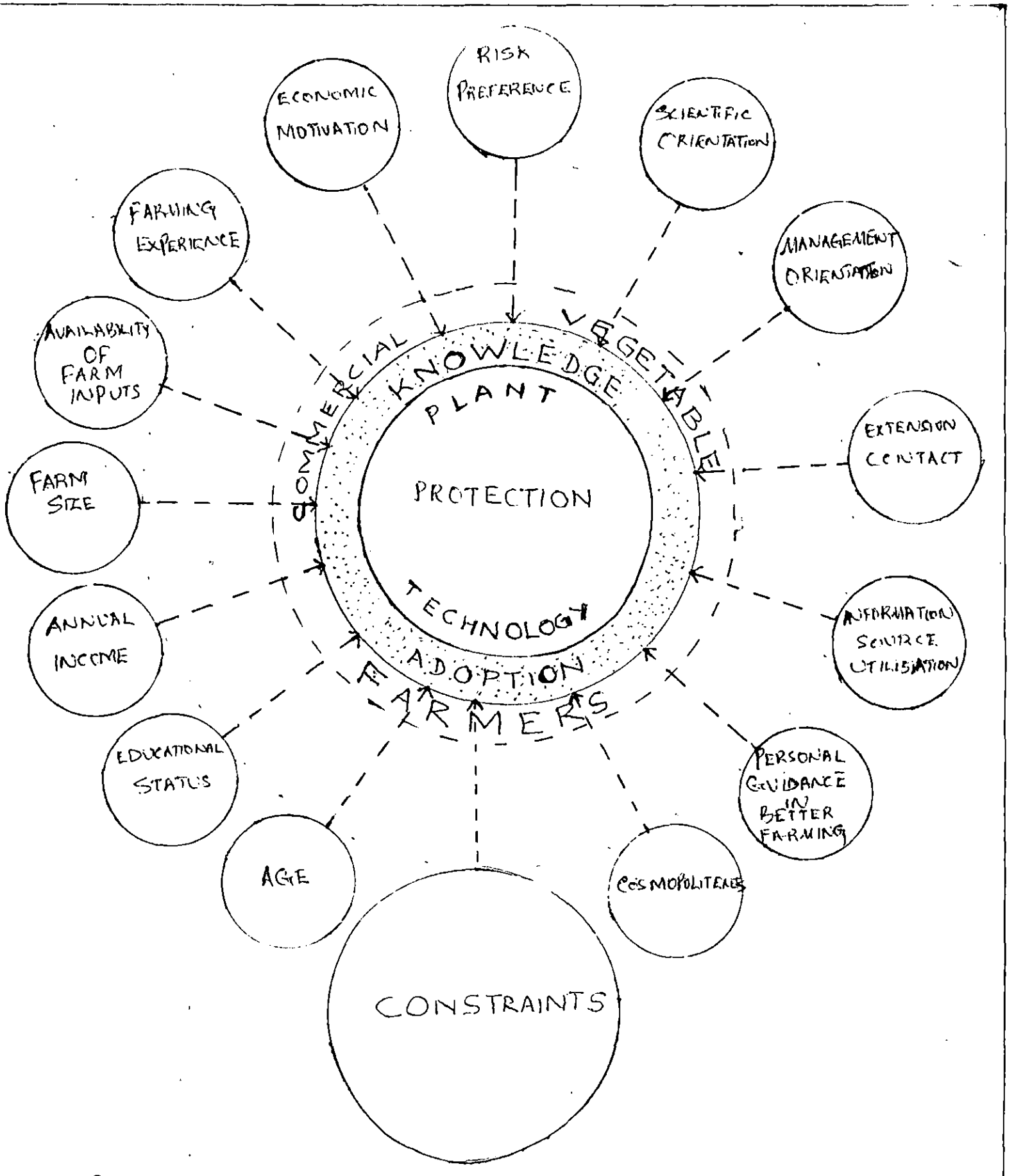
Govind (1992) observed that lack of assured irrigation was found to be the most serious constraint among both the IPM and non-IPM farmers. Inadequacy of inputs and package deals along with subsidy were found to be the second and third important constraints experienced by a larger percentage of farmers.

Ramachandran (1992) reported that the major constraints felt by participant farmers were lack of input supply in time, lack of timely guidance and supervision, lack of information regarding the package of practices recommendations of the variety and poor quality of seeds.

2.8 Conceptual frame work for the study

The main objective of conceptual frame work here, is to provide a perspective reference for systematically analysing the knowledge level and extent of adoption of improved plant protection practices by commercial vegetative farmers as influenced by a multiplicity of personal, situational, psychological and social variables and constraints.

The conceptual frame work is depicted in Fig.1. It is expected to facilitate theoretical and empirical analysis of the dependent variables.



FIG·1· CONCEPTUAL FRAMEWORK FOR THE STUDY

Materials and Methods

CHAPTER-III
MATERIALS AND METHODS

The methodology for research followed in the study is presented under the following heads.

3.1 Locale of research
3.2 Selection of sample
3.3 Selection of plant protection methods
3.4 Selection and operationalisation of variables and their measurement
3.5 Procedure employed in data collection
3.6 Statistical tools employed
3.7 Hypotheses set for the study

3.1 Locale of research

The study was undertaken in Thrissur district of Kerala with main emphasis on vegetables concentrating on the adoption of plant protection practices by farmers owing to the following reasons:

a) Vegetables are the important crops with the higher nutritive value to the people of Kerala
b) These crops are subjected to the intensive and extensive use of plant protection chemicals and
c) These crops are cultivated comparitively in a larger area than all the other major crops in Thrissur.

3.2 Selection of sample

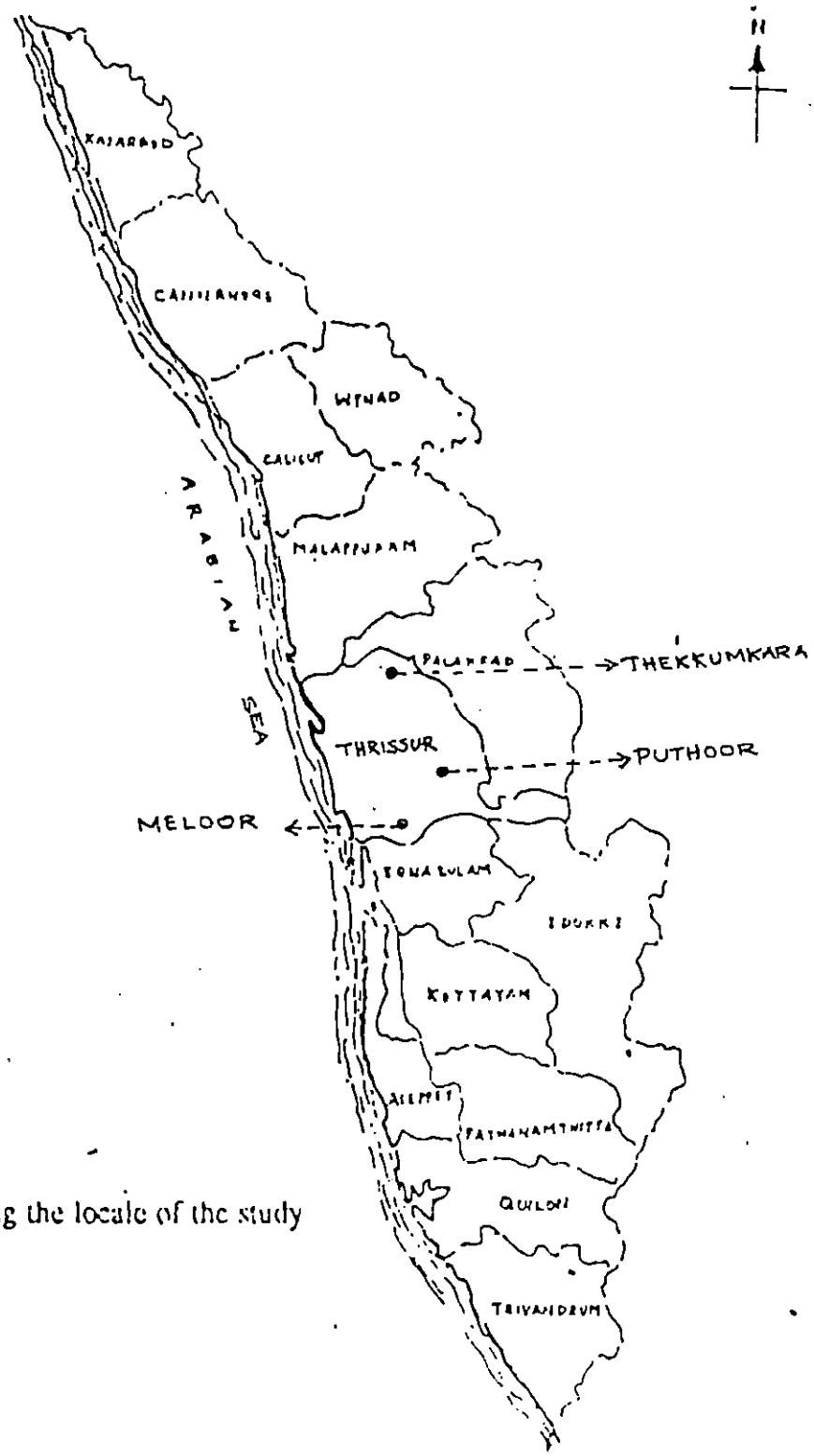
The sample was selected from the study area based on stratified random sampling procedure.

3.2.1 Selection of Krishi Bhavans

There are 3 agricultural subdivisions in the district of Thrissur. Stratified 2 stage sampling technique was adopted for the selection of respondents from these agricultural subdivisions. From each subdivision, one Krishi Bhavan where vegetables are cultivated extensively was selected and this formed the first stage units. Altogether 3 Krishi Bhavans were purposively selected for this study. The map showing the location of the study is given in Fig.2.

3.2.2 Selection of respondents

The study was concerned with the gaps in the adoption of plant protection practices by the commercial vegetable growers of Thrissur district. In consultation with the Agricultural Officers of the selected Krishi Bhavans, a list of all vegetable growers having more than 50 cents under vegetable cultivation were prepared separately for each Krishi Bhavan and 50 farmers each were chosen randomly. Thus, altogether 150 farmers were selected for the study which formed the second stage units. The selected agricultural subdivisions, Krishi Bhavans and number of respondents are presented in Table 1.



Map of Kerala showing the locale of the study

Table 1. Selected Krishi Bhavans and number of farmers

District	Subdivision	Krishi Bhavan	Number of farmers per Krishi Bhavan
Thrissur	1. Thrissur	Puthoor	50
	2. Chalakkudy	Meloor	50
	3. Vadakkanchery	Thekkumkara	50
Grand total			150

3.3 Selection of plant protection methods

In accordance with the objectives of the study, based on review of literature, discussions with experienced field level functionaries, subject experts from KAU and pilot study, 4 methods of plant protection were identified. The methods were applicable to all the respondents if he/she decided to adopt. These were chemical, cultural, mechanical and integrated methods of plant protection.

3.3.1 Selection of crops

Based on the pilot study observations and the discussion with the officers of the State Department of Agriculture, scientists, farmers, the major vegetable crops like amaranthus, cowpea, bittergourd and snake gourd were identified which are cultivated extensively in Thrissur district.

3.3.2 Selection and categorisation of practices related to plant protection methods

Based on review of literature, discussions with scientists and progressive farmers various practices related to the different plant protection methods were identified in accordance with the objectives of the study.

The various practices identified for chemical method of plant protection were standardised on the lines adopted by Athimuthu (1990) and Govind (1992) as follows.

i) Name: This referred to the nomenclature of the inputs involved in the selected plant protection practices.

ii) Quantity: This referred to the amount of inputs involved in the selected plant protection practices.

iii) Number of applications: This referred to the number of times the inputs involved in the selected plant protection practices were to be used.

iv) Interval of application: This referred to the duration between 2 consecutive operations involving the inputs of the selected plant protection practices.

v) Method: This referred to the way in which or procedure by which the inputs involved in the selected plant protection practices were to be used.

vi) Precautions: This referred to the carefulness required for the operation involving the inputs of the selected plant protection practices.

For cultural, mechanical and integrated methods of plant protection also various protection practices were identified. A list of identified practices and sub-practices under each plant protection method was prepared and each of these practices and sub practices were subjected to judges rating. Judges were drawn from among extension specialists, subject experts in plant protection and

experienced field level extension functionaries. The degree of importance of each practice was then rated by these judges on a 5-point continuum ranging from 'most important' to 'not important' with scores of 5, 4, 3, 2 and 1 respectively. Out of a total of 38 judges, ratings from 33 judges were recieved back and processed. The letter sent to the judges is given in Appendix III.

The total score obtained for each of the practices and sub-practices under a practice for all the judges was calculated separately and the practices or sub-practices having scores at or above 80 per cent were considered for inclusion in the final schedule. The practices selected under each method of plant protection are detailed below.

1. Chemical method : The practices selected under the chemical method of plant protection for vegetables were (i) Selection of chemical (ii) quantity of chemical to be used/acre and (iii) precautions.

2. Cultural method : The practices included under the cultural method of plant protection in vegetables were (i) monitoring of pests in the main field (ii) assessing plant population/sq.m. (iii) weeding operations and (iv) application of nitrogenous fertilizers.

3. Mechanical method : The practices included under the mechanical method of plant protection in vegetables were (i) collection and destruction of egg masses and other stages of pests and (ii) collection and destruction of affected plant parts or plants.

4. Integrated method : The practices related to the concept of integrating the above methods of plant protection were included under this method.

3.4 Selection and Operationalisation of variables and their measurements

The variables were selected based on the objectives, review of literature and discussion with scientists in K.A.U. and experts in the field of plant protection. The procedures of operationalisation and quantifications of these variables are as detailed below.

3.4.1 Independent variables

A list of independent variables was prepared and subjected to relevancy rating by the judges. Judges were drawn from among extension specialists and experienced field level extension functionaries. The degree of importance of each variable was then rated by these judges on a 4-point continuum ranging from `most important' to `not at all important' with scores of 4, 3, 2 and 1 respectively. Out of a total of 40 judges, ratings were 35 judges were received back and processed. The letter sent to the judges is given in Appendix II.

The total score obtained for each of the independent variables for all the judges was calculated separately and the variables having scoring at or above 80 per cent were considered for inclusion in the final schedule.

The independent variables thus selected were age, educational status, annual income, farm size, availability of farm inputs, farming experience, economic motivation, risk preference, scientific orientation, management orientation, extension contact, information source utilisation, personal guidance in better farming, indebtedness, social participation and cosmopoliteness.

3.4.1.1 Age

This was measured by directly asking the number of years he/she has completed at the time of investigation.

3.4.1.2 Educational status

The educational status was operationally defined as the extent of literacy attained by the respondent. The scale developed by Shivadurappa (1988) and adopted by Sushamma (1993) was modifed and used for the present study. The scoring procedure was as follows:

Category	Score
Illiterate	0
Can read and write	1
Primary school	2
Middle school	3
High school	4
College and above	5

3.4.1.3 Annual Income

Annual income referred to the net income of the respondent and his family for a year obtained from the main and subsidiary occupations. The scoring procedure followed by Selvakumar (1988), Venugopalan (1989) and Govind (1992) was adopted for measuring the variable. A score of one was assigned to every thousand rupees of annual income.

3.4.1.4 Farm size

Farm size referred to the number of cents of land owned by the respondent. The fraction in land size was converted into the next whole number.

3.4.1.5 Availability of farm inputs

Availability of farm inputs was operationally defined as those farm resources which were obtained for use in various farming activities. Based on adequacy and periodicity of availability of farm inputs, scores were allotted. A score of 3, 2 and 1 was given for 'adequate', 'moderate' and 'inadequate' respectively under adequacy of availability of inputs. Similarly a score of 3, 2 and 1 was given for 'always', 'seasonal' and 'occassional' respectively under periodicity of availability of inputs.

3.4.1.6 Farming experience

Farming experience referred to the actual completed years of experience of the respondent in farming. The scale developed by Venugopalan (1989) was adopted for quantifying this variable. A score of one was given to every completed year of experience in farming.

3.4.1.7 Economic motivation

Economic motivation may be regarded as an indication of the degree of willingness of farmer for investment of his available potential resources in adopting farm innovations. It was operationally defined as the extent to which a farmer was oriented towards profit maximisation and the relative value he placed on monetary gains.

The procedure developed by Thiagarajan (1981) and adopted by Balan (1987) was used for measuring economic motivation.The scale consisted of 3 sets of statements, each set having 3 short statements with weights 3, 2 and 1 indicating different intensities of motivation from high to low. The forced choice method was followed to overcome familiar problems of personal biases and lack of objectivity of self-evaluation. This method forced the respondent to choose from the group of 3 short statements describing a particular personality characteristic, the one which most accurately described the respondent himself and also one which least accurately portrayed himself. After obtaining the most least choice for each of the 3 sets of statements, scoring was done by summing up ratios of weights of most like statements to weights of least like statements.

3.4.1.8 Risk preference

Risk preference referred to the degree to which the farmer was oriented towards risk and uncertainity in adopting new ideas in farming. The scale developed by Supe (1969) and adopted by Venugopalan (1989) and Govind (1992) was used for measuring risk preference in the present study. The responses were collected on a five point continuum ranging from strongly agree to strongly disagree. There were six statements, of which four were positive and two negative. The scoring was done as follows:

Responses	Scores
Strongly agree	7
Agree	5
Undecided	4
Disagree	3
Strongly disagree	1

The scoring pattern was reviewed for negative statements. The scores obtained for each statement were summed up to get individual farmer's risk preference score.

3.4.1.9 Scientific orientation

Scientific orientation referred to the degree to which the farmer was oriented to the use of scientific methods in decision making in farming.

Scientific orientation scale developed by Supe (1969) and adopted by Ramachandran (1992) was used in the present study.

A score of `1' was given for agreement and `0' for disagreement. The total score obtained by an individual over 6 statements was taken as his scientific orientation score.

3.4.1.10 Management orientation

Management orientation referred to the degree to which a farmer was oriented towards scientific farm management comprising planning production and marketing of his farm enterprises. Chari and Nandapurkar (1987) were of the opinion that farmers as the manager of agricultural enterprise are expected to maximise the profits. The scale developed by Samantha (1977) and adopted by Ramachandran (1992) was used to measure management orientation of farmers. The scale consisted of 6 statements.

A score of `1' was given for agreement and `0' for disagreement. The total score obtained by an individual for all the statements was taken as his management orientation scores.

3.4.1.11 Extension contact

A measure of the respondent's extension contact was obtained by assigning scores of 3, 2 and 1 respectively for the responses viz., twice a week, once a week and once to thrice a month (Bonny, 1991) for his contact with different extension personnel. The scores were added up for arriving at the total extension contact score.

3.4.1.12 Information source utilisation

Information source utilisation was operationally defined as the use of various sources of information by the respondent in order to get information on agricultural technology. Here the `source', `individual' and `channels' were collectively termed as `information sources', since for practical purposes, there is no clear demarcation that could be made between `source' and `channel'.

Based on discussion with field level functionaries, scientists and progressive farmers, various sources of information utilised by farmers were identified and categorised under mass media sources, personal cosmopolite sources and personal localite source. The procedure adopted by Ramachandran (1974), Athimuthu (1990) and Govind (1992) were followed with slight modification. The respondents were asked to indicate the frequency of use of these sources on a three point continuum viz., `whenever needed', `at times needed' and `never' with scores of 2, 1 and 0 respectively. The information source utilisation score of an individual was the sum of scores obtained by him on these different sources.

3.4.1.13 Personal guidance on better farming

Personal guidance on better farming was defined as the advice, help and assistance received by a farmer from different extension personnel for efficient utilisation of resources and solving farming problems.

Balan (1987) used the scale developed by Singh (1981) with slight modification which was followed in this study. The scale consisted of 12 statements rated on a four point continuum ranging from very much, to little with scores 4, 3, 2 and 1 respectively. The summation of the scores for different statements gave the total score for a respondent on personal guidance.

3.4.1.14 Cosmopoliteness

Cosmopoliteness of the respondents was measured using the scale developed by Desai (1981). Here cosmopoliteness was measured in terms of the frequency of visit to nearby town, and purpose of visit. The scoring procedure was

A. Frequency of visit to the nearby town	Score
Twice or more a week	5
Once a week	4
Once a fortnight	3
Once a month	2
Very rarely	1
Never	0

B. Purpose of visit	Score
All visits relating to agriculture	5
Some relating to agriculture	4
Personal or domestic matters	3
Entertainment	2
Any other purpose	1
No response	0

The cosmopoliteness score was obtained by summing up the scores obtained by an individual over the above two responses.

3.4.2 Dependent variables

3.4.2.1 Knowledge

The quantum of scientific information possessed by the respondents on the subject 'plant protection technology' was referred to as knowledge in the present study. Various researchers over the years have attempted to quantify and measure this variable using different approaches. Bloom *et al.* (1955) defined knowledge as those behaviour and test situations which emphasised remembering either by recognition or recall of ideas, materials or phenomena.

Sankaraiah and Singh (1967) measured knowledge of farmers on improved methods of vegetable cultivation based on teacher-made test as suggested by Anastasi (1961). Nair (1969) measured knowledge level of farmers on recommended package of practices for rice using teacher-made test with multiple choice questions. Anantharaman (1991) calculated the total knowledge score of farmers on scientific management in crop enterprise by adding the number of items answered correctly by each respondent. The procedure followed in the present study

to measure the knowledge of the farmers about plant protection practices is descibred below.

3.4.2.1.1 Collection of items

The knowledge test composed of questions called items. In consultation with the subject matter specialists, agricultural officers and progressive farmers, a pool of items was prepared with respect to plant protection methods viz., chemical, cultural, mechanical and integrated methods of plant protection. In order to analyse the farmers knowledge about various practices of plant protection, the items were then subjected to item analysis based on judges rating and those items which satisfied the eligibility criteria were selected to constitute the final schedule.

3.4.2.1.2 Method of scoring

All the items were framed in the objective form to be answered by the respondents as correct/incorrect. The respondents correctly answering the items were given a score of '1' and '0' for answering the items incorrectly. Then total knowledge score was calculated by summing up the number of items correctly answered by him.

3.4.2.2 Adoption of improved plant protection practices by vegetable cultivators

Adoption of plant protection practices referred to the acceptance and use of recommended plant protection methods by farmers.

Various methods have been developed to measure the adoption behaviour by several researchers. Ernest (1973), Anantharaman (1977) and

Chandrakandan (1982) measured the adoption of agricultural practices based on actual/recommended model. Selvakumar (1988) followed an in depth practice analysis by identifying 7 sub-practices for studying the adoption of 1 major practice viz., control of white fly on cotton. Athimuthu (1990) and Govind (1992) also identified various technological units for measuring adoption of agricultural innovations for the study. Realising the merits of this procedure, in the present study, the adoption behaviour was measured with the help of a plant protection adoption score developed exclusively for the study.

3.4.2.2.1 Fixing weightage score

The plant protection practices and sub-practices under various methods related to plant protection were referred to 40 judges. They were requested to assign a score, ranging from 1-10 for each of the practices and sub practices of plant protection based on their importance in vegetable production. The letter sent to the judges is given in Appendix IV. The mean importance score was taken as the weightage for each of the practice and sub-practices. The importance score arrived at are also given in Appendix IV.

3.4.2.2.2 Computing extent of adoption score

The next step in the procedure of developing plant protection adoption score was computing the extent of adoption. The extent of adoption of the selected plant protection methods was measured based on actual/recommended model for certain practices. First, for the actual/recommended model, the actual/recommended scores for each of the plant protection sub-practices coming under a practice for each of the plant protection methods were calculated (Appendix V). It was multiplied by the corresponding weight of that particular sub-practice to get the

score on extent of adoption of that sub-practice. These scores on extent of adoption of sub-practices were summed up for a particular practice and divided by the number of sub-practices for which the values were added. This value is then multiplied by the corresponding weight of the practice under which the sub-practices were included to get the extent of adoption of that particular practice of a plant protection method. Similarly the scores for extent of adoption of all the practices coming under a plant protection method for which this model was applicable were calculated and summed to obtain the score of extent of adoption of the practices under a plant protection method. Similarly the scores for extent of adoption of all the methods were calculated.

The adoption score for the practice, `precautions to be undertaken while using the plant protection chemicals' under chemical method of plant protection was calculated for each respondent separately as detailed below. For this a score of `1' was given for adoption and `0' for non-adoption. The total score obtained by an individual for the five statements was taken as his adoption score for the same. This score was added to the adoption scores obtained for chemical method of plant protection based on the actual/recommended model to arrive at the total adoption score for chemical method of plant protection for each individual.

Similarly, the adoption score for cultural, mechanical and integrated methods of plant protection also were found out. By summing up the scores obtained for all the statements by an individual, the total adoption score for these methods were arrived at. The overall adoption score for an individual was obtained by the summation of the adoption scores obtained for all the methods.

3.4.3 Constraints experienced by farmers in the adoption of plant protection practices

Constraint analysis is a major theme in transfer of technology research. Pandya and Trivedi (1988) defined constraints as those difficulties or problems faced by individuals in the adoption of technology.

Based on the discussion with farmers, scientists, extension workers, review of literature and observations by the researcher, various constraints were enlisted and were referred to 35 judges. The letter sent to the judges is given in Appendix VI. They were requested to assign rank values in order of importance. Then individual ranks were worked out for each constraint by summing up their rank values over all the judges. The first 12 constraints were thus identified and subjected to rating by the vegetable farmers on a 2 point continuum ranging from `most important constraint' to `least important constraint' with score of `1' and `0' respectively. The relative importance of each constraint was then worked out by summing up their scores over all the respondents.

3.5 Procedure employed in data collection

3.5.1 Method of data collection

The data were collected using a pre-tested and structured interview schedule constructed for the purpose of study (Appendix-I). The schedule consisted of three parts. Part I dealt with the collection of information on various independent variables under study. Part II dealt with the farmer's knowledge about and adoption of plant protection technology. Part III was meant to collect data on the constraints experienced by farmers along with the suggestions to overcome the constraints in the adoption of plant protection technology.

The final interview schedule prepared was administered to the respondent farmers in the selected panchayats of Thrissur district. The data collection was carried out during April 1996 to September 1996.

3.6 Statistical tools employed

The data collected from the respondents were scored, tabulated and analysed using suitable statistical methods. The statement analysis was done using computer facilities at the College of Horticulture, Vellanikkara.

The following statistical methods were used in this study based on the nature of the data and relevant information required.

3.6.1 Mean

The mean scores for all the variables were worked out to make suitable comparisons wherever necessary.

3.6.2 Percentage analysis

Percentage analysis was done to make simple comparisons wherever necessary.

3.6.3 Simple Correlation Analysis

Simple correlation analysis was done to study the relationship between each of the independent variables and dependent variables.

3.6.4 Multiple Regression Analysis

The test was carried out to determine the combined contribution of the independent variables in effecting variations in the dependent variables. The test was carried out also to identify the variables which contributed significantly to the changes in the dependent variables.

The square of the multiple regression coefficient (R) is the cofficient of determination (R^2) which represent the proportion of the total variation explained by the independent variables in the regression equation taken together. The partial regression coefficient or partial `b' were obtained for the variables included in the regression equation. The following prediction equation was used in the present study to determine the multiple regression

$$Y = a + b1\ X1 + b2\ X2 + \ldots\ldots\ldots + bn\ Xn$$

where a = constraint

b1 = the coefficient which appears in the equation which represents the amount of change in Y that can be associated with unit increase in `x1' with the remaining independent variables held fixed. This is referred to as partial regression cofficient or partial `b'.

x1, x2 ..... xn the independent variables

y = the dependent variable

3.7 Hypotheses set for the study

In the light of the postulated relationship of the variables as for the theoretical orientation of the study, based on the objectives and assumptions, relevant null Hypotheses were formulated as follows:

1. There would be no significant relationship between the independent and dependent variables selected for the study.

2. There would be no significant contribution of the independent variables in the variation of the dependent variables selected for the study.

CHAPTER-IV

RESULTS AND DISCUSSION

The findings of the study and the discussions there on are presented in this chapter under the following heads:

4.1 Analysis of the dependent variables of the study

4.1.1 Knowledge of farmers about plant protection practices

4.1.2 Extent of adoption of plant protection practices by farmers

4.2 Correlation analysis between independent and dependent variables

4.3 Relative importance of the selected independent variables in explaining the variations in the dependent variables - results of regression analysis

4.4 Constraints perceived by farmers in commercial vegetable cultivation

4.5 Suggestions to overcome the constraints in the adoption of plant protection practices as perceived by farmers

4.1 Analysis of the dependent variables of the study

4.1.1 Knowledge of farmers about plant protection practices

The distribution of respondents based on their mean scores of extent of knowledge about improved plant protection practices is presented in Table 2 and Fig.3.

Table 2. Distribution of respondents based on the extent of knowledge about improved plant protection practices

(n = 150)

Class	Number of respondents	(%)
Below 50 (very low)	21	14
50-150 (low)	42	28
151-250 (medium)	78	52
Above 250 (high)	9	6
Total	150	100

The commercial vegetable cultivators were grouped into 4 categories based on their mean scores on knowledge. The possible range of scores was between 10 to 30. Grouping was done as follows:

Category	Score
Very low	< 50
Low	50-150
Medium	151-250
High	> 250

A glance at table 2 reveals that only 14 per cent of farmers had very low level of knowledge about improved plant protection practices. A majority of the commercial vegetable growers (52%) had medium level of knowledge, while 6 per cent of the farmers had high level of knowledge about plant protection practices. The results are diagramatically presented in Fig.3.

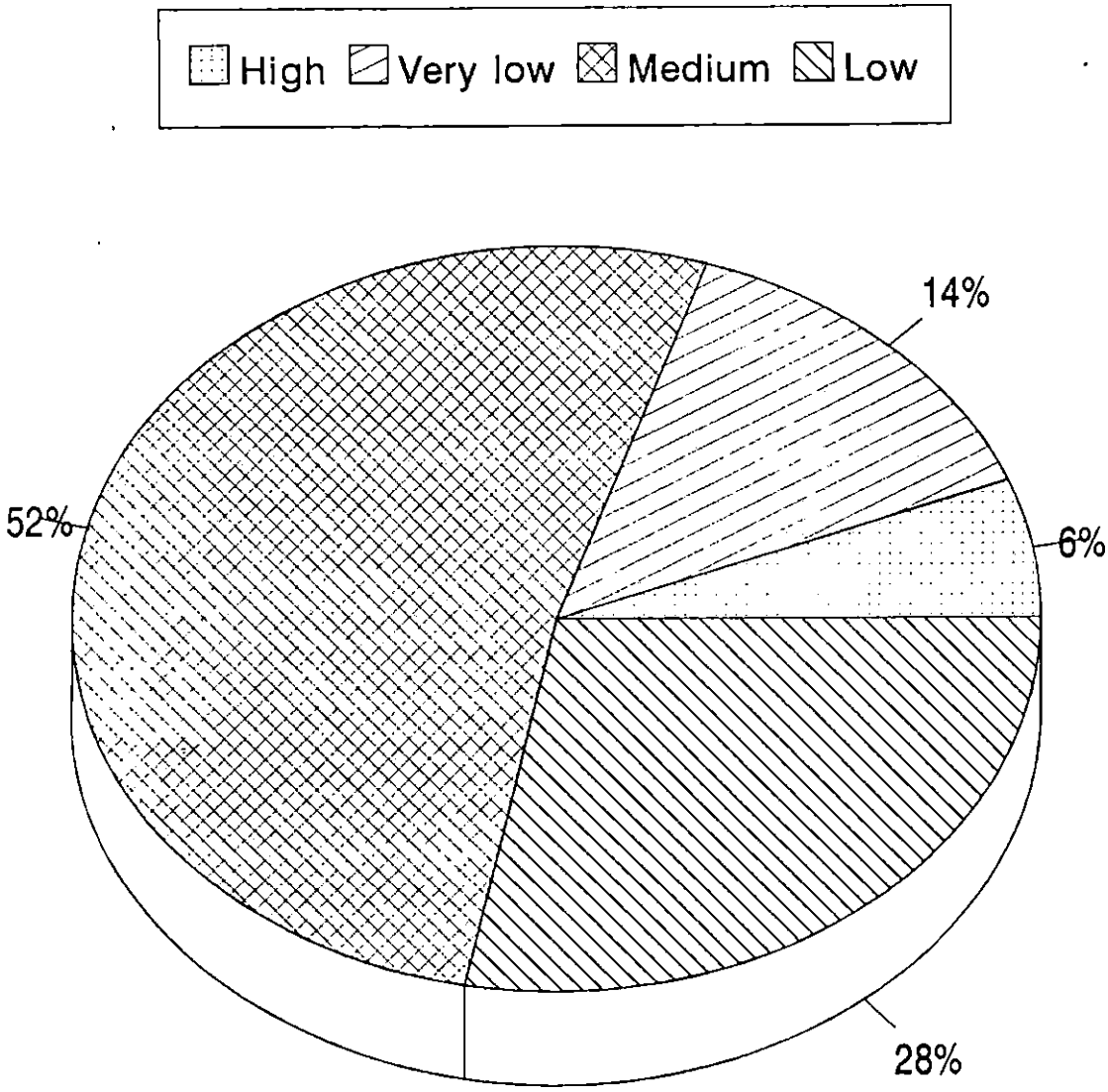


FIG.3 DIAGRAM SHOWING THE LEVEL OF KNOWLEDGE ABOUT IMPROVED PLANT PROTECTION PRACTICES BY COMMERCIAL VEGETABLE GROWERS

A medium level of knowledge for the majority of farmer respondents reflects the exposure of these farmers to the improved plant protection practices in vegetables. The reasons for the majority of farmers falling under the category of medium level of knowledge would be their easy access or proximity to KAU, or the effective functioning of the Department of Agriculture through the network of Panchayat and Krishi Bhavans all over the state. The other reasons that could be attributed to this finding are the high information seeking behaviour combined with higher rate of literacy of Kerala farmers which in turn might have attributed to increased rate of acquiring knowledge about improved plant protection practices.

The fact that 6 per cent of farmers had high level of knowledge about plant protection practices could be explained on the basis that these farmers might be more innovative and progressive when compared to the majority of the farmers or it may be due to their higher extension contact combined with their orientation to the scientific methods of plant protection practices.

The present result was in agreement with the findings of Manivannan (1980), Chandrasekharan (1981), Arumugham (1983) and Bonny (1991) who indicated that a majority of farmer respondents in their respective studies also possessed medium level of knowledge.

4.1.2 Extent of adoption of plant protection practices by farmers

The distribution of respondents based on their mean scores on extent of adoption of improved plant protection practices is presented in Table 3 and Fig.4.

Table 3. Distribution of respondents based on the extent of adoption of improved plant protection practices

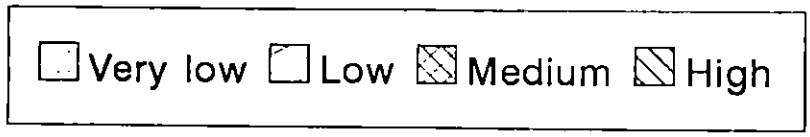
(n = 150)

Class	Number of respondents	(%)
Below 50 (very low)	15	10
50-150 (low)	45	30
151-250 (medium)	81	54
Above 250 (high)	9	6
Total	150	100

Based on their scores on the extent of adoption of improved plant protection practices, the commercial vegetable growers were grouped into 4 categories as follows:

Category	Score
Very low	Below 50
Low	50-150
Medium	151-250
High	Above 250

It may be inferred from Table 3 that only 10 per cent of the farmers had very low level of adoption of plant protection practices. A majority of the



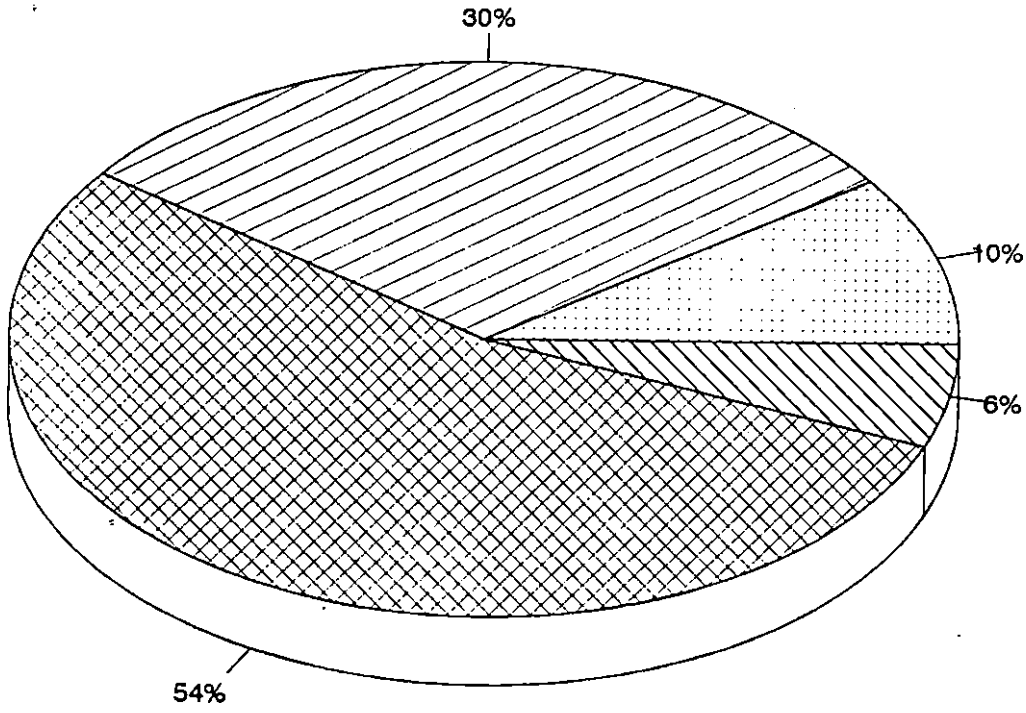


FIG.4. DIAGRAM SHOWING THE EXTENT OF ADOPTION OF IMPROVED PLANT PROTECTION PRACTICES BY COMMERCIAL VEGETABLE FARMERS

commercial vegetable growers (54%) had medium level of adoption. Only 6 per cent were high adopters. The results are diagrammatically presented in Fig.4.

Extent of adoption of improved plant protection practices is related necessarily to the level of knowledge of farmers about the practices. The conviction about the relative advantage of plant protection practices is also of great relevance for adoption. In the light of these facts, the present findings were quite logical, as it is observed that majority of the vegetable farmers had medium level of adoption which is congruent with the medium level of knowledge as evinced by the study.

The present result was in line with the findings of Godhandapani (1985), Chenniappan (1987) and Aziz (1988).

4.2 Correlation analysis between independent and dependent variables

4.2.1 Level of knowledge and independent variables

The results of correlation analysis showing the relationship between the level of knowledge of commercial vegetable growers on improved plant protection practices and independent variables is furnished in Table 4.

It was found that out of the fourteen independent variables included in the study, nine variables showed positive and significant relationship with knowledge about improved plant protection practices. They are educational status (X_2), annual income (X_3), farm size (X_4), availability of farm inputs (X_5), scientific orientation (X_9), extension contact (X_{11}), information source utilisation (X_{12}), personal guidance in better farming (X_{13}) and cosmopoliteness (X_{14}). While negative and significant influence was evinced by risk preference (X_8) and

Table 4. Results of simple correlation analysis between level of knowledge and independent variables

(n = 150)

Variable No.	Independent variables	Correlation coefficient
X_1	Age	-0.115 NS
X_2	Educational status	0.534**
X_3	Annual income	0.798**
X_4	Farm size	0.260*
X_5	Availability of farm inputs	0.748**
X_6	Farming experience	0.051 NS
X_7	Economic motivation	0.062 NS
X_8	Risk preference	-0.186*
X_9	Scientific orientation	0.738**
X_{10}	Management orientation	-0.341*
X_{11}	Extension contact	0.412**
X_{12}	Information source utilisation	0.752**
X_{13}	Personal guidance in better farming	0.667**
X_{14}	Cosmopoliteness	0.768*

* Significant at 5% level
** Significant at 1% level
NS - Not significant

management orientation (X_{10}). Rest of the variables farming experience (X_6) and economic motivation (X_7) did not have any significant influence on knowledge about improved plant protection practices. Age (X_1) was found to have a negative but non-significant correlation with knowledge about improved plant protection practices by commercial vegetable growers.

In the present study, education was measured in terms of the formal schooling of the farmers which certainly opens up new vistas of developments in various fields. Commercial growers being professionals in vegetable cultivation can be expected to be open to any information related to their field of activity. Observed positive trend between education and knowledge therefore is quite natural.

Increased income helps farmers to invest money in cultivation, thus motivating them to acquire knowledge about improved plant protection practices and hence the observed positive relation between income from vegetable cultivation and the level of knowledge is quite logical which draws support from the findings of Godhandapani (1985).

Cultivation in large farms gives opportunity for more income generation which however demands greater attention to scientific management practices. These might be the reasons for positive and significant relationship of farm size with knowledge of farmers. This finding was in confirmity with the observation of positive relation between level of knowledge in vegetable cultivation and farm size by Vijayan (1989) and Athimuthu (1990).

Abundant availability of farm inputs creates an ideal situation where farmers can work towards better performance. Availability of farm inputs at the right times, goes a long way in increasing production, especially for seasonal crops

like vegetables, provided improved technology is also at hand. Hence the observed significant positive relation between availability of farm inputs and knowledge about improved plant protection practices is quite natural and reasonable.

Scientific orientation helps farmers to attain excellence in cultivation. Farmers with more scientific orientation is likely to have an inclination to know more about new ideas and methods of scientific agriculture and hence the observed significant relation between scientific orientation and level of knowledge about improved plant protection practices by commercial vegetable growers, which is in confirmity with the findings of Bonny (1991).

Contact with extension agency and information source utilisation results in exposure of farmers to improved plant protection practices. Those farmers who had opportunity to come in contact with extension agencies might have developed a sense of confidence in their abilities to take rational decisions. Deb *et al.* (1968) had reported that rationality of farmers was related to their extension contact. The greater the contact with extension agency and more the information sources utilised, farmers necessarily acquire more knowledge. This finding is in confirmity with the findings of Ananandarao (1988) and Govind (1992).

The observed relation between cosmopoliteness and level of knowledge about improved plant protection practices by commercial vegetable growers could be explained on the basis that farmers with more of exposure to the outside world are primarily more prone to accept and adopt a new technology. To obtain higher yield and maximise income from vegetable cultivation, it is likely that they attempt to gain more knowledge about improved plant protection practices.

4.2.2 Extent of adoption and independent variables

The results of correlation analysis showing the degree of relationship between extent of adoption of improved plant protection practices and independent variables are presented in Table 5.

It was found from table 5, that out of the fourteen independent variables included in the study, nine variables showed positive and significant relationship with extent of adoption of improved plant protection practices. They are educational status (X_2), annual income (X_3), farm size (X_4), availability of farm inputs (X_5), scientific orientation (X_9), extension contact (X_{11}), information source utilisation (X_{12}), personal guidance in better farming (X_{13}) and cosmopoliteness (X_{14}). Risk preference (X_8) and management orientation (X_{10}) showed significant and negative correlation. Among the rest of the variables, farming experience (X_6) and economic motivation (X_7) did not exert any significant influence on extent of adoption of improved plant protection practices. Correlation with age (X_1) is negative but not significant.

Educational status showed positive and significant relationship with extent of adoption of improved plant protection practices. Education would have made the farmers to search and acquire more information as evidenced by a significant positive correlation with knowledge about improved plant protection practices thereby motivating them to adopt the improved plant protection practices.

A farmer with a large farm size will certainly be interested in the relative advantage in profits that may accrue when he adopts improved plant protection practices. Viewed in this perspective, the observed positive relationship between farm size and extent of adoption is quite understandable.

Table 5. Results of simple correlation analysis between extent of adoption and independent variables

(n = 150)

Variable No.	Independent variables	Correlation coefficient
X_1	Age	-0.116 NS
X_2	Educational status	0.448**
X_3	Annual income	0.678**
X_4	Farm size	0.214*
X_5	Availability of farm inputs	0.682**
X_6	Farming experience	0.069 NS
X_7	Economic motivation	0.018 NS
X_8	Risk preference	-0.224*
X_9	Scientific orientation	0.689**
X_{10}	Management orientation	-0.226*
X_{11}	Extension contact	0.411**
X_{12}	Information source utilisation	0.714**
X_{13}	Personal guidance in better farming	0.568**
X_{14}	Cosmopoliteness	0.65**

* Significant at 5% level
** Significant at 1% level
NS - Not significant

Availability of farm inputs provides the farmers with the various inputs needed in farming at the opportune time. This serves as a favourable condition resulting in adoption of improved plant protection practices as indicated by a positive relation between availability of farm inputs and adoption.

The nature of being more scientifically oriented helps the farmers to know and understand the practices clearly for effective management of the farm. This might have led the farmers in adopting the improved plant protection practices and therefore the positive and significant relation between scientific orientation and extent of adoption. This finding is in agreement with the findings of Kamarudeen (1981) and Jnanadevan (1993).

Better contact with extension agencies and more exposure to various sources of information enhances farmers' awareness about new developments in scientific cultivation which definitely might have contributed positively to the extent of adoption by them. This might have helped farmers to adopt these practices more for increasing the returns and earnings from their farms. Viewed in this angle, it is natural and logical that both extension contact and information source utilisation were positively and significantly related with extent of adoption as is seen from the results of the study.

Personal guidance in better farming provides the farmers with functional and purposive information on scientific farming. This serves as a favourable condition resulting in adoption of improved plant protection practices as indicated by a positive relation between personal guidance in better farming and adoption.

Cosmopoliteness had positive and significant relation with extent of adoption of improved plant protection practices. Awareness about new ideas and farming practices usually results from the farmers visiting various agencies

associated with farm consultancy services, thereby creating a favourableness towards acceptance of different methods of crop production, thus helping themselves to protect their crops and earn more. The finding is therefore plausible and justifiable.

A higher level of management orientation implied a better involvement in activities related to the production aspect of an enterprise. The farmers may raise different vegetables in their fields to ensure higher income from this enterprise. There are possibilities of variation from the general recommendations for each specific type of vegetable. However, this factor was taken into account in the measurement of adoption which might have resulted in a negative relation between management orientation and adoption.

4.3 Relative importance of the independent variables in explaining the dependent variable

Correlation analysis was useful only to find the relationship between the variables. Therefore, an attempt was made to know the relative importance of the different independent variables in explaining variation in each of the dependent variables viz., extent of adoption and level of knowledge about improved plant protection practices in vegetable cultivation.. Multiple regression analysis was employed to find out the variations in the two dependent variables contributed by the independent variables put together.

4.3.1 Multiple regression analysis of level of knowledge using all independent variables

Table 6 gives the results of regression analysis. The model has been constructed using all of the fourteen independent variables.

Table 6. Results of multiple regression analysis on knowledge with independent variables

Variable No.	Independent variables	Regression coefficient	Student T value
X_1	Age	-0.0868886	-1.072 NS
X_2	Educational status	0.54017	1.377 NS
X_3	Annual income	0.644483	1.503 NS
X_4	Farm size	0.01163	1.025 NS
X_5	Availability of farm inputs	1.1647	2.425*
X_6	Farming experience	0.20078	1.866 NS
X_7	Economic motivation	0.0099711	0.024 NS
X_8	Risk preference	-3.3962	-2.031*
X_9	Scientific orientation	2.1405	3.943**
X_{10}	Management orientation	-0.37858	0.481 NS
X_{11}	Extension contact	0.019099	0.77 NS
X_{12}	Information source utilisation	0.22955	3.348*
X_{13}	Personal guidance in better farming	-0.073521	1.035 NS
X_{14}	Cosmopoliteness	2.4021	6.759*

Intercept = -12.535292
R^2 = 0.569
F = 63.70

* Significant at 5% level
** Significant at 1% level
NS - Not significant

The findings of multiple regression analysis revealed that the F value (63.70) was significant, indicating that all the variables together contributed significantly to the variations in the level of knowledge of farmers about the improved plant protection practices. The coefficient of determination (R^2) revealed that 86 per cent of the variation in the level of knowledge was explained by these fourteen variables.

Out of the fourteen independent variables, five variables were selected based on their significant contribution in the regression model. This was done to provide a more compact model for the study. The variables thus selected were availability of farm inputs, risk preference, scientific orientation, information source utilisation and cosmopoliteness. Table 7 shows the results of the analysis.

Table 7. Multiple regression analysis of knowledge on selected independent variables

Variable No.	Selected variables	Regression coefficient	T value
X_5	Availability of farm inputs	0.18595	-2.914**
X_8	Risk preference	-0.40525	-2.964*
X_9	Scientific orientation	2.7106	7.364**
X_{12}	Information source utilisation	-0.28732	4.909**
X_{14}	Cosmopoliteness	2.7011	8.249**

Intercept = -1.605672
R^2 = 0.859
F = 174.80

* Significant at 5% level
** Significant at 1% level

The results of the more compact regression model showed great increase in the F value (174.80) indicating that the selected five variables together contributed significantly to the variation in the level of knowledge of farmers about improved plant protection practices. The coefficient of determination (R^2)

revealed that 85.9 per cent of the variation in the level of knowledge was explained by these 5 selected variables.

All of the five selected variables were found to be significant in explaining the level of knowledge, viz., availability of farm inputs, risk preference scientific orientation, information source utilisation and cosmopoliteness.

The observed contribution by availability of farm inputs to level of knowledge about plant protection practices could be explained on the basis that the farmers who possessed various farm inputs at the opportune time is likely to seek more information for putting these inputs into effective use maximising his returns. Thus the significant relation between the two variables were justifiable. The findings were in agreement with the results of Singh (1990).

Risk preference was observed as significantly contributing to the variations in level of knowledge about improved plant protection practices. Farmers with higher levels of risk preference naturally tend to venture into unconventional areas rather than confine themselves to traditional and beaten paths. Therefore, such farmers might have sought more information about newer and more innovative methods and techniques of plant protection practices and hence the finding.

The results also showed that scientific orientation was another important variable contributing significantly to the level of knowledge in plant protection technology. A favourable orientation towards science and technology logically leads to better information seeking behaviour and a more sound knowledge base. Therefore, the observed relation is only natural, which is supported by results of Jnanadevan (1993).

In order to achieve higher yields and earn more income, the farmers have to draw from every available information source that opens up to them. This in turn is certain to lead to more knowledge about various aspects of crop production. The observed relation was thus justifiable. The finding draws its support from the results of Bonny (1991).

The frequency of visits to nearby towns for purposes related to agriculture opens up new avenues to farmers for information seeking. Knowledge about plant protection practices being a speciality area is likely to be a topic for such learning activity. Hence the observed significant contribution by cosmopoliteness to level of knowledge about plant protection practices was justifiable. The finding draws its support from the results of Jananadevan (1993).

In the light of the above discussion, the hypothesis set for the study that there would be no significant contribution of the independent variables to the variations in the level of knowledge about improved plant protection practices was rejected in the case of independent variables availability of farm inputs, risk preference, scientific orientation, information source utilisation and cosmopoliteness and the same was accepted in the case of the other nine variables.

4.3.2 Multiple regression analysis of extent of adoption using all independent variables

The results of multiple regression analysis of extent of adoption of improved plant protection practices in vegetable cultivation with the independent variables is given in Table 8.

The findings of multiple regression analysis revealed that the F value (24.76) was significant, indicating that all the variables together contributed significantly to the variation in the extent of adoption of improved plant protection

Table 8. Results of multiple regression analysis on extent of adoption with independent variables

Variable No.	Independent variables	Regression coefficient	Student T value
X_1	Age	-2.023	-2.260*
X_2	Educational status	-0.41715	-0.096 NS
X_3	Annual income	0.27859	0.589 NS
X_4	Farm size	-2.3919	-0.479 NS
X_5	Availability of farm inputs	1.6102	2.419*
X_6	Farming experience	3.0318	2.555*
X_7	Economic motivation	-3.3263	-0.740 NS
X_8	Risk preference	-3.0411	-1.413 NS
X_9	Scientific orientation	17.062	2.849*
X_{10}	Management orientation	12.386	1.428 NS
X_{11}	Extension contact	1.8422	0.676 NS
X_{12}	Information source utilisation	2.2261	2.944*
X_{13}	Personal guidance in better farming	0.074357	0.095 NS
X_{14}	Cosmopoliteness	13.101	3.342*

Intercept = -18.580876
R^2 = 0.720
F = 24.76**

* Significant at 5% level
** Significant at 1% level
NS - Not significant

practices. The coefficient of determination (R^2) revealed that 72 per cent of the variation in the extent of adoption were explained by the fourteen variables.

Out of the fourteen independent variables only six were found to be significant in explaining the variations in the extent of adoption of improved plant protection practices namely age, availability of farm inputs, farming experience, scientific orientation, information source utilisation and cosmopoliteness. These variables were subjected to a further analysis and a more compact regression model was obtained as follows.

Table 9. Multiple regression analysis of "Extent of Adoption" on selected independent variables

Variable No.	Selected variables	Regression coefficient	T value
X_1	Age	-1.5837	-1.768
X_5	Availability of farm inputs	1.8883	2.557*
X_6	Farming experience	2.4007	2.050*
X_9	Scientific orientation	11.738	2.805**
X_{12}	Information source utilisation	15.290	4.206**
X_{14}	Cosmopoliteness	2.7886	4.223**

Intercept = -84.325744
R^2 = 0.690
F = 53.00

* Significant at 5% level
** Significant at 1% level

The revealings of the more compact regression model as in Table 9 shows that F value (53.00) was significant, indicating that the selected 6 variables together contributed significantly to the variations in the extent of adoption of improved plant protection practices. The coefficient of determination (R^2) indicated that 69 per cent of the variation in the extent of adoption were explained by these 6 selected variables.

Out of the six selected variables, five were found to be significant in explaining the extent of adoption in improved plant protection practices viz., availability of farm inputs, farming experience, scientific orientation, information source utilisation and cosmopoliteness.

It could be logically concluded that with the availability of more farm inputs, the farmers were motivated to adopted various improved plant protection practices in vegetable and hence the observed relation between availability of farm inputs and extent of adoption of improved plant protection practices by commercial vegetable growers, which draws support from the findings of Jnanadevan (1993).

The more experienced farmers are likely to possess more confidence and capability to put to use the various methods of improved plant protection practices in their fields. The significant contribution towards variations in extent of adoption of improved plant protection practices in vegetables by farming experience was thus justifiable. The finding was in agreement with the results of Bonny (1991).

In the present era of technological explosion, it is quite logical that a farmer who has better access to the different mass media and personal sources of information comes across experiences and expertise related to a wide variety of topics involved in agriculture. Therefore the observed significant contribution for information source utilisation to extent of adoption of plant protection practices is quite justifiable which is supported by the results of Prakash (1980), Vijayan (1989) and Bonny (1991).

The observed relation between cosmopoliteness and extent of adoption of improved plant protection practices could be explained on the basis that farmers who have more of exposure to outside world can be expected to be more

innovative. To obtain higher yield and maximise income, it is likely that they attempt to put into practice various informations obtained from reliable sources. The finding draws its support from the results of Govind (1992).

In the light of the above discussion, the hypothesis set for the study that there would be no significant contribution of the independent variables to the variations in the extent of adoption of improved plant protection practices were rejected in the case of independent variables availability of farm inputs, farming experience, scientific orientation, information source utilisation and cosmopoliteness and the same were accepted in the case of other nine variables.

4.4 Constraints perceived by farmers in the adoption of plant protection practices in commercial vegetable cultivation

An attempt was made to identify the important constraints as perceived by farmers engaged in commercial vegetable cultivation.

The major constraints experienced by the farmers are presented in Table 10. These constraints were ranked based on the severity with which they were felt by farmers as indicated by them.

Increased cost of plant protection chemicals was reported by 80 per cent of the respondents as the most important constraint. Seventy five per cent of the farmers pointed out 'difficulty in preparation/ application' as the next important constraint. 'Difficulty in the selection of alternate chemicals', 'inadequacy of capital', 'non-availability of labour', and 'lack of knowledge about technology' were the other constraints in the order of importance as reported by 72, 70, 65 and 60 per cent of the farmers respectively. The ranks obtained by other constraints are shown in the Table 10.

Table 10. Constraints in the adoption of improved plant protection practices by commercial vegetable growers

Sl.No.	Constraints	Per cent	Rank
1	Inability in identifying/diagnosing pests/diseases	45	IX
2	Non-availability of PP chemicals	20	XII
3	Increased cost of PP chemicals	80	I
4	Lack of knowledge about technology	60	VI
5	Inadequate supervision and guidance	50	VIII
6	High labour charge	58	VII
7	Non-availability of labour	65	V
8	Inadequacy of capital	70	IV
9	Poor socio-economic status	40	X
10	Difficulty in the selection of alternate chemicals	72	III
11	High risk involved	30	XI
12	Difficulty in preparation/application	75	II

Incidence of pests and diseases seriously limit vegetable production. The high incidence of pests and diseases prompts for repeated and intensive use of plant protection chemicals in vegetables. This trend was also observed in the high extent of adoption of plant protections practices as evinced in this study. This could have prompted them to perceive the high cost of plant protection chemicals as an important constraint.

'Difficulty in preparation/application' was ranked as the second major constraint in successful vegetable production because they widely considered it as a complex technology, involving many calculations. 'Difficulty in the selection of alternate chemicals' was ranked as the third important constraint by the farmers. Majority of the farmers found it very difficult to choose alternate chemicals in the absence of a recommended chemical. These findings are in conformity with the findings of Govind (1992).

Many of the improved plant protection practices in commercial vegetable cultivation, especially those involving chemicals are capital intensive. This was reflected in the constraint 'inadequacy of capital, perceived as important by the farmers. This also reflects the lack of credit support for the improvement of scientific vegetable cultivation. Financial institutions may consider this and offer suitable incentives for encouraging vegetable cutlivation on a commercial scale.

Non-availability of labour was ranked the next important constraint. Plant protection operations using chemicals are considered a hazardous job and unless adequately remunerated, labourers are reluctant to turn up. Further, because of piece meal nature, it often fails to offer full time employment. These may be the reasons for this constraint being perceived as important by the vegetable farmers.

'High labour charge' was ranked an important constraint in the adoption of plant protection practices in vegetable production. Most of the operations in plant protection demand intensive use of labour involving heavy expenditure. A group approach in vegetable cultivation could be tried which can help in considerably reducing the expenditure on labour as has been reported in the case of rice cultivation now being implemented in the state.

The other constraints in the order of importance were, inadequate supervision and guidance, inability in identifying/diagnosing pests/diseases, poor socio-economic status, high risk involved and non-availability of plant protection chemicals. However, these were assigned only lower ranks by the farmers.

4.5 Suggestions to overcome the constraints in the adoption of plant protection practices by the farmers

Suggestions given by the farmers to overcome the constraints experienced in the adoption of improved plant protection practices is given in Table 11.

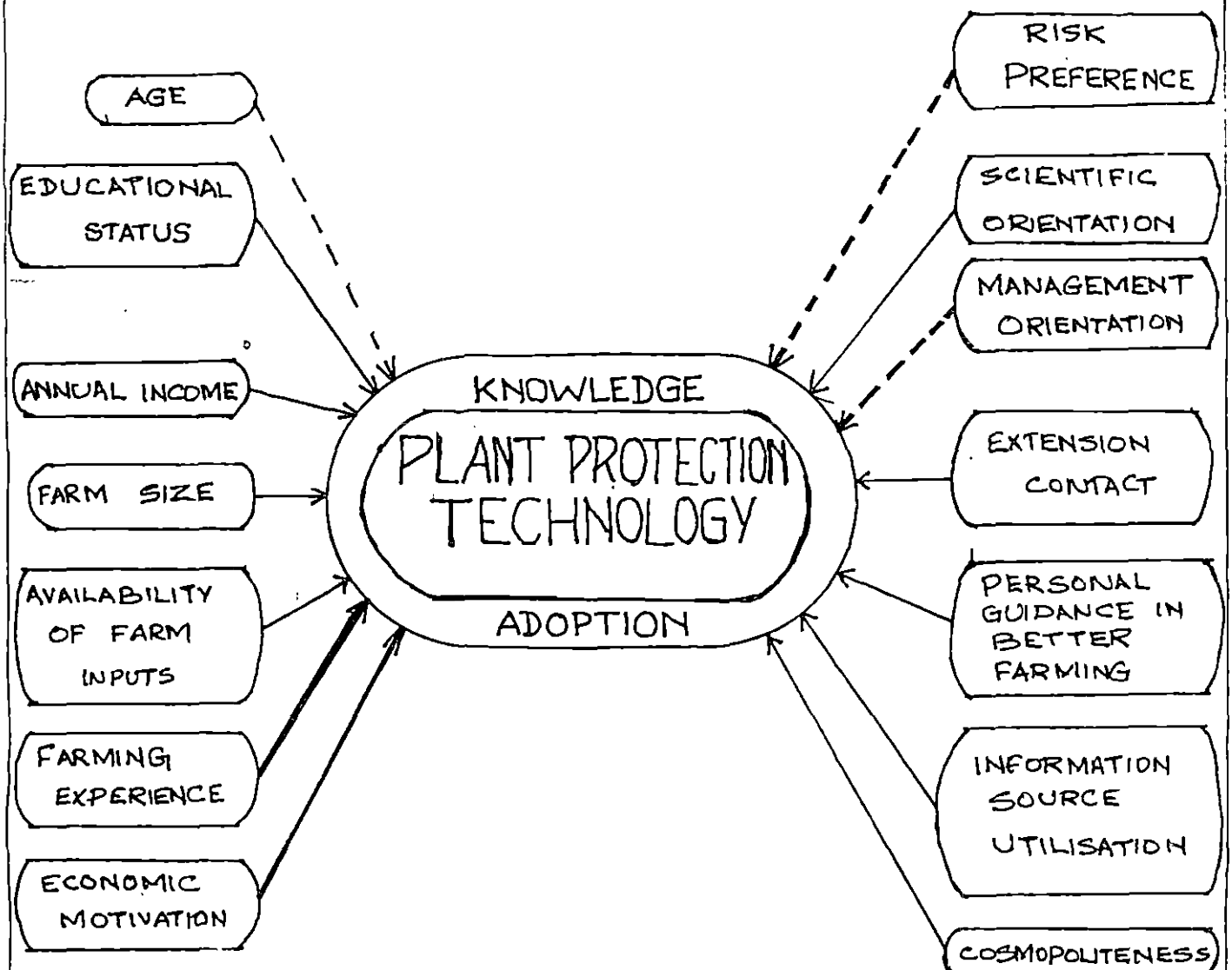
A cursory glance of the results presented in Table 11 reveals the following.

The most important suggestion was 'to develop low cost technology for the control of pests and disease'. It was also noticed from the same table that 'develop simple and more compatible plant protection technologies', 'impart adequate training to farmers to enhance knowledge' and 'avail more extension support' were important suggestions which need urgent attention by the planners, researchers and administrators.

Table 11. Suggestions to overcome the constraints in the adoption of improved plant protection practices given by the farmers

(n = 150)

Sl.No.	Constraints	Per cent	Rank
1	Ensure adequate supply of credit facilities	46	VII
2	Ensure proper irrigation facilities	44	VIII
3	Impart adequate training to farmers to enhance knowledge	60	III
4	Ensure adequate and timely supply of inputs	55	V
5	Develop low cost technology for the control of pests and diseases	75	I
6	Develop disease and pest tolerant varieties	50	VI
8	Develop simple and move compatible plant protection technologies	70	II



+vely significant ——→
-vely significant - - →
Non significant ——→
-vely non significant -·→

FIG 5 - EMPIRICAL MODEL SHOWING THE RELATIONSHIP BETWEEN KNOWLEGE AND ADOPTION OF PLANT PROTECTION PRACTICES WITH SELECTED PSYCHOLOGICAL, SOCIAL AND SITUATIONAL VARIABLES.

Summary

CHAPTER-V

SUMMARY AND CONCLUSION

Science has given man immense powers. But all science whether physical or social will be useless and all human energy invested of scientific innovations and discoveries will be mere waste unless their useful and practical findings are communicated to the people in such a way that they accept them and adopt them to attain a status of social and economic well being. In India, the productivity in majority of the crops is possibly the lowest. The reason may be found in the gap between theoretical knowledge acquired by the scientists and the extent to which it has found practical application by the clientale.

In the process of agricultural development, the prime mover is considered to be the new farming technology. Higher the gap between the recommended practices and actual adoption, lesser will be the utilisation of the research findings which will ultimately lower, the agricultural production in the country. It is therefore, imperative to critically analyse and study the various factors associated with the extent of adoption of recommended cultivation practices by the clientale. In this context, the present study was undertaken with the following specific objectives.

1. This study aims to assess the knowledge and adoption of plant protection practices by commercial vegetable growers of Thrissur district.

2. It also desires to assess the relationship between selected characteristics of farmers (psychological, social, situational and system variables) and knowledge and adoption of plant protection practices by vegetable growers.

3. Further, it is meant to study the constraints in the adoption of plant protection practices by vegetable cultivators in Trichur district.

The study was conducted during 1996 in 3 subdivisions of Trichur district where vegetable cultivation is practiced on a commercial scale.Three panchayaths namely Puthoor, Meloor and Thekkumkara were selected for the study. Fifty vegetable farmers having at least 50 cents each were selected from the 3 pachayaths to constitute a sample of 150 respondents.

The dependent variables included in the study were level of knowledge about improved plant protection practices and extent of adoption of improved plant protection practices in vegetable cultivation.

Age, education status, annual income, farm size, availability of farm inputs, farming experience, economic motivation, risk preference, scientific orientation, management orientation, extension contact, information sources utilisation, personal guidance in better farming and cosmopoliteness were the independent variables selected for the study.

The data were collected by personal interviews with the respondents using a structured and pretested interview schedule developed for the purpose. The collected data were analysed using mean scores, percentage analysis, simple correlation analysis and multiple regression analysis.

The salient findings of the study were:

1. About 52 per cent of commercial vegetable farmers had medium level of knowledge about improved plant protection practices.

2. About 54 per cent of commercial vegetable farmers had medium level of adoption of improved plant protection practices.

3. Cosmopoliteness, information source utilisation, availability of farm inputs and scientific orientation recorded significant positive relation with level of knowledge and extent of adoption of improved plant protection practices by commecial vegetable growers.

4. The results of multiple regression analysis indicated that cosmopoliteness, information source utilisation and scientific orientation contributed significantly towards explaining variations in the level of knowledge and extent of adoption of improved plant protection practices by commercial vegetable farmers.

The important constraints perceived by the farmers were increased cost of plant protection chemicals difficulty in preparation/application of plant protection chemicals, difficulty in the selection of alternate chemicals, in adequacy of capital, non-availability of labour and lack of knowledge about technology.

Implications of the study

The study conclusively proved that plant protection aspects form one of the most decisive factors in commercial vegetable cultivation. Therefore, every effort should be made to realign the training programmes in vegetable cultivation highlighting the plant protection aspects. The recent trends in control of pests and diseases with minimum use of pesticides focussing on integrated pest management may be covered in such trainings.

The results of constraint analysis also pointed out the need for improvements to be made in the area of plant protection, where at present the use of insecticides incurring high cost to the farmers in terms of money and health and environmental hazards prevail. The supply and service system have to be geared up to meet the requirement of the farmer.

Absence of motivating the farmers to attend to the seminars, demonstrations, workshops, campaigns, farm trials and trainings may also be recorded as an important gap in the adoption of improved plant protection practices by commercial vegetable farmers.

High cost of labour, intensive use of capital and increased expenditure of the various farm inputs in adopting the improved plant protection practices by commercial vegetable farmers postulates that financial assistance to the vegetable farmers is not overwhelming from different co-ordinating agencies.

Despite this, little attention has been paid to in ensuring timely and adequate supply of various plant protection chemicals to commercial vegetable farmers. Also, little attention has been paid to in providing adequate supervision and guidance to the vegetable farmers about preparation and application of the suitable chemicals and identification of pests/diseases which would help them in selecting the appropriate plant protection chemical resulting in the right step towards adoption of improved plant protection practices in commercial vegetable cultivation.

As far as services are concerned, above all, various agricultural extension agencies should be geared up, so as to help the commercial vegetable farmers to have ready access to reliable information about improved plant protection practices.

In short much more attention need to be paid to the commercial vegetable farmers for more effective adoption of improved plant protection practices.

Suggestions for future research

The present study had considered adoption of plant protection practices of selected vegetables, but several differences in cultivation practices and plant protection methods do exist among the different specific type of vegetable crops. In order to make the study more objective and comprehensive, it would be more appropriate if adoption is studied for the different types of other vegetables separately.

Many of the variables included in the present study could not evince significant relation with the dependent variables as observed from correlation and regression analysis. Hence it is suggested that a more exhaustive study may be undertaken including more relevant variables.

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* Originals not seen

Appendices

APPENDIX-I

Kerala Agricultural University
Department of Agricultural Extension, College of Horticulture, Vellanikkara

Gaps in the adoption of plant protection practices by commercial vegetable growers of Thrissur district

INTERVIEW SCHEDULE

Respondent No. Panchayat:

Name of the respondent :

Address :

1. Age

2. Educational status

Illiterate
Can read and write
Primary School
Middle School
High School
College and above

3.A. Annual income

a) From Agricultural Sources
b) From other sources (specify)
Total income

B. Income from vegetable cultivation

4. Farm size	Area (cents)	Area under vegetable (cents)
1. Owned land		
a. Wed land		
b. Garden land		
2. Leased in land		
a. Wet land		
b. Garden land		

5. Availability of farm inputs

Items	Availability of inputs					
	Adequacy			Periodicity		
	Adequate	Moderate	Inadequate	Always	Seasonal	Occassional
1. Seeds/planting materials						
2. Manures/Fertilizers						
3. P.P. Chemicals						
4. Equipments/tools machinery						
5. Credit						
6. Technical knowledge						
7. Water for irrigation						
8. Other (coir, mulch, transporation)						

6. Farming experience

a) Your experience in farming (years) .....years
b) Since howmany years you have been growing vegetables in your land?
c) Since when you have been growing vegetables for commercial purpose?

7. Economic motivation

Below are given 3 sets of statements. From each set select 2 statements, one `most like' and other `least like'

I. a) All I want from my farm is to make just a reasonable living for the family.
   b) In addition to making reasonable amount of profit the enjoyment in farming life is also important for me.
   c) I would invest in farming to the maximum to gain large profits.

II.a) I would not hesitate to borrow any amount of money in order to run the farm properly
   b) Instead of growing new cash crops which cost more money I follow routine farming practices.
   c) It is not only monetary profit but also the enjoyment of work done which gives me satisfaction for my hard working in the farming.

IIIa) I hate to borrow money on principles even when it is necessary for properly running the farm.

b) My main aim is maximising monetary profit in farming by growing cash crops in comparison to growing of crops which are simply consumed by my family.

c) I avoid excessive borrowing of money for farm investment.

8. Risk preference

Please give your degree agreement for the following statements

	SA	A	UD	DA	SDA
1. A farmer should resort to multiple cropping to avoid greater risk involved in growing a single crop					
2. A farmer should rather take more of a chance in making a big profit than to be content with a similr but less risky profits					
3. A farmer who is willing to take greater risks than average farmer usually does better financially					
4. It is good for a farmer to take risk when he know his chance of success if fairly high					
5. It is better for a farmer not to try new farming unless most others have used them with success					
6. Trying an entirely new practice in farming by a farmer involves risks but is worth it					

9. Scientific orientation

(Please give your agreement/disagreement with the following statements)

1. New method of farming give better results to a farmer than old methods
2. The way of farming by traditional method is still the best way to farm
3. Even a farmer with a lot of farm experience should use new methods of farming
4. A good farmer experiments with new ideas in farming
5. Though it takes time for a farmer to learn new methods in farming it is worth the effort

6. The traditional methods of farming have to be changed in order to raise the standard of living of a farmer

10. Management orientation: Give your agreement/disagreement

	Agree/Disagree
1. Each year one should think of a fresh about the crop to be cultivated in each type of land	
2. It is not necessary to make prior declision about the variety of crop to be cultivated	
3. The amount of seeds, fertilizers, PP chemicals needed for raising a crop should be assessed before cultivation	
4. It is now necessary to think ahead of the cost involved in raising a crop	
5. One need not consult any agrl. expert for planning	
6. It is possible to increase the yield through farm production	

11. Extension contact

Frequency of meeting officials	Twice a week	Once a week	Once to three a month
a) Research scientists			
b) Extension officers			
c) Field level workers			
d) Input agencies			
e) Others			

12. Information source utilisation

How often do you use the following information sources?

Sl.No.	Sources	Whenever needed	At times needed	Never
(a)	Mass media sources			
1.	Demonstrations			
2.	TV			
3.	Poster			
4.	Radio			
5.	Film			
6.	Field trips			
7.	Newspapers			
8.	Farm publications			
9.	Others (specify)			
(b)	Personal cosmopolite sources			
1.	Research Scientist			
2.	Agrl. Officers			
3.	Agrl. Assistants			
4.	Others (specify)			
(c)	Personal localite sources			
1.	Neighbours			
2.	Friends			
3.	Family members			
4.	Relatives			

13. Personal guidance in better farming?
Indicate your responses to the following statements in the appropriate column

	Very much	Much	Not much	Little
1. Extent to which you discussed your farming problems with the extn. personnel during last 2 years				
2. The extent to which the extension personnel visited your crop in the last 2 years				
3. The help you have received in determining the most suitable cropping pattern for your farm				
4. The advice you have received for proper use of fertilizer to different crops of your farms				
5. The advise you have received for efficient water use in your farm				
6. The assistance you have received in identifying the disease of your crops and prescribing control measures				
7. The assistance you received in testing your soil				
8. The advice you have got about proper storage of your farm produce				
9. The advice you have received in getting the additional returns on the use of new inputs				

14. Indebtedness

i. How you borrowed to meet cultivation expenses? Yes/No
If yes, indicate the sources.

a) Private individuals
b) Cooperative Society
c) Commercial Banks
d) Private Banks
e) Others (specify)

ii. When did you borrow? (specify the period)

iii. Amount of loan taken

iv. Period of repayment

v. a) Amount repaid
b) Amount outstanding

15. Social participation

a) Are you a member/office bearer in any of the following organisations. If yes, please specify the organisation and the role

Organisation	Member	Office bearer
i) Panchayat		
ii) Co-operative Society		
iii) Radio Rural Forum		
iv) Young Farmer's Club		
v) Vegetable growers Association		
vi) Others (specify)		

16. If you are a member, how frequently you attend its meeting and other activities

i) Regularly attend
ii) Occassionally attend
iii) Never attend

17. Cosmopoliteness

A. Frequency of visit to the nearest town

1. Twice or more a week ( )
2. Once a week ( )
3. Once a fortnight ( )
4. Once a month ( )
5. Very rarely ( )
6. Never ( )

B. Purpose of visit

1. All visits relating to agriculture ( )
2. Some relating to agriculture ( )
3. Personal or domestic matters ( )
4. Entertainment ( )
5. Any other purpose ( )
6. No response ( )

Adoption of improved plant protection practices in vegetables

Do you adopt timely PP measures : Yes/No
If yes specify the following:

I.A. Chemical method of plant protection in vegetables

Plant protection practices	About knowledge		About adoption	
	Correct	Incorrect	Quantity used kg/acre	Quantity required kg/acre
a) Amaranthus				
(i) Aphid				
1.				
2.				
3.				
ii) Leaf webber				
1.				
2.				
3.				
iii) Whiterust				
1.				
2.				
3.				
b) Cowpea				
i) Pea aphid				
1.				
2.				
3.				

ii) Pod borer

1.
2.
3.

iii) Leaf spot

1.
2.
3.

(c) Bittergourd

i) Fruit flies

1.
2.
3.

ii) Red pumpkin beetles

1.
2.
3.

iii) Downy mildew

1.
2.
3.

d) Snakegourd

i) Fruit flies

1.
2.
3.

ii) Red pumpkin beetles

1.
2.
3.

iii) Downy mildew

1.
2.
3.

B. Pleaseindicate you knowledge about adoption of the precautions to be undertaken while using pesticides/fungicides for the chemical control of pests/ diseases in vegetables

S. No.	Plant protection practices	About knowledge		About usefulness of adoption		
		Correct	Incorrect	Extremely useful	Useful	Not useful
1.	Do not mix the chemicals with bare bands					
2.	Do not eat or drink while using pesticides					
3.	Do not apply the chemicals against wind					
4.	Do not wash the empty containers in streams/ channels/rivers, etc.					
5.	Destroy the empty containers immediately after use					

2. Cultural method of plant protection in vegetables

S. No.	Plant protection practices	About knowledge		About usefulness of adoption		
		Correct	Incorrect	Extremely useful	Useful	Not useful
1.	Monitoring pests in main field					
(a)	The time interval for monitoring					
2.	Plant population/sq.m					
(a)	The no. of hills/sq.m					
3.	Weeding operation					
(a)	The no. of weeding					
4.	Application of nitrogenous fertilizers					
(a)	The quantity/acre					
(b)	The no. of application					

3. Mechanical method of plant protection in vegetables

S. No.	Plant protection practices	About knowledge		About usefulness of adoption		
		Correct	Incorrect	Extremely useful	Useful	Not useful
1.	About the collection and destruction of egg masses or other stages of pests					
2.	About the collection and distribution of affected plant parts or plants					

4. Integrated method of plant protection in vegetables

S. No.	Plant protection practices	About knowledge		About usefulness of adoption		
		Correct	Incorrect	Extremely useful	Useful	Not useful
1.	Combination of methods					
(a)	Combining different methods with the concepts of IPM					
(b)	The conservation of natural enemies					

Constraints in the adoption of plant protection practices

Sl. No.	Constraints	Most important	Least important
1.	Inability in identifying/diagnosing pests/diseases		
2.	Non availability of PP chemicals		
3.	Increased cost of PP chemicals		
4.	Lack of knowledge about technology		
5.	Inadequate supervision and guidance		
6.	High labour changes		
7.	Non availability of labour		
8.	Inadequacy of capital		
9.	Poor socio-economic status		
10.	Difficulty in the selection of alternate chemicals		
11.	High risk involved		
12.	Difficulty in preparation/application		

APPENDIX-II

KERALA AGRICULTURAL UNIVERSITY

Dr.Joy Mathew
Associate Professor

Central Training Institute
Mannuthy, Dated: 6th March 1996

Sir,

Mr.Manoj, M., M.Sc.(Ag.) student who is working under my guidance is undertaking a research study entitled, "Gaps in the adoption of plant protection practices by commercial vegetable growers of Thrissur district" as a part of his research work. One of the objectives of the study is to track out the selected characteristics of farmers in relation to adoption of plant protection practices by commercial vegetable growers.

In view of your professional experience and expertise, you have been identified as a judge for rating the relevancy of the list of identified variables furnished in the schedule attached. You may check the importance of the included traits in influencing the adoption of plant protection practices by commercial vegetable growers.

I request you to kindly spare some of your valuable time for this purpose. You are free to add any new variables relevant to the study. I request you to return the list duly filled at your earliest convenience in the enclosed self-addressed stamped envelope. Hoping your kind co-operation.

Yours faithfully,

Sd/-
(Joy Mathew)

Encl: 1. Schedule
2. Stamped self addressed envelope

LIST OF INDEPENDENT VARIABLES

Variables	Most important	Some what important	Important	Not at all important
1. Age				
2. Education				
3. Annual income				
4. Land Tenure status				
5. Experience in vegetable cultivation				
6. Indebtedness				
7. Labour input				
8. Cropping intensity				
9. Irrigation potential				
10. Social participation				
11. Economic motivation				
12. Risk preference				
13. Scientific orientation				
14. Achievement motivation				
15. Management orientation				
16. Information source utilisation				
17. personal guidance on scientific farming				
18. Market orientation				
19. Extension contact				
20. Farm size				
21. Socio-economic status				
22. Knowledge on vegetable cultivation				
23. Attitude				

Variables	Most important	Some what important	Important	Not at all important
24. Availability of materials				
25. Mass media exposure				
26. Innovativeness				
27. Credit orientation				
28. Value orientation				
29. Awareness				
30. Initial cost				
Any other variables				
1.				
2.				
3.				
4.				
5.				

APPENDIX-III

KERALA AGRICULTURAL UNIVERSITY

Dr.Joy Mathew
Associate Professor

Central Training Institute
Mannuthy

Dear Sir/Madam,

This is in relation to the research study taken by Sri.Manoj, M., M.Sc.(Ag.) student in the Department of Agricultural Extension, College of Horticulture, Vellanikkara. His research problem is "Gaps in the adoption of plant protection practices by commercial vegetable growers of Thrissur district".

He has identified 4 methods of plant protection for the study. Specific practices with sub practices under possible methods related to the adoption of each practice of plant protection in vegetables (amaranthus, cowpea, bittergourd and snakegourd) were also identified. You are requested to decide upon (1) The important of each method of plant protection. (2) The importance of the specific practices and sub-practices under different methods related to the adoption of each practice of plant protection in vegetable cultivation.

Please put a tick mark ( ) in the appropriate column in a five point continuum, viz., 'Most important', 'More important', 'Important' (Impt.), 'Less important' and 'Not important' for fixing the importance of each specific practice and sub-practice.

I once again request you, to give your valuable judgement to enable the researcher to select the important plant protection methods, their practices and sub-practices in vegetable cultivation.

Thanking you in advance for your contribution in completing this portion of his research work.

With regards,

Yours sincerely,

Sd/-
(Dr.Joy Mathew)

1. Importance of the methods of plant protection in vegetable cultivation

Sl. No.	Plant protection (PP) methods	Response category				
		Most impt.	More impt.	Impt.	Less impt.	Not impt.
1.	Chemical method of PP					
2.	Cultural method of PP					
3.	Mechanical method of PP					
4.	Integrated method of PP					

2. The plant protection practices and sub-practices in vegetable cultivation

Sl. No.	Plant protection (PP) methods	Response category				
		Most impt.	More impt.	Impt.	Less impt.	Not impt.
I.	Chemical method of PP					
i.	Selection of the chemical					
ii.	Quantity of chemical to be used					
iii.	Precautions to be taken while using the PP chemicals					
II.	Cultural method of PP					
i.	Monitoring pests in main field					
	(a) Time at which monitoring is to be commenced					
	(b) Time interval for monitoring					
ii.	Plant population/sq.m					
iii.	Weeding operation					
	(a) The no. of weedings					
iv.	Application of nitrogenous fertilizers					
	(a) The quantity/acre					
	(b) The no. of applications					

Sl. No.	Plant protection (PP) methods	Response category				
		Most impt.	More impt.	Impt.	Less impt.	Not impt.
III.	Methanical method of PP					
i.	About the collection and distribution of egg masses or other stages of pests					
ii.	About the collection and destruction of affected plant parts or plants					
IV.	Integrated method of PP					
i.	Combination of methods (a) Combining different methods with the concept of IPM (b) The conservation of natural enemies					

APPENDIX-IV

KERALA AGRICULTURAL UNIVERSITY

Dr.Joy Mathew
Associate Professor

Central Training Institute
Mannuthy

Dear Sir/Madam,

This is in relation to the research study undertaken by Sri.Manoj, M., M.Sc.(Ag.) student in the Department of Agriculture Extension, College of Horticulture, Vellanikkara. His research problems "Gaps in the adoption of plant protection practices by commercial vegetable growers of Thrissur district".

He has identified various practices and their sub-practices under possible methods related to the adoption of four plant protection practices selected for vegetable cultivation. It is assumed that all the practices and their sub-practices are important in technology acceptance.

It is therefore necessary to fix weightage for each of the practices and sub-practices based on their importance in plant protection in vegetable cultivation.

Kindly mark the importance of each of the identified practices and sub-practices related to the adoption of plant protection measures by giving a ( ) mark at the appropriate column with score, ranging from 1 to 10.

Thanking in advance for your contribution in completing this portion of his research work.

With regards,

Yours sincerely,

Sd/-
(Joy Mathew)

Please assign importance score of 1-10 for each of the following practices and sub-practices of plant protection

Sl. No.	Plant protection practices	Weightage score 1-10	Score arrived
I. Chemical method of PP			
i.	Selection of chemical		9
ii.	Quantity of chemical to be used		9
II. Cultural method of PP			
i.	Monitoring position main field		9
	(a) The time interval for monitoring		9
ii.	Plant population/sq.m		8
	(a) The no. of hills/sq.m		7
iii.	Weeding operation		8
	(a) The no. of weedings		7
iv.	Application of nitrogenous fertilizers		9
	(a) The quantity/acre		8
	(b) The no. of applications		8
III. Mechanical method of PP			
i.	About the collection and distruction of egg mass or other stages of pests		7
ii.	About the collection and destruction of affected plant parts or plants		7

12 High labour charges

13 Lack of knowledge about technology

14 Difficulty in the selection of alternate chemicals

Sl. No.	Plant protection practices	Weightage score 1-10	Score arrived
IV. Integrated method of PP			
i.	Combination of methods		8
	(a) Combining different methods with the concept of IPM		9
	(b) The concentration of natural enemies		8

APPENDIX-V

The following procedure was used for computing adoption

1. Chemical method of plant protection

1. Selection of chemical	a)	Actual area treated with the recommended chemical / Recommended quantity of the chemical/ acre
2. Quantity of chemical used/acre	a)	Actual quantity of chemical used/acre / Recommended quantity of the chemical/acre

2. Cultural method of plant protection

1. Monitoring pests in main field	a)	Actual area monitored for pest as recommended / Total area
2. Plant population/sq.m		Actual area planted with recommended no. of hills/sq.m / Total area sown
3. Weeding operation		Actual area following recommended no. of weeding / Total area sown
4. Application of nitrogenous fertilizers		Actual area applied with recommended quantity of nitrogenous fertilizers / Total area

Constraints in the adoption of plant protection practices

Sl.No.	Constraints	Rank
1	Non-availability of labour	
2	Inability in identifying/diagnosing pests/diseases	
3	Inadequate irrigation facilities	
4	Difficulty to implement mechanical method	
5	Inadequacy of capital	
6	Non-availability of PP chemical	
7	High risk involved	
8	Increased cost of PP chemicals	
9	Poor socio-economic status	
10	Inadequate supervision and guidance	
11	Difficulty in preparation/application	
12	High labour charges	
13	Lack of knowledge about technology	
14	Difficulty in the selection of alternate chemicals	
15	Weed problem	

GAPS IN THE ADOPTION OF PLANT PROTECTION PRACTICES BY COMMERCIAL VEGETABLE GROWERS OF THRISSUR DISTRICT

By

M. MANOJ

ABSTRACT OF THE THESIS

Submitted in partial fulfilment of the requirement for the degree of

Master of Science in Agriculture

(AGRICULTURAL EXTENSION)

Faculty of Agriculture

Kerala Agricultural University

Department of Agricultural Extension

COLLEGE OF HORTICULTURE

VELLANIKKARA - THRISSUR

KERALA

1998

ABSTRACT

It is commonly observed that there is a wide gap between the technology generated in research stations and its actual use by the clientale. It is with this view in mind that the present study was undertaken to identify the gaps in the adoption of plant protection practices by commercial vegetable growers in Thrissur District. The relationship between personal, situational and psychological characteristics of commercial vegetable farmers and their adoption was also studied. The constraints in the adoption process were also subjected to analysis.

The study was conducted in Thrissur district. The sample consisted of 150 farmers from the three selected panchayats for the study. Data were collected using pretested and well structured interview schedule and suitable statistical techniques were employed in the analysis of the data.

A prime aspect observed during the course of this study was the non-availability of simple and more compatible plant protection technology thus forcing the farmers to accept the failures of applying complex plant protection technology.

Lack of adequate and effective linkage between various extension agencies and research institutions in transfer of technology has led to the confinement of the improved plant protection technology within the research institutions. This has resulted in the non-availability of many an improved technology to the farmers thereby resulted in an unwaranted gap in the adoption of improved plant protection practices by commercial vegetable farmers.

The results of multiple regression analysis indicated that cosmopoliteness, information source utilisation and scientific orientation as the important variables

explaining maximum variation in the extent of adoption and level of knowledge about improved plant protection practices by commercial vegetable farmers.

The important constraints perceived by the farmers were increased cost of plant protection chemicals, difficulty in preparation/application of PP chemicals, difficulty in the selection of alternate chemicals, inadequacy of capital, non-availability of labour and lack of knowledge about technology.

The results point vividly to the prime need for strengthening the extension education efforts of the field functionaries to reduce the gap with respect to the adoption of improved plant protection practices by commercial vegetable farmers.