INTEGRATED PEST MANAGEMENT IN TANKFED RICE CULTIVATION – A CRITICAL ANALYSIS

Thesis submitted in part fulfilment of the requirement for the Degree of

MASTER OF SCIENCE (Agriculture) in AGRICULTURAL EXTENSION

to the Tamil Nadu Agricultural University,

Coimbatore.

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CENTRE FOR AGRICULTURAL AND RURAL DEVELOPMENT STUDIES

TAMIL NADU AGRICULTURAL UNIVERSITY

COIMBATORE-641 003

2000

CERTIFICATE

This is to certify that the thesis entitled, **"INTEGRATED PEST MANAGEMENT IN TANKFED RICE CULTIVATION – A CRITICAL ANALYSIS"** submitted in part fulfilment of the requirements for the award of the degree of **MASTER OF SCIENCE (AGRICULTURE) IN AGRICULTURAL EXTENSION** to the Tamil Nadu Agricultural University, Coimbatore, is a record of bonafide research work carried out by **Mr.M.LAWRANCE** under my supervision and guidance and that no part of this thesis has been submitted for the award of any other degree, diploma, fellowship or other similar titles or prizes and that the work has not been published in part or full in any scientific or popular journal or magazine.

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Date : 29.9.2000

EXTERNAL EXAMINER

ACKNOWLEDGEMENT

ACKNOWLEDGEMENT

I take great pleasure to express my sincere and heartfelt thanks to my Chairman, **Dr.I.Mohamed Iqbal**, Associate Professor of Agricultural Extension and Rural Sociology, Department of Agricultural Extension and Rural Sociology, Tamil Nadu Agricultural University, Coimbatore for his steadfast inspiration, remarkable counselling, meticulous guidance, constant encouragement with much care and affection evinced throughout the research.

I express my glowing gratitude with gracious faithfulness to **Dr.R.Annamalai**, Dean (Agri), Tamil Nadu Agricultural University, Coimbatore and **Mr.M.Suresh**, Assistant Professor of Agricultural Statistics, Department of Agricultural Statistics, Tamil Nadu Agricultural University, Coimbatore, the members of the advisory committee, who gave their valuable guidance in the correction and interpretation for the study.

I owe a great deal to **Dr.R.Netaji Seetharaman**, Professor and Head, Department of Agricultural Extension and Rural Sociology for his valuable suggestions and rendered during the study period to make the study in a right path. My profound sense of thanks to **Dr.P.Athimuthu**, Professor, **Dr.J.Venkatapirabu** and **Dr.C.Karthikeyan**, Assistant Professors, Department of Agricultural Extension and Rural Sociology and other staff members of the department for their warm and willing help throughout the study period.

The instrument of acknowledgement will be out of tune, if I fail to express my gratitude to my friends **Eevera, Guna, Jayalakshmi, Raja, Yeswanth, Kella, Selva, Senthil, Ganesh, Subbu, Suganya, Nambo, Prabakhar, Shravan, Venkat, Murugan,**

Chandra, Sunil, Marimuthu, Arumugam and **Kathiravan** and my other junior friends. I am expressingly placing my immense pleasure in acknowledging the invaluable and timely help rendered by **Mr.Marimuthu, Mr.Ananth, Mr.Venkattakumar** and **Mr.Sriram.**

I am deeply indebted to my parents, sister, uncle and my grand parents for their love and affection, which fostered in maintaining the much needed piquant and mirth in pursuit of my educational ambitions.

I extend my profound thanks to **Mrs.K.Jayam**, for her flawless typing of this thesis.

At last but never least, I Praise the Lord Almighty, who gave me the guidance to know when to hold on and the grace to make the right decisions with dignity.

[M.LAWRANCE]

ABSTRACT

ABSTRACT

INTEGRATED PEST MANAGEMENT IN TANKFED RICE CULTIVATION – A CRITICAL ANALYSIS

BY

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Exclusive reliance on chemical pesticides had resulted in pesticide resistance, resurgence, residues, environmental pollution etc. This has led to the development of Integrated Pest Management (IPM) strategies. In Tamil Nadu this approach has been introduced in the villages through the establishment of Farmer's Field School(FFS)in addition to other approaches. If the farmer beneficiaries of FFS was studied this would provide scope for increasing the adoption trend of the IPM packages. Keeping in view, the present study has been designed to compare the IPM practices among the FFS and non-FFS farmers. Sixty respondents from each category were selected from the three villages. Data were collected by the well structured interview schedule.

The FFS farmers were found to be significantly differ from the non-FFS farmers in their characteristics viz., contact with extension agency, scientific orientation, progressiveness, innovativeness, trainings undergone and possession of plant protection equipments. Majority of FFS farmers had medium and high awareness followed by low

level, while there was somewhat equal distribution among non-FFS farmers. More FFS and non-FFS farmers had high and medium knowledge. Majority of the FFS and Non-FFS farmers had low and medium levels of adoption of IPM.

Monitoring pests for the Economic Threshold Level (ETL) in nursery and main field, use of light traps, conservation of natural enemies, ETL-based chemical spray, selection of variety, use of aluminium phosphide tablets for rat control, intensity based chemical spray and adjustment of planting time had exhibited difference with respect to the awareness among FFS and non-FFS farmers. The FFS farmers had more awareness than non-FFS farmers.

There was significant difference in adoption for conservation of natural enemies, intensity based correct amount of chemical spray, removal of infected plant debris, optimum spacing, optimum fertilizer application, monitoring pests in nursery and main field for ETL level among both the categories.

Education, farming experience, area under paddy, extension agency contact, cosmopoliteness, scientific orientation, innovativeness and farm size had contributed significantly towards the awareness and adoption about Stem borer control measures among FFS farmers, while for non-FFS farmers mass media exposure, cosmopoliteness and economic motivation had shown significance. With regard to the awareness and adoption about Leaf folder control education, farm size, extension agency contact, social participation, cosmopoliteness, scientific orientation, innovativeness, area under paddy and risk orientation had resulted in significance among FFS farmers, whereas for non-

FFS farmers education, economic motivation, scientific orientation and innovativeness had contributed significantly. Cosmopoliteness and risk orientation had shown significance among FFS farmers, while education, scientific orientation, progressiveness and risk orientation was found to have significant contribution among non-FFS farmers with respect to the awareness and adoption about Gall midge control. Towards the awareness and adoption about the BPH control farming experience, area under paddy, contact with extension agency, cosmopoliteness, scientific orientation, progressiveness, innovativeness and risk orientation had exhibited significance among FFS farmers. In the case of non-FFS farmers contact with extension agency, education, economic motivation and scientific orientation had exhibited significance for the same pest. With regard to the control of rat among FFS farmers, mass media exposure and cosmopoliteness had influenced significantly, while education and trainings undergone had shown significance among non-FFS farmers. Farm size, farming experience, contact with extension agency, cosmopoliteness, economic motivation, innovativeness had resulted in significant contribution towards the awareness and adoption about Blast control. In the case of non-FFS farmers, innovativeness and possession of plant protection equipments had exhibited significance for Blast control. For Tungro control, extension agency contact and economic motivation had exhibited significance among FFS farmers with regard to their awareness and adoption. In the case of non-FFS farmers, area under paddy, extension agency contact, cosmopoliteness and economic motivation had resulted in significance with the awareness and adoption about Brown leaf spot control, while for non-FFS farmers no variable had shown significance.

Innovativeness had shown the significant contribution towards the awareness among FFS farmers, while mass media exposure and progressiveness had shown significance for non-FFS farmers. Possession of plant protection equipments had resulted in highly significant relationship with the knowledge of FFS farmers, while the farming experience, contact with extension agency, and scientific orientation had shown significant contribution towards the knowledge. Mass media exposure determined the knowledge of non-FFS farmers. Education and innovativeness had exhibited highly significant contribution towards the adoption while the contact with extension agency had shown significant contribution towards the adoption. In the case of non-FFS farmers, risk orientation had resulted in highly significant contribution with adoption, while the mass media exposure had shown contribution towards the adoption of IPM practices.

Among the constraints faced by farmers, rat menace and labour scarcity were experienced by majority of the FFS and non-FFS farmers. Non co-operation of neighbours, susceptible nature of certain paddy varieties and less conviction were also expressed by the majority of FFS and non-FFS farmers. High cost of herbicides, lack of electricity facilities, lack of timely technical guidance, difficulties in calculating chemical dosage and remembering the ETL-level were the constraints experienced by the FFS and non-FFS farmers.

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INTRODUCTION

CHAPTER I

INTRODUCTION

Indian farmers and agricultural technologists have contributed a two-fold increase in food grain production in the last four decades. This is largely due to introduction of High yielding crop varieties, fertilizers, assured irrigation and improved agronomic practices. The food grain demand at the minimum required production growth of 2.5 per cent has been estimated to be between 220 and 243 million tonnes by 2001 – 2002 and 2006 – 2007 respectively in which the rice alone has to be 103.5 million tonnes by 2006 – 2007. As against an impressive food production growth of 2.89 per cent, it was only 2.37 per cent in nineties (1990-96), inspite of good monsoon for the tenth year in a row. In respect of rice it has come down to 2.02 per cent as compared to 4.39 per cent in the eighties (Siddiq, 1997).

The realisation that stable performance is as important as progressive improvement of yield and the fact that the gap between actual and potential yields in rice is still wide, have prompted scientists to identify the yield destablising factors and develop methods to correct them. There are several reasons for this reduction in yield, among which the important factor is pest incidence. In rice, the incidence of pests and diseases accounts for over 30 per cent of yield losses.

The importance of pest management in raising the productivity of rice ecosystem while maintaining their sustainability is well recognised. Pest management has now evolved into a complex system, which is an integral component of an integrated crop

management system. However, to exploit the potential of improved varieties and to ward off pests, chemical pesticides became essential and synonymous with modern agriculture.

The average per hectare consumption of pesticides in India has risen from 15.4 g/ha in 1960-61 to 450 g/ha in 1989-90 (Anon., 1991). The use pattern of pesticides reflects that the consumption of pesticides by rice accounts for 23 per cent of the total consumption. Among the states, Tamil Nadu, Andhra Pradesh, Uttar Pradesh and Maharashtra are using maximum quantity of pesticides. These four states alone utilise about 48.8 per cent of the total pesticides.

The consequences of misusing agricultural chemicals had led to an eventual crisis in pest control. The consequences include:

- Development of resistance to insecticides by arthropods mortality of non-target pollinating insects and wild life.
- Decimation of natural enemy populations, resulting in resurgence of treated pests and elevation of minor pests to the level of significance, environmental pollution with residues of persistent toxins. Excessive and increasing costs for control (Newson, 1974).

Pesticide pollution has altered the food chain and also resulted in the biomagnification of pesticides i.e., increase in concentration of chemical pesticide from lower to higher organisms in a food chain. Several pesticides such as DDT and other chlorinated hydrocarbons have persistent residual deposits.

It has been estimated that more than one million poisoning cases occur in the world annually with about 15,000 deaths (Gupta, 1989). India accounts for one-third of the total pesticide poisoning cases in the world (Atwal and Dhaliwal, 1997).

The strategy of exclusive reliance on insecticides for all pest problems created a number of ecological and environmental problems. Synthetic organic pesticides to kill or suppress specific insects, diseases and weeds brought about a temporary abandonment of many of the basic preventive and suppressive approaches to pest control. However it soon became clear that organic chemicals were not the ultimate answer, as undesirable side effects were manifest. Hence the search for a solution to pest problems that was ecologically compatible and economically feasible rapidly led to integration of tactics i.e., to overcome increasing problems associated with the misuse of pesticides. Integrated Pest Management (IPM) was proposed during 1981, which aims at the ecologically friendly methods of pest control through the minimum use of pesticides.

IPM seeks maximum use of naturally occurring pest controls, including weather, disease agents, predators and parasites. In addition, IPM utilizes various biological, physical and chemical control and habitat modification techniques.

A broader definition was adopted by the panel of Experts of Food and Agriculture Organisation: "Integrated Pest Management is the associated environment and the population dynamics of the pest species, utilizes all suitable techniques and methods in as compatible a manner as possible and maintains the pest population at levels below those cause economic injury".

IPM is a programme by farmers and not for farmers. It seeks to empower farmers to become managers and decision-makers so that they can handle the control methods to maximise profits while optimising production inputs and resources. To achieve this Farmer's Field School were established in villages to

- make farmers expert in their own fields.
- Develop their ability of making critical and informed decisions that render their farming profitable and sustainable.
- Develop new ways of thinking and problem solving.
- Help farmers to organise themselves and their communities. IPM was given a major thrust at the national level to train master trainers and Agricultural Extension Officers and farmers in Farmers Field Schools through season long training

About 2000 FFSs were established in 2000 villages in twenty-five states and union territories in India during 1995-96. The farmers in the FFS were trained during weekly field exercises to rely more on IPM more or IPM practices (Ragunathan, 1996).

Kenmore (1996), an architect of IPM in South and South East Asia has emphasised the following for sustainability of IPM.

- Farmers becoming experts through IPM.
- Farmers managing the ecosystem rather than attempting to control it.
- Local communities owning IPM.

Impact of IPM is one of the important areas of research at present and with regard to IPM, only a few studies had attempted to identify the knowledge and adoption. Hence,

the present study has been designed to investigate the awareness, knowledge and adoption of IPM practices among FFS and non-FFS farmers, with the following objectives.

1. To assess the extent of awareness and knowledge about the Integrated Pest Management (IPM) technology among the FFS and Non-FFS farmers.
2. To compare the FFS and Non-FFS farmers with regard to the adoption of IPM practices.
3. To enlist the constraints experienced by the farmers in IPM.
4. To propose an action model for effective IPM in paddy.

Scope of the study

A comparison of FFS and Non-FFS farmers will help in analysing the advantages for strengthening it further.

If the constraints experienced in the adoption of IPM are documented, this will facilitate to develop a strategy for effective IPM.

An action model will be helpful for the policy makers and extension personnel and the farmers for enhanced awareness, knowledge and adoption of the IPM technologies.

Limitations of the study

The limitations of time, finance and physical facilities were experienced by the student researcher. However, every effort has been putforth to conduct this study as objectively and systematically as possible in the field situations. Hence, the findings of this study may be generalised to other comparable areas, where similar situation prevails.

REVIEW OF LITERATURE

CHAPTER II

REVIEW OF LITERATURE

An acquaintance with earlier pertinent studies has been felt necessary to develop an understanding of the present study. Keeping in view, the objectives of the study, an attempt was made in this chapter to review the literature, which had relation to the study. These are presented under the following sections.

2.1. Technology dimensions

2.2. Relationship of characteristics of farmers with their awareness, knowledge and adoption

2.3. Awareness of Integrated Pest Management

2.4. Knowledge on Integrated Pest Management

2.5. Adoption on Integrated Pest Management

2.6. Constraints in the adoption of IPM practices

2.1. Technology dimensions

Poe (1981) reported the following objectives for IPM.

- To promote crop production and protection that is practical, effective, economical and environmentally sound.
- To establish agricultural pest control on sound ecological principles based on knowledge of life systems of the pest and crop.
- To demonstrate integration of control tactics employing various principles of crop protection in chemical, cultural and biological control.

- To provide alternate choice tactics for pest control.
- To develop the capability of predicting pest population levels and forecast effects of regulating factors and potential hazards.
- To periodically assess crop growth, population levels and environmental components which affect yields.

Okada (1991) identified environment friendly insect pest control. The identified technologies are listed below.

1. Insect pest control using no insecticides – conservation of natural enemies.
2. Pest control methods using no insecticides.
   - Sex pheromones
   - Synthetic sex pheromones
3. Biological control methods
   - Introducing natural enemies
   - Breeding pest resistance varieties
4. Physical control methods
   - Collection and destruction of insects
   - Cutting of the branches insects live on
   - Using fluorescent light
   - High and low temperature treatment
5. Cultural control methods
   - Crop rotation
   - Trap crops
6. Integrated pest management
   - Economic injury level
   - Combined use of all technologies like biological, cultural, physical and mechanical control methods.

Prokopy and Croft (1994) reported four levels of the integration in IPM.

Level I - integration of methods for the control of single species or species complexes.

Level II- integration of impacts of multiple pest categories (insects, pathogens and weeds) and the methods for their control.

Level III- integration of multiple pest impacts and the methods for their control within the context of the total cropping system (ecosystem level integration).

Level IV – integration of psychological, social, political and legal constraints to IPM.

Mew **et al.** (1995) stated that by applying the knowledge of scientists and farmers through Integrated Pest Management systems, we can ensure that losses to rice pests can continue to be safely and sustainably minimised.

Kenmore **et al.** (1995) explained that IPM had evolved into a series of activities viz.,

- Growing healthy crops
- Visiting crops in field regularly
- Understanding biological control agents and agro eco-system
- Making farmers IPM experts.

Huis **et al.** (1997) reported that "A more integrated site specific approach to the development is necessary to solve the many problems related to sustainability in agriculture. The original concept of IPM emerged in response to the negative consequences of chemical pest management in high external input agriculture. However,

for resource-poor farmers IPM should be considered a methodology for arriving at appropriate pest management systems using participatory methods in problem definition and technology development.

Schmidt **et al.** (1997) identified that the confidence building, common perception of problems by researchers and farmers, integration of local knowledge, promotion of farmer interactive extension, group approach, motivation of farmers, extension staff motivation, practical education, favourable policy frame, awareness building with mass media and situation analysis as the success factors in IPM.

Singh (1997) stated that the use of an integrated approach has got its own advantage as it keeps the plant and its environment unpolluted and plays a major role in insect pest management programme, which ought to be economically viable.

According to Kogan (1998) "IPM is a decision support system for the selection and use of pest control tactics, singly or harmoniously coordinated into a management strategy, based on benefit analyses that take into account the interests of and impacts on producers, society and the environment".

Sumathi and Alagesan (1998) reported that in IPM technology, there are four components viz., cultural, mechanical, chemical and biological consisting of eighteen important practices, which help to minimise the pest and diseases in the crop production.

2.2. Relationship of characteristics of farmers with their awareness, knowledge and adoption

The relationship of characteristics of farmers with their awareness, knowledge and adoption are furnished in Table 1, 2 and 3.

2.3. Awareness of Integrated Pest Management (IPM)

Rajagopalan (1986) found that most of the farmers were unaware about plant protection measures and also not interested in adopting them.

Satapathy and Patnaik (1986) stated that the farmers were aware of the control measures against the pests like grass hopper and cutworm.

Venkataraman (1987) found that 16.66 per cent of contact farmers and non-contact farmers were aware of IPM for paddy.

Grieshop **et al.** (1988) pointed out that 23.00 per cent of respondents were not aware of the Integrated Pest management technology.

Norton and Heong (1988) comprehended that cent per cent of the farmers were aware of pest problems in rice.

Theodore (1988) found that same proportion of contact farmers (45.00%) and other farmers (45.00%) belonged to high awareness category and also reported that nearly equal number of contact farmers (40.00%) and other farmers (42.50%) had low awareness.

Velumani (1988) revealed that little less than half of the respondents were aware about cleaning the sprayer and duster (49.16%) before and after the operation and precautious to be followed (38.33%) while spraying.

Saxena **et al**. (1989) revealed that a large majority of the farmers in Oyugis (96.00%) were quite aware of the crop varieties that were resistant to insect pests.

Athimuthu (1990) stated that most of the respondents (54.00%) were with low awareness on the nutrient use technology for paddy crop. Only 29 per cent had high awareness while 17.00 per cent had medium awareness.

Snehalatha (1991) reported that farmers seed treatment with azospirillum had the maximum level of awareness (62.50%) among the farmers. The use of light traps for leaf hopper was known to 75 per cent of the respondents.

The findings of Santha (1992) revealed that a majority of farmers (48%) was under the high awareness category on cultural methods of IPM, while 22.5 and 20 per cent belonged to low and medium level categories respectively. In general, most of the IPM respondents belonged to high awareness category, while only one-fourth of the non-IPM farmers were in the high awareness category.

Bhople and Lakhdive (1996) reported that more than half (63.33%) of the respondents had known about the IPM practices and as much as 45.00 per cent of them had an idea about neem seed extract.

The findings of Velusamy (1997) revealed that, among the three bio-control methods for cotton pests, N.P.V. spray was well known to 92.50 per cent of cotton growers followed by *Trichogramma chilonis* and *Crysopa sp.* with 90 per cent and 67.50 per cent respectively.

Chitere (1998) reported that nearly two-third of farmers were aware of IPM practices and its research works. But only 30 per cent and 16.7 per cent of farmers in two places had adopted some IPM practices. The farmers adopting components tended to have had contact with the project technicians and extension workers and had also visited the IPM crop trials.

The findings of Sumathi and Alagesan (1998) revealed that summer ploughing, timely and synchronised sowing of groundnut, destruction of alternate host plants, removal of residues in the field and destruction of all stages of pests were found to be known to cent per cent of the farmers of all the categories.

Kavitha (1998) reported that 75 per cent of the farmers had known about Pungam, Thumbai and Adathoda leaves as green leaf manure and 75 per cent of farmers had known about the use of pungam oil against pests.

Sudhakar (1998) reported that cent per cent of the farmers were aware of the practices viz., crop rotation, intercropping and use of light traps. In general, 50 per cent of the respondents belonged to high level of awareness followed by 41.66 per cent medium and 8.3 per cent low level category.

2.4. Knowledge on Integrated Pest Management (IPM)

Subramanian (1985) stated that two-third of rice growers (66.83%) possessed medium level of knowledge, 21.67 per cent had high level of knowledge and 17.50 per cent had low level of knowledge.

Satapathy and Patnaik (1986) observed that farmers possessed very little knowledge about the control measures against the pests viz., leaf hopper and caseworm of paddy.

Palani (1987) concluded that a majority of paddy farmers (51.67%) had medium level of knowledge about rat control measures followed by 25.83 per cent and 22.50 per cent under low and high level categories respectively.

Rathinasabapathy (1987) reported that majority (48.00%) of the farmers had medium level of knowledge on IPM and only 31.25 per cent had high level of knowledge about IPM practices.

Adalla and Kola (1988) reported that the level of knowledge and perception of farmers regarding pests and their damage were low. In addition, their knowledge on rice pest control appeared limited to spraying of chemicals such that even natural enemies were being sprayed on sight.

Theodore (1988) reported that greater knowledge about contingency practices resulted to greater information source utilization.

The findings of Velumani (1988) revealed that knowledge gap was 55.82 per cent with respect to pests. This gap was with reference to the name of the pest, symptoms caused by them, the name of the chemical and quantity to be used etc.

Adhiguru (1991) indicated that 43.00 per cent of the beneficiaries had high level of knowledge on improved rice farming practices recommended under Integrated Programme for Rice Development (IPRD) while sizeable proportion (37.00%) and about one-fourth (21.00%) had low and medium level of knowledge.

Iqbal (1992) concluded that use of sticks for mixing chemicals was done in all cases. But only one-third of them had knowledge on use of appropriate ratio of petrol and oil, cleaning nozzles and washers, washing the appliances after use etc.

Santha (1992) reported that about half of IPM farmers (48.00%) belonged to the high knowledge category, whereas only a little less than one-fourth of the non-IPM farmers (22.00%) belonged to the same category. Again only one-third of IPM farmers belonged to low knowledge level category while it was half in the case of non-IPM farmers.

Khan (1994) concluded that 62.50 per cent of owners had thorough knowledge about maintenance and use of plant protection equipments (PPE), whereas the non-owner groups had only less (3.90%) had thorough knowledge on maintenance and use of PPE.

Rathakrishnan **et al**. (1994) found that 46.67 per cent of the rainfed groundnut growers had knowledge on recommended seed rate, 41.67 per cent had knowledge on gypsum application.

Manjunath **et al**. (1995) revealed that a good number of farmers belonged to medium knowledge category, while 24.00 per cent and 23.00 per cent of farmers belonged to high and low knowledge category.

Jayaraj (1997) indicated that slightly less than half (42.50%) of the respondents were found to possess low level followed by high (33.33%) and medium (24.17%) knowledge levels on use of bio-pesticides.

Jirli and Gangadharappa (1997) reported that 31 per cent of farmers had high knowledge on IPM while 45 per cent had medium and 24 per cent had little knowledge.

The findings of Sivakumar (1997) revealed that 44 per cent, 30 per cent and 26 per cent of Farmer's Field School farmers had low, medium and high levels of know-how behaviour (knowledge) respectively whereas the non-FFS farmers had 52 per cent, 26 per cent and 22 per cent of low, medium and high levels of knowledge on IPM.

The findings of Vasantha and Mavaty (1998) revealed that 89.17 per cent were having low level of knowledge on pesticide pollution and only meagre amount (7.5% and 3.33%) of the respondents had medium and high level of knowledge about pesticide pollution.

Venkatachalam (1999) interpreted that majority of the cotton growers had medium to high level of knowledge towards the use of bio-control agents.

2.5. Adoption of Integrated Pest Management

Rajagopalan (1986) reported that 57.30 per cent of farmers adopted the technology of application of Di-ammonium phosphate to the nursery and 67.30 per cent of farmers adopted the split dose of application of nitrogen to the rice crop.

Pitchai (1987) reported that nursery application of Di-Ammonium Phosphate was followed by 13.37 per cent of small farmers and application of neem cake blended urea had been adopted by 33 per cent and 41.67 per cent of small and big farmers respectively.

Rathinasabapathy (1987) concluded that 50.76 per cent of farmers had medium level of adoption, 21.04 per cent of farmers had low level of adoption and 28.20 per cent of farmers had high level of adoption in Integrated Pest management.

Anandarao (1988) found that the practices of summer ploughing, fertilizer application were adopted in higher level by more number of contact farmers than their counter parts. Seed treatment was the practice adopted to a lesser extent (0 – 25%) by both the growers.

Grieshop **et al.** (1988) stated that 26.00 per cent of farmers had adopted the Integrated Pest management practices for tomato crop.

Majority of small (86.00%) and marginal (1990.00%) farmers were distributed towards low level of adoption as reported by Krishnamoorthy (1988).

Norton and Heong (1988) reported that only a few farmers used standard operating procedures or spray schedules recommended by the agricultural authorities for insect pests such as Brown Plant Hoppers and rice bugs. The insecticide chosen by the farmers were usually appropriate. Three years later, after an extensive campaign carried out by the agricultural authorities, more than 90 per cent of the farmers were using effective chemicals.

Seetharaman (1988) reported that 41 per cent of the respondents have treated seeds before sowing. Only 16 per cent of the respondents have adopted weedicide application.

Sharma (1988) reported that optimum seed rate and correct spacing was followed by 86.45 and 86.97 per cent of the farmers, while the plant protection measures, recommended dose of fertilizers and weedicide application were adopted by 47.65 per cent, 26.30 per cent and 21.35 per cent of the respondents.

Radha **et al**. (1989) pointed out that in rice cultivation small farmers applied relatively higher doses of manures while larger farmers applied slightly more quantity of fertilizers and also invested more on plant protection measures.

Saxena **et al**. (1989) reported that crop rotation as a pest control measure was adopted by 32.00 per cent farmers. Only 39.00 per cent reported using insecticides to control insect pests of various crops. Hand picking/killing of insect pests was adopted by 9 per cent. Only 4 per cent of farmers used both mechanical and physical methods.

Ramachandran and Sripal (1990) reported that higher adoption level was found for the plant protection (89.17%) followed by seed treatment (75.00%).

Verma **et al**. (1990) reported that the highest adoption level was observed for depth of sowing (93.60%) and pest control (76.00%).

Adhiguru (1991) reported that three-fourth were adopting the herbicides application at full level. Plant protection measures were adopted to the recommended level by 67.00 per cent of the respondents.

Nikhade **et al**. (1991) observed that more than 55.00 per cent of the respondents adopted the recommended plant protection measures.

Sathiyanarayanan (1991) indicated that more than three-fourth of the respondents (63.33%) were medium adopters for the Azospirillum application followed by low adopters (20%) and high adopters (16.67%) respectively.

Snehalatha (1991) reported that Azospirillum seed treatment which was one of the new technologies diffused had the maximum adoption level (55.00%). Further they reported that about 87.50 per cent of the respondents reported to have followed seed treatment practices with Thiram and Captan.

According to Palanisamy (1992), greatest adoption was found among cotton growing farmers and neem seed kernel extract was used only by cotton and rice growers.

Rajkumar (1992) reported that 63.50 per cent of the respondents adopted summer ploughing, 5.00 per cent of respondents adopted manual control of pests and none

adopted bio-control agents. About half (50.53%) of the respondents were adopting need-based chemical application.

The findings of Santha (1992) revealed that majority of the IPM farmers (58.00%) had high level of adoption. She also reported that 48.00 per cent of non-IPM farmers belonged to low level of adoption. Almost the same trend was noticed with a maximum percentage of farmers under the high adoption category for the rodent (60.98%) followed by case worm (51.61%) and BPH (51.61%) and also for the Blast disease (50.00%).

Sundarambal (1994) reported that majority of the farmers had medium level of adoption (77.14%) followed by high (15.24%) and low (7.62%) adoption behaviour.

Narayana **et al**. (1995) reported that more than half of the respondents (53.00%) had medium level of adoption of weedicides in paddy followed by low (25.00%) and high (22.00%) levels.

According to Sujatha **et al**. (1995), with reference to adoption of cultural practices by cotton growers, almost all the cultural practices were taken by all the farmers and the practice of avoiding other malvaceous crops in the vicinity of cotton fields were taken by 90 per cent of the farmers.

Iqbal **et al**. (1995) reported that use of NPV to control the pests was adopted by majority of small farmers (82.98%) with high level of adoption than medium farmers (50%) and big farmers (46.15%). They also reported that use of locally designed light traps was adopted by 74.47 per cent of small, 58.82 per cent marginal and 38.56 per cent of big farmers.

Jayaraj (1997) indicated that majority (60.83%) of the farmers were found to have low level of adoption while less percentage (20.00 and 19.17 %respectively)had medium and high level of adoption regarding bio-pesticides

Khan **et al.** (1997) reported that only 13 per cent of the respondents adopted the seed treatment methods, herbicides and fungicides were adopted by only 14 per cent and 11 per cent of the respondents respectively.

According to Peshin and Kalra (1997) the IPM trained farmers had applied fewer pesticides than non-IPM farmers. The average yields per unit area in six IPM villages were 6.3 t per ha as compared to 5.2 t/ha in non-IPM village.

Rambabu and Rao (1997) reported that majority of the farmers (65.00%) were adopting the recommended intercultural operations namely weeding, hoeing etc., whereas 35.00 per cent were in the category of partial adoption towards weed management.

Sakharkar and Sundarasamy (1997) reported that 15 per cent of the respondents adopted seed treatment practices.

The reports of Sivakumar (1997) revealed that 96 per cent of FFS and 80 per cent of Non-FFS farmers had adopted the practice of monitoring of pests in nursery. Similarly 92 per cent of FFS and 56 per cent of Non - FFS farmers had adopted the synchronous planting. He had also reported that 64 per cent of FFS and 14 per cent Non-FFS farmers had applied pesticides when crossed the Economic Threshold Level for pests. Similarly

76 per cent of FFS and 18 per cent of Non-FFS farmers adopted the practice of collection and destruction of eggs.

Sriram (1997) reported that 30.83 per cent of farmers have adopted the introduction of bio-control agents in their field and 61.67 per cent of the farmers had adopted the use of botanical pesticides and 10.83 per cent of them used to conserve the natural enemies.

Velusamy (1997) reported that nearly two-third of the cotton growers have adopted N.P.V. spray for control of *Heliothis sp.* followed by *Trichogramma sp.* with 40 per cent respectively.

Vijayakumar (1997) observed that more than half of the respondents (51.66%) were low level adopters followed by medium (42.50%) and high (5.84%) adopters in the adoption of neem based botanicals in paddy.

Anitha (1998) reported that 60 per cent of farmers belonged to medium level pesticides use behaviour followed by 20.84 per cent as high level pesticide use behaviour.

Mangoendihardjo (1998) reported that despite some informal training on aspects of IPM either nationally through the IPM programme or locally during training programmes supported by Non-Governmental Organisations, many farmers in Indonesia continued to use chemical pesticides inappropriately.

Poonguzhali (1998) concluded that majority of the cotton growers (58.33%) had medium level of adoption followed by high level and low level adoption with 25.00 per cent and 16.67 per cent respectively.

Rani (1998) revealed that only one-third of the respondents (34.18%) had adopted the specified weed management practices and 46.15 per cent of them had adopted this technology with slight modification.

The findings of Sudhakar (1998) revealed that less than half (44.16%) of the respondents had medium level of adoption, followed by 30.84 per cent and 25.00 per cent of them who had low and high level of adoption.

Sumathi and Alagesan (1998) reported that big farmers had better adoption than the small and marginal farmers. He reported that among the IPM practices, summer ploughing, destruction of alternate host plants and removal and destruction of all residues of groundnut in the field were adopted by all the respondents.

Kavitha (1998) concluded that majority (67.50%) of the respondents had medium level of adoption of neem technologies, followed by 16.67 per cent and 15.83 per cent of low and high level of adoption.

Norvell and Hammig (1999) indicated that farmers with IPM training followed more sustainable practices than their untrained counterparts. Their results also revealed that IPM training and farmers' knowledge of ecology of the farm were positive factors which significantly affected the adoption of sustainable practices in IPM.

Venkatachalam (1999) reported that 42.50 per cent of the cotton growers had low level of adoption followed by medium (35.00%) and high (22.50%) levels of adoption towards bio-control agents.

2.6. Constraints in the adoption of Integrated Pest Management practices

Davane **et al**. (1980) stated the following were the problem in use of plant protection measure: (i) high price of insecticides, (ii) non-availability of effective insecticides, (iii) complicated method to control pest, (iv) non-availability of skilled labour, (v) risk in using plant protection measures and (vi) non-availability of information about its proper use.

Corbet (1981) inferred that a major barrier in adoption of integrated pest management was the lack of recognition among influential people of the need for integrated pest management and the steps required to implement it. Provision of technical information and advice in pest control is needed.

Jeyakrishnan (1984) observed that majority of the paddy growers (96.00%) had perceived reduction of vigour of pests by prophylactic application. He also stated that 93.90 per cent of the farmers faced technical difficulty and 12.25 per cent of the respondents lacked experience in the need based pesticide application.

Balasubramaniam (1985) stated that high cost of chemicals (26.00%), ignorance (198.00%) and non-availability of seed treatment chemicals (6.00%) were the problems for the seed treatment of the pulse seeds.

Rathinasbapathi (1987) reported that constraints like non-conviction, water scarcity at the time of sowing and a high wages were experienced by majority of the growers.

Samonte (1987) stated that communicative failure, educational constraint, agricultural barriers such as small size of farm, economic obstacles, psychological constraints and sociological factors were some of the constraints expressed in the adoption.

Bottrell (1988) found that increasing highly subsidised use of pesticides as one of the major constraints, delaying progress in the development of IPM programmes in the topics.

According to Krishnamoorthy (1988), the following constraints were experienced by the majority of the respondents in the use of low cost seed treatment: (I) inability to remember the technology and chemical name, (ii) unaware about the specific pests and diseases, (iii) absence of complete information about seed treatment, (iv) unaware about the alternate chemicals and (v) absence of sufficient field trip.

Oka (1988) expressed that large scale adoption of plant synchrony and crop rotation was difficult due to the reason that irrigation was available any time of the year which facilitated the farmers to plant rice any time throughout the year.

Selvakumar (1988) enumerated the problems encountered by contact and non-contact farmers for want of information support on whitefly control measures as newness

of the whitefly menace, lack of precise information, inadequate details and distortion of message.

Jaiswal and Sharma (1990) reported that poor economic condition of farmers did not permit them to adopt plant protection practices.

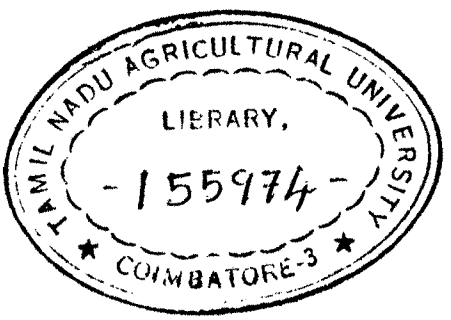
Ramachandran and Sripal (1990) reported that the following constraints in the adoption of seed treatment.

1. Lack of knowledge about the method of seed treatment.
2. Unable to purchase at the time of sowing season.
3. Lack of knowledge about the method of using the pheromone sex trap.
4. Non-availability of pheromone trap in time.

According to Palanisamy (1992) adulteration of neem products was the major constraint for the users while the main constraint to non-users was poor technical guidance.

Santha (1992) pointed out that lack of persuasion by extension agents and inability to contact them at appropriate time were found as the major constraints by 68.00 per cent of Non-IPM farmers. This was followed by 46 per cent due to non-understandability of details given by change agents.

Delvadia **et al.** (1993) explained that non-availability of pesticides, lack of money, high price of pesticides, low price for the produce and lack of plant protection equipment were the major constraints in the adoption of plant protection measures.



Khan (1994) reported that poor coverage during season, difficult in securing spraymen during season and increased payment were the constraints experienced by respondents in going for contact system of plant protection.

Ponkathaperumal (1994) stated that the paddy growers faced the following constraints while adopting Integrated nutrient management practices.

- Heavy weed occurrence
- Inability to understand and remember the method of application of various fertilizers.
- Non-availability of organic manure
- Inadequate drainage facilities
- Lack of economic support price

Gray (1995) reported that lack of interaction, inadequate educational programmes and lack of market incentives were perceived as impediments for more rapid adoption of IPM.

Iqbal **et al.** (1995) stated that lack of adequate knowledge on the natural predators and parasites was the major constraint, as reported by majority (50.83%) of the respondents.

Anusuya (1997) identified the following reasons for non-adoption of IPM practices.

- Lack of adequate knowledge on ETL (45.83%)
- Lack of adequate knowledge on predators and parasites (43.33%).
- Non-availability of various recommended traps in the market (41.67%).
- Lack of adequate knowledge of weedicide (32.50%).

Backwad and Shirakar (1997) reported that lack of precise information on monitoring, lack of location specific IPM packages, non-availability of bio-agents and low educational status of the farmers were the main constraints in the implementation of IPM.

According to Desai **et al**. (1997), non-availability of plant protection appliances (45.94%) and lack of finance for the purchase of pesticides/fungicides (22.97%) were experienced by majority of them.

The findings of Sriram (1997) revealed the labour scarcity, lack of technical guidance on use of bio-control agent, lack of knowledge to identify predators, lack of knowledge to identify the pest and diseases were the constraints faced by the respondents.

Vijayakumar (1997) expressed the following constraints encountered in the adoption of neem based botanicals.

1. Inability to understand and remember the various recommendation of neem based botanicals.
2. Inadequacy of neem oil.
3. Non-availability of neem seeds and spraying equipments.
4. Delay in controlling the pest population.
5. Blockage of spraying nozzles while using neem oil.

Kavitha (1998) reported that the lack of knock down effect, inability of neem products to protect the crop when there was pest outbreak or high infestation, lack of awareness about the practices, non-availability of neem based pesticides locally and inadequate knowledge were the major constraints faced by paddy growers in the use of neem products.

Sohi **et al.** (1998) found that the major constraints leading to non-adoption of weedicide were high cost of herbicides, financial problems, lack of equipment and lack of technical help.

Sujatha and Annamalai (1998) revealed that high cost, lack of conviction and inadequate technical information were the constraints expressed by marginal and small farmers in case of weedicides.

Sudhakar (1998) reported the following constraints faced by farmers in following the IPM practices.

- Non-availability of labour and high wages.
- High cost and non-availability of bio-pesticides.
- Insufficient knowledge of the correct quantity and dose of fertilizers and pesticides.
- Non-co-operation of neighbours.
- Difficulties in identifying pests and diseases.
- Hardships in maintaining correct spacing.

Lack of information, lack of technical guidance, high cost, non-availability, lack of money at the time of application and lack of time were the problems in the adoption of weed control measures as reported by Oudhia (1999).

Table 1. Relationship of characteristics of farmers with their awareness level

Variables	Positively significant	Negatively significant	Non significant
Age	-	Sophia (1991), Sriram (1997)	Adhiguru (1991), Santha (1992).
Education	Theodore (1988), Adhiguru (1991), Sophia (1991), Sriram (1997).	-	Santha (1992)
Farm size	-	-	Theodore (1988), Adhiguru (1991), Santha (1992).
Farming experience	-	-	Theodore (1988), Adhiguru (1991), Sophia (1991), Santha (1992).
Mass media exposure	Adhiguru (1991), Sophia (1991), Santha (1992), Sriram (1997).	-	Theodore (1988)
Contact with extension agency	Adhiguru (1991), Santha (1992), Sriram (1997).	-	Theodore (1988), Sophia (1991).
Social participation	Sophia (1991), Santha (1992).	-	Sriram (1997)
Cosmopoliteness	Sophia (1991)	-	-
Economic motivation	Sophia (1991)	-	Sriram (1997)
Scientific orientation	-	-	Theodore (1988), Sophia (1991).
Progressiveness	-	-	-
Innovativeness	-	-	Adhiguru (1991), Sriram (1997)
Risk orientation	Theodore (1988), Santha (1992), Sriram (1997).	-	Sophia (1991)

Table 2. Relationship of characteristics of farmers with their knowledge level

Variables	Positively significant	Negatively significant	Non significant
Age	Krishnakumar (1996)	Shanmugasundaram (1987), Sophia (1991), Kavitha (1998).	Palani (1987), Rathinasabapathi (1987), Shanmugasundaram (1987), Adhiguru (1991), Santha (1992), Thiyagarajan (1996), Anitha (1998).
Education	Madhavan (1987), Palani (1987), Shanmugasundaram (1987), Anandarao (1988), Velumani (1988), Dharmalingam (1990) Sophia (1991), Krishnakumar (1996), Sivakumar (1997), Kavitha (1998).	Venkatachalam (1999)	Rathinasabapathy (1987), Shanmugasundaram (1987), Subramanian (1987), Anandarao (1988), Jayaraman (1988), Theodore (1988), Thiyagarajan (1996), Sivakumar (1997), Anitha (1998).
Farm size	Madhavan (1987), Palani (1987), Velumani (1988), Jayaraj (1997), Sivakumar (1997), Kavitha (1998), Venkatachalam (1999).		Rathinasabapathy (1987), Subramanian (1987), Anandarao (1988), Santha (1992), Krishnakumar (1996).
Farming experience	Krishnakumar (1996), Jayaraj (1997).	Madhavan (1987), Shanmugasundaram (1987), Kavitha (1998).	Rathinasabapathy (1987), Subramanian (1987), Anandarao (1988), Jayaraman (1988), Palani (1988), Sophia (1991), Santha (1997), Sivakumar (1997).
Mass media exposure	Madhavan (1987), Palani (1987) Subramanian (1987), Anandarao (1988), Jayaraman (1988), Santha (1992), Krishnakumar (1996), Sivakumar (1997), Kavitha (1998),	-	Rathinasabapathy (1987)

Table 2 (Contd.)

Variables	Positively significant	Negatively significant	Non significant
Contact with extension agency	Madhavan (1987), Palani (1987), Rathinasabapathy (1987), Jayaraman (1988), Dharmalingam (1990), Sophia (1991), Santha (1992), Krishnakumar (1996), Kavitha (1998).	-	Subramanian (1987), Anandarao (1988).
Cosmo-politeness	Velumani (1988)	-	Sophia (1991)
Economic motivation	Rathinasabapathy (1987), Jayaraman (1988), Dharmalingam (1990), Sophia (1991), Krishnakumar (1996), Venkatachalam (1999).	-	-
Scientific orientation	Madhavan (1987), Palani (1987), Rathinasabapathy (1987), Jayaraman (1988), Velumani (1988), Dharmalingam (1990), Krishnakumar (1996), Jayaraj (1997), Venkatachalam (1999)	Sivakumar (1997)	Anandarao (1988). Sophia (1991).
Progressive ness	Jayaraman (1988), Kavitha (1998)	-	-
Innovative-ness	Rathinasabapathy (1987), Jayaraman (1988), Velumani (1988), Dharmalingam (1990) Sivakumar (1997), Kavitha (1998), Venkatachalam (1999),	-	-
Risk orientation	Rathinasabapathy (1987), Subramanian (1987), Anandarao (1988), Velumani (1988), Dharmalingam (1990), Santha (1992), Krishnakumar (1996).	-	Palani (1987), Sophia (1991), Venkatachalam (1999).
Trainings undergone	Palani (1987), Venkatachalam (1999).	-	-

Table 3. Relationship of characteristics of farmers with their adoption

Variables	Positively significant	Negatively significant	Non significant
Age	Sophia (1991), Krishnakumar (1996).	Rajkumar (1992), Sriram (1997), Kavitha (1998), Sudhakar (1998).	Palani (1987), Rathinasabapathy (1987), Santha (1992), Anitha (1998).
Education	Madhavan (1987), Krishnamoorthy (1988), Dharmalingam (1990), Adhiguru (1991), Sophia (1991), Rajkumar (1992), Santha (1992), Krishnakumar (1996), Jayaraj (1997) Sriram (1997), Kavitha (1998), Sudhakar (1998).	-	Anandarao (1988), Jayaraman (1988), Theodore (1988), Rathinasabapathy (1987), Subramanian (1987), Thiyagarajan (1996), Sivakumar (1997), Anitha (1998).
Farm size	Palani (1987), Subramanian (1987), Rajkumar (1992), Santha (1992), Jayaraj (1997), Sivakumar (1997), Anitha (1998), Kavitha (1998), Venkatachalam (1999).	Prasad and Siddaramaiah (1997)	Anandarao (1988), Jayaraman (1988), Krishnamoorthy (1988), Theodore (1988), Adhiguru (1991), Krishnakumar (1996), Thiyagarajan (1996), Sriram (1997), Sudhakar (1998).
Farming experience	Rajkumar (1992), Krishnakumar (1996).	Madhavan (1987), Thiyagarajan (1996), Sriram (1997), Kavitha (1998)	Palani (1987), Rathinasabapathy (1987), Subramanian (1987), Theodore (1988), Adhiguru (1991), Sivakumar (1997), Anitha (1998), Sudhakar (1998).

Table 3. (Contd.)

Variables	Positively significant	Negatively significant	Non significant
Mass media exposure	Madhavan (1987), Palani (1987), Subramanian (1987), Anandarao (1988), Jayaraman (1988), Krishnamoorthy (1988), Theodore (1988), Adhiguru (1991), Sophia (1991), Santha (1992), Krishnakumar (1996), Prasad and Siddaramaiah(1997), Sriram (1997), Kavitha (1998), Sudhakar (1998)	-	Rathinasabapathy (1987), Thiyagarajan (1996).
Contact with extension agency	Madhavan (1987), Palani (1987), Jayaraman (1988), Krishnamoorthy (1988), Dharmalingam (1990), Adhiguru (1991), Santha (1992), Krishnakumar (1996), Sriram (1997), Anitha (1998), Sudhakar (1998).	-	Subramanian (1987), Anandarao (1988), Theodore (1988), Sophia (1991), Thiyagarajan (1996).
Social participation	Madhavan (1987), Rathinasabapathy (1987), Krishnamoorthy (1988), Dharmalingam (1990), Sophia (1991), Santha (1992), Krishnakumar (1996), Jayaraj (1997), Prasad and Siddaramaiah (1997), Kavitha (1998), Sudhakar (1998).	Subramanian (1987)	Thiyagarajan (1996), Venkatachalam (1999).
Cosmopolite-ness	Sophia (1991), Prasad and Siddaramaiah(1997).	-	-

Table 3. (Contd.)

Variables	Positively significant	Negatively significant	Non significant
Economic motivation	Palani (1987), Rathinasabapathy (1987), Jayaraman (1988), Dharmalingam (1990) Sophia (1991), Santha (1992), Krishnakumar (1996), Jayaraj (1997), Prasad and Siddaramaiah (1997), Sriram (1997), Anitha (1998), Sudhakar (1998), Venkatachalam(1999).	-	Rajkumar (1992)
Scientific orientation	Madhavan (1987), Palani (1987), Rathinasabapathy (1987), Subramanian (1987), Krishnamoorthy (1988), Jayaraman (1988), Dharmalingam (1990), Rajkumar (1992), Krishnakumar (1996), Jayaraj (1997), Anitha (1998), Sudhakar (1998), Venkatachalam (1999).	-	Theodore (1988), Thiyagarajan (1996), Sivakumar (1997).
Progressiveness	Jayaraman (1988), Kavitha (1998).	-	-
Innovativeness	Rathinasabapathy (1987), Jayaraman (1988), Dharmalingam (1990), Adhiguru (1991), Rajkumar (1992), Jayaraj (1997), Prasad and Siddaramaiah (1997), Sivakumar (1997), Sriram (1997), Kavitha (1998), Sudhakar (1998), Venkatachalam (1999).	-	-

Table 3 (Contd.)

Variables	Positively significant	Negatively significant	Non significant
Risk orientation	Palani (1987), Rathinasabapathy (1987), Subramanian (1987), Krishnamoorthy (1988), Dharmalingam (1990), Santha (1992), Krishnakumar (1996), Thiyagarajan (1996), Prasad and Siddaramaiah (1997), Sriram (1997), Anitha (1998), Sudhakar (1998), Venkatachalam (1999).	-	Anandarao (1988), Sophia (1991), Rajkumar (1992), Sivakumar (1997).
Training undergone	Anitha (1998)	-	Thiyagarajan (1996)
Possession of PPE	-	-	Prasad and Siddaramaiah (1997)

RESEARCH METHODOLOGY

CHAPTER III

RESEARCH METHODOLOGY

This chapter deals with the methodological aspects comprising the selection of locale of the study area, the sampling procedure followed for selecting the villages and respondents, variables and their measurement, method of data collection and the statistical tools used. These details are presented under the following major sub heads.

3.1 Locale of Research.

3.2 Sample and Sampling Procedure.

3.3 Description of the Study area.

3.4 Operationalisation of Variables and their measurement.

3.5 Method of data collection.

3.6 Statistical tools used.

3.1. LOCALE OF RESEARCH

The research was designed to study the Integrated Pest Management (**IPM**) in Tankfed Rice Cultivation. In Tamil Nadu there are 38,842 tanks, of this Pudukottai District occupies the first position with 12.7 per cent of tanks to the total number of tanks in the state (Table 4). It also has 78 per cent of the net area irrigated under Tankfed irrigation. Further, the Farmer's field School (FFS) on Integrated Pest Management was also conducted in Pudukkottai District by the Department of Agriculture. Considering the above details the Pudukottai District was selected for this study ("Tamil Nadu An Economic Appraisal 1994-95").

Table.4. District–wise per cent distribution of tanks in Tamil Nadu

District	**Per cent to total number of tanks in Tamil Nadu**
1.Chengalpattu	9.33
2.South Arcot	6.88
3.North Arcot	3.48
4.Thiruvannamalai	4.64
5.Salem	2.13
6.Dharmapuri	6.00
7.Coimbatore	0.20
8.Erode	0.13
9.Trichirapalli	6.76
10.Pudukottai	12.70
11.Thanjavur	1.10
12.Nagapattinam	-
13.Maduri	6.23
14.Dindigul	7.41
15.Ramnadu	4.70
16.Virudunagar	2.56
17.Sivagangai	11.8
18.Tirunalveli	5.58
19.Tuticorin	1.61
20.Nilgiris	0.01
21.Kanyakumari	6.61
Total	**100.00**

FIG.1 MAP DEPICTING THE STUDY AREA

Table.5. Total number of tanks in Pudukottai district

Sl. No.	Name of the taluk	No. of tanks	Name of the block	No. of tanks
1.	Thirumayam	1490	1.Thirumayam	496
			2.Arimalam	259
			3.Ponnamaravathi	735
2.	Kulathur	1484	1.Annavasal	790
			2.Kunnandarkovil	443
			3.Viralimalai	251
3.	Avudayar kovil	261	1.Avudayar kovil	233
			2.Manamelkudi	28
4.	Alangudi	366	1.Thiruvarangulam	240
			2.Karambakudi	126
5.	Pudukottai	360	1.Pudukottai	360
6.	Gandarvakottai	106	1.Gandarvakottai	106
7.	Aranthangi	121	1.Aranthangi	121
	Total	**4188**	**Total**	**4188**

3.2. SAMPLE AND SAMPLING PROCEDURE

3.2.1. Selection of taluks and blocks

Pudukottai district has seven taluks viz., Alangudi, Arantangi, Avudayarkovil, Gandarvakottai, Kulathur, Pudukottai and Thirumayam. These seven taluks cover thirteen blocks viz., Alangudi, Annavasal, Arantangi, Avudayarkovil, Gandarvakottai, Karambakudi, Kunnandarkovil,Manamelkudi, Ponnamaravathi, Pudukottai,Thirumayam Thiruvarangulam and Viralimalai. Among the seven taluks Thirumayam and Kulathur taluks were having more number of tanks viz., 1490 and 1484 respectively. The Kulathur taluk consist of three blocks viz., Annavasal, Kunnandarkovil, and Viralimalai. From these three blocks Annavasal block was selected for the study of FFS (Integrated pest

management)-farmers as it was having maximum number of tanks (790) than the other two blocks in the Kulathur taluk. Thirumayam taluk consist of three blocks viz., Arimalam, Ponnamaravathi and Thirumayam. From them Ponnamaravathi block was selected for the study of Non-FFS farmers as it was having maximum number of tanks (735) than the other two blocks in Thirumayam taluk. The data regarding the number of tanks are furnished in table 5.

3.2.2. Selection of Villages

Annavasal block has 58 villages. Among these 58 villages Farmer's Field School (FFS) was conducted in ten villages during the year (1999-2000). From which three villages viz., Kiliyur, Madhiyanallur and Veeraperumampatti were selected randomly for the study of FFS-farmers. Ponnamaravathi block has 49 villages. From these 49 villages three villages (in which no FFS was conducted), were purposively selected for the study of Non-FFS farmers. The selected three villages include Arasamalai, Idayathur, and Melathanium. From each village twenty farmers were selected randomly after arranging them in an alphabetical order.

3.2.3. Selection of Respondents

As the study has been designed to compare the FFS and Non –FFS farmers with regard to their IPM practices, the farmers who attended the FFS were considered as FFS farmers. From each FFS thirty farmers had participated .So twenty from each FFS were selected randomly. Totally sixty farmers were selected from the three villages. For the remaining sixty non-FFS farmers, they were selected from the three selected villages (in which no Farmer's field school was yet conducted) of Ponnamaravathi block. From

each village twenty farmers were selected randomly after arranging them in an alphabetical order.

Respondents from FFS category

NAME OF THE VILLAGE	TOTAL FARMERS	SAMPLES
1.Kiliyur	30	20
2.Madhiyanallur	30	20
3.Veeraperumampatti	30	20
Total	90	60

Respondents from Non-FFS category

NAME OF THE VILLAGE	TOTAL FARMERS	SAMPLES
1.Arasamalai	94	20
2.Idayathur	225	20
3.Melathanium	350	20
Total	669	60

3.3. DESCRIPTION OF THE STUDY AREA

Cropping pattern

The major crops grown in Pudukottai district are Rice, Maize, Sorghum, Ragi and Pulses like Redgram, Blackgram, Greengram and oilseeds like Groundnut, Gingelly. Sugarcane and Cashew are the important commercial crops in this area while Casuarina and Eucalyptus are also raised in addition to Mango and Jack.

Rice occupies the major area i.e. 1 lakh acre in Pudukkottai district. Rice was sown in 54 per cent of the gross cropped area in Pudukkottai district as against 36 per cent of the state as a whole.

The crop season in which rice is being grown in the district are

Crop	Season
Rice	a) Kharif - June to September. (*Kuruvai*)
	b) Rabi - October to December (*Thaladi*)
	c) Summer - February to May *(Navarai*)

Irrigation

The gross area of crops irrigated was 101758 ha. i.e., 49.34 per cent of gross area irrigated to gross area sown at the time of study. Tanks numbering 4188 cater to a major portion viz. 79,969 to amounting to 78 per cent of area irrigated to total net area irrigated. High irrigation intensity of 107.62 per cent was recorded in this District. Other sources of irrigation are tube wells, wells, springs and canals.

Rainfall

The district receives major percentage of rainfall in Northeast Monsoon (406.1 mm) and in Southwest monsoon it receives 247.0 mm. In hot weather period, it receives 43.7 mm per annum, whereas in winter season it receives only 9.2 mm.

3.4. OPERATIONALISATION OF VARIABLES AND THEIR MEASUREMENT

INDEPENDENT VARIABLES

3.4.1. Age

Age was operationalised as the number of completed years of respondents at the time of inquiry and the chronological age was taken as a measure.A score of one was assigned to each year. The respondents were classified into 3 groups as followed by Selvanayagam (1986)

Category	Age
Young	-Upto 34 Years
Middle	-35 to 45 Years
Old	-Above 45 Years

3.4.2. Education

Educational status was operationalised as the level of formal education attained by the individual respondent. Based on the level of formal education, they were grouped into 5 categories as followed by Pushpa (1996) with slight modification.

			Score
Illiterate	-	No education	-1
Primary	-	Upto 5 Years of Schooling	-2
Middle	-	Upto 8 Years of Schooling (6-8)	-3
Secondary	-	Upto 12 Years of Schooling (9-12)	-4
Collegiate	-	Degree and beyond.	-5

3.4.3.Farm Size

It referred to the number of acres cultivated by the respondent at the time of enquiry. The total extent of land was arrived by using a conversion procedure of equating 2 acres of dry land to 1 acre of irrigated land as followed by Theodore (1988). One Score was assigned to every one acre of irrigated land. An extent of above 0.5 acre was rounded to the next whole number for assigning the score. For example a respondent possessing 2.6 acre of irrigated land was given a score of 3. The respondents were classified into three categories as per the procedure adopted by Adhiguru (1991).

Farm Size		Category
Upto 2.5 acres	-	Marginal Farmers
2.51 to 5.00 acres	-	Small Farmers
More than 5.00 acres	-	Big Farmers

3.4.4. Farming Experience

Farming experience in the present study has been referred as the actual completed years of experience of the respondents in farming .The scoring procedure followed by Sriram (1997) was adopted .One score was given to every year of experience in farming Using cumulative frequency the respondents were classified into low, medium, and high level of farming experience.

3.4.5.Area under Paddy

Area in acres cultivated under Paddy was taken into account. For one acre of Paddy area cultivated an unit score was given.

3.4.6.Mass media exposure

This referred to the regularity with which farmers read newspapers and magazines, listened to radio, viewed to television, attended agricultural exhibitions, field days, field trips, participated method demonstration and adaptive research trials. It was measured based on the frequency of exposure as developed by Mani (1996) with slight modification.

Frequency	Score
Regular	2
Occasional	1
Never	0

3.4.7.Contact with Extension Agency

It referred to the degree to which an individual maintained contacts with extension agency for getting advice on agriculture or non-agricultural aspects. This variable was

measured on two dimensions namely frequency and purpose of contact. The Scoring procedure followed by Santha (1992) was adopted here.

a) Frequency of Contact		**Score**
Never	-	1
Sometimes	-	2
Regularly	-	3

b) Purpose of Contact

Non-Agricultural	-	1
Agricultural	-	2

The scores obtained by an individual on both items were summed up to arrive at the total score under this variable. Based on the scores obtained using cumulative frequency they were classified into Low, Medium and High level of extension agency contact.

3.4.8. Social Participation

Social Participation referred to the degree of involvement of the respondents in formal organizations as member or office bearer, both in the past and present. The Scoring pattern followed by Gnanadeepa (1991) was adopted to measure the social participation of respondents.

		Score
No Participation	-	0
Member in one Organization	-	1
Member in more than one Organization	-	2
Office bearer in one Organization	-	3
Office bearer in more than one Organization	-	4

The scores obtained by an individual on the present and past were summed up to arrive the total social participation score of an individual.

3.4.9.Cosmopoliteness

This was operationalised as the frequency and purpose of visits by a farmer to places like towns / cities outside his village. The scoring procedure adopted by Gnanadeepa (1991) was used for this study as follows.

a) Visit to towns / cities	-	**Scores**
Yes	-	1
No	-	0
b) Frequency of visit		**Scores**
Often	-	3
Occasionally	-	2
Rarely	-	1
c) Purpose of visit		**Scores**
Personal	-	1
Non agricultural	-	2
Agricultural	-	3

After the Score for individual respondent was obtained, the respondents were classified into Low, Medium and High by cumulative frequency method.

3.4.10. Economic Motivation

It referred to the profit maximisation and relative value placed by a farmer on economic ends. The scale developed by Supe (1969) was used in this study. There were six statements in which the last statement was negative.

The scoring procedure used is as follows.

Response	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
Positive items	7	5	4	3	1
Negative items	1	3	4	5	7

The scores for each individual was arrived at by summing up the scores were 42 and 6, (as maximum and minimum respectively). Based on the scores obtained, they were classified into three categories viz., Low, Medium and High using cumulative frequency.

3.4.11.Scientific Orientation

Scientific orientation was operationalised as degree to which a respondent was oriented with the use of scientific methods in farming. The scale developed by Supe (1969) was used in this study. There were six statements of which the second one was negative and the rest were positive statements. The scoring was measured interms of a five-point continuum as detailed below

Response	**Strongly Agree**	**Agree**	**Undecided**	**Disagree**	**Strongly Disagree**
Positive items	7	5	4	3	1
Negative items	1	3	4	5	7

The maximum score an individual could obtain on this scale was 42 and minimum score was 6. The score obtained for each statement for each respondent was summed up, based on which, they were categorised as Low, Medium and High using cumulative frequency.

3.4.12.Progressivenes

It was operationalised as the degree to which farmers was receptive to modern values and practices for measuring progressiveness the scale followed by Somasundaram (1995) was used. Scale consisted of the seven statements for which the respondents had to answer 'Yes' or 'No'.

'Yes' response was assigned with one score and the 'No' response with 'zero' score. The progressiveness score for an individual was obtained by summing up the response for each item. The response was classified into low, medium and high using cumulative frequency method.

3.4.13.Innovativeness

It was Operationalised as "the degree to which a farmer is relatively earlier in adopting new ideas". The scoring procedure developed by Singh (1977) was used to measure innovativeness.

The questions asked with the scoring procedure is detailed as follows.

Question

When would you prefer to adopt a new practice in farming?

Response	**Scores**
a) As soon as it is brought to my knowledge	3
b) After I have seen other farmer using it successfully	2
c) I prefer to wait and take my own time	1

Using the cumulative frequency method the respondents were classified into Low, Medium and High from the obtained scores.

3.4.14.Risk Orientation

Risk Orientation was defined as the degree to which the farmers were oriented towards risk and uncertainty in adopting new ideas in farming. Risk orientation scale developed by Supe (1969) was used. The Scale consisted of six statements, where in items one and five were negative and the rest were positive.

The scoring was as given below.

Response	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
Positive items	7	5	4	3	1
Negative items	1	3	4	5	7

The scores obtained for each statement were summed up to get the individual respondent's risk orientation score. The possible range of score in this scale was from 6 to 42. Maximum Score would reveal high risk orientation, while the minimum score would indicate low risk orientation.

3.4.15.Training Undergone

This variable was operationalised as the number of trainings undergone by the respondents so for. The scoring procedure was adopted based on the training undergone by the respondents.

If the respondent undergo any training, then he was awarded with the score of 'two'. For each additional training additional score of two was given. If he has not attended any training, then he was left with the score of 'one'.

Possession of Plant Protection Equipments

This was operationalised as the possession of any plant protection equipments like sprayer, duster by the respondents.

If the respondent was having one equipment, he was awarded with the score of two. If he possessed more than one an additional score of one was provided for each additional equipment. If he possess no equipment then he was awarded 'one'. While spraying if he used to spray by himself then he was awarded with the score of one. When he used labour for spraying if he supervise the mixing and spraying of chemicals then he was awarded with 'one'. If not then he was awarded with the score of 'zero'.

DEPENDENT VARIABLES

Knowledge Level on IPM Technologies

The knowledge on IPM can be defined as the quantum of scientific information known to subject on IPM Technology. To select the items for knowledge test the discussion with scientist and the procedure adopted by Santha (1992) was followed. There was a set of questions in the knowledge test.

Each item of the knowledge test was dichotomised into correct and incorrect responses. Every correct response was assigned a score of one while the incorrect response received a score of zero. All such scores were summed up for each individual respondent.

The formula used for the calculation of knowledge index of each respondent.

$$K.I. = \frac{K}{P} * 100$$

K.I = Knowledge Index

K = Knowledge score secured by the respondent

P = Possible maximum score for all recommended integrated Pest management Practices on Rice.

Extent of Awareness on IPM technology

Awareness is the state of perceiving and taking account of some event, occasion, experience of object. It can also be defined as the 'Being conscious of Something. Swaminathan (1986) measured awareness on two point continuum namely 'aware' and 'not aware'. In this study to quantify the extent of awareness on IPM technology, similarly 2 point continuum was used as follows

Response	**Score**
Aware	2
Not Aware	1

The awareness was measured separately for all the technological units under each IPM practices for each pests. Such indices for all the technological units of a particular IPM practice when summed up and divided by the total number of technological units comprised in that particular IPM practice gave the IPM technology awareness score for that practice. Following the same procedure, the awareness scores for all the practices under all components of IPM technological were added to obtain the score for the extent of awareness about the IPM technology.

Extent of Adoption on IPM Technology

Adoption is a decision to make full use of an innovation as the best course of action available (Rathakrishnan **et al.**, 1997). The same technological units were used to

identify the awareness of farmers on IPM also used here to find the adoption. These technological units were selected based on the discussion with the scientists in Agricultural Entomology and the secondary sources. The proportion of each technological units of particular IPM practice were calculated and multiplied by the corresponding weights to get the extent of adoption. Then the total number of technological units for which the values were added summed up these extent of adoption of technological units for particular IPM practice and divided. This was multiplied by corresponding weight of that IPM practice to get extent of adoption of respective practices.

To get the total extent of adoption under each component of IPM the practices under each component were summed up. Then the total score was obtained by adding the adoption scores of all components of IPM. The adoption level of individual farmer was interpreted in terms of low, medium and high by using the cumulative frequency method.

Constraints in the Adoption of IPM technology

The respondents were asked to indicate the constraints faced by them in the adoption of each practice under IPM technology. The frequency of respondents indicating each of the constraints was found out and ranked based on the percentages.

Method of data collection

Keeping in view the objectives of the study a well structured and pretested interview schedule was prepared, incorporating the major pests of paddy. Those pests are Stem borer, Leaf folder, Gall midge, Brown plant hopper, Rat, Blast, Tungro and Brown leaf spot. Among these pests except Gall midge, Rat, Blast and Brown leaf spot

all other were having four components under IPM viz., Agronomic methods, Physical methods, Chemical methods and Biological methods. The Gall midge was not having the physical method, while the Biological method was not included for Rat, Blast and Brown leaf spot as those were not advocated. And through pre test some practices under these components were resulted with very meagre or nil amount of variation with respect to their awareness and adoption. Hence those respective practices were not been included in the questionnaire.

STATISTICAL TOOLS USED

1.Cumulative frequency method

This method was used to categorise the farmers into three categories viz.,low, medium and high by using the following formula.

$$L_1 = K + \frac{(l_i - C)\,h}{F}$$

Where,

K – Median between the lower limit of the class in which l_i –occurs and the upper limit of the previous class .

l_i – Boundary values viz., l_1 and l_2.

c - Cumulative square root of the frequency upto class in which l_i – lies.

1. Low - Below the L_1 values
2. Medium - Between the L_1 and L_2 values
3. High - Above the L_2 values

2. Percentage analysis

Percentage analysis was used in descriptive analysis for making simple comparisons for calculating percentage.

3.Test of Significance (t - test)

For using the Significance of the difference between 2 means of independent variables, t-test of significance was used.

4. Zero - Order Correlation Analysis

This tool was employed to examine the characteristics in relation to farmer's Knowledge level and adoption level.

The formula used was

$$r_{xy} = \frac{\Sigma xy - \frac{(\Sigma x)(\Sigma y)}{n}}{\sqrt{\left[\Sigma x^2 - \frac{(\Sigma x)^2}{n}\right]\left[(\Sigma x)^2 - \frac{(\Sigma y)^2}{n}\right]}}$$

Where n = Sample size

r_{xy} = Correlation Co-efficient

x = Independent Variables.

y = Dependent Variables.

Σxy = Sum of Products of x and y

Σy = Sum of Value of y

Σx = Sum of Value of x

Σx^2 = Sum of Square of 'x' Values

Σy^2 = Sum of Square of 'y' Values

$(\Sigma x)^2$ = Square of Sum of 'x' Values

$(\Sigma y)^2$ = Square of Sum of 'y' Values

5. Multiple Regression Analysis

To find out the functional relationship between dependent and Independent variables - multiple regression analysis was worked out. The simple correlation measured only the interdependence and gives no idea of how far on is directly dependent on the other. The multiple Regression analysis helps to find out the extent of contribution of all independent variable as a single set to the dependent variable. The regression co-efficient measures the rate of charge of 'y'. The following is the general form of multiple Regression equation.

$$y = a + b_1 x_1 + b_2 x_2 + b_3 x_3 + \ldots\ldots\ldots b_n x_n$$

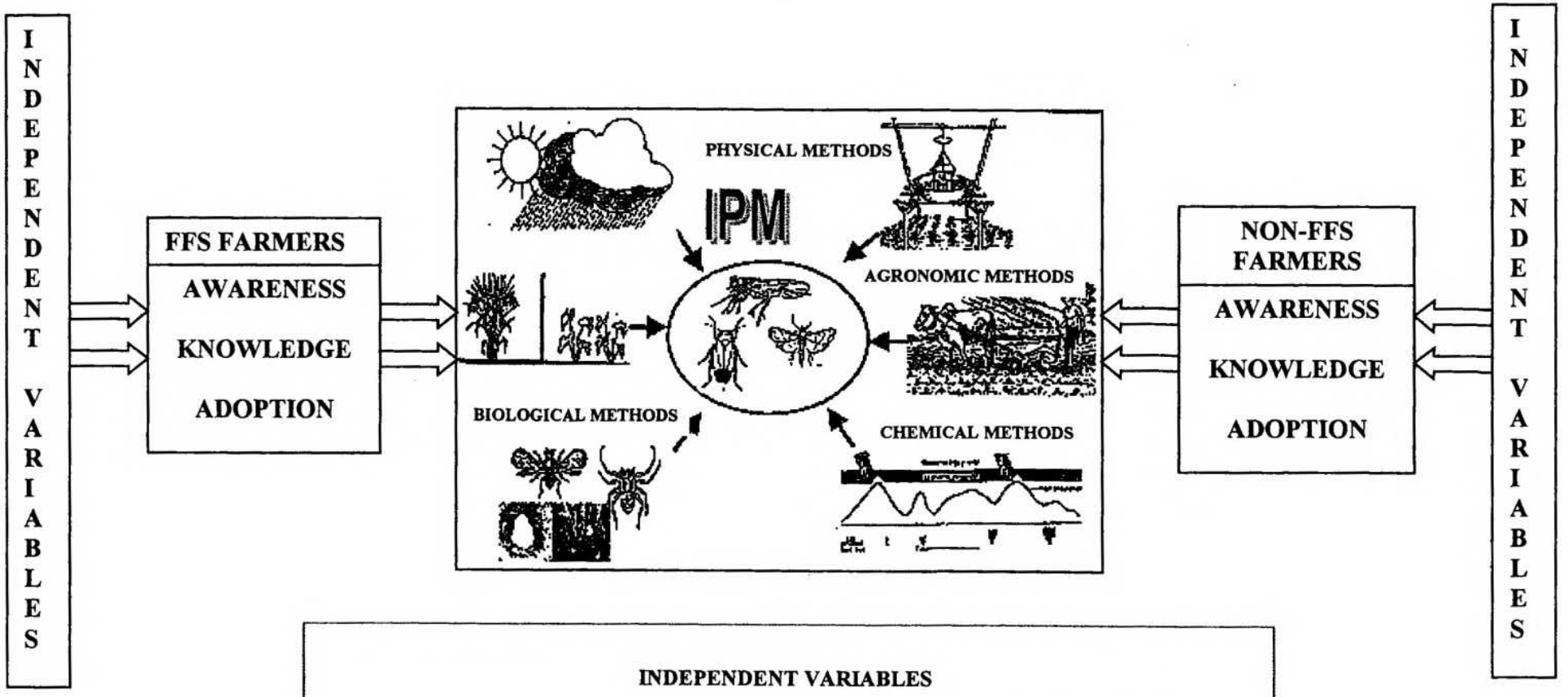
where y = Expected value of dependent variable.

a = Intercept.

x_1 to x_n are Independent Variable

b_1 to b_n are the partial regression co-efficients

FIG. 2 . CONCEPTUAL MODEL SHOWING THE CONTRIBUTION OF INDEPENDENT VARIABLES TOWARDS THE DEPENDENT VARIABLES



INDEPENDENT VARIABLES

X_1 – Age	X_6 – Mass media exposure	X_{11} – Scientific orientation
X_2 – Education	X_7 – Contact with extension agency	X_{12} – Progressiveness
X_3 – Farm size	X_8 – Social participation	X_{13} – Innovativeness
X_4 – Farming experience	X_9 – Cosmopoliteness	X_{14} – Risk orientation
X_5 – Area under paddy	X_{10} – Economic motivation	X_{15} – Trainings undergone
		X_{16} – Possession of PPE

FINDINGS AND DISCUSSION

CHAPTER IV

FINDINGS AND DISCUSSION

This chapter brings out the findings of the study along with discussion in detail under the following headings.

4.1. A comparison of the characteristics of FFS and non-FFS farmers

4.2.a. Awareness and adoption of the IPM practices by the FFS and non-FFS farmers

4.2.b. Distribution of FFS and non-FFS farmers according to their awareness, knowledge and adoption

4.3. Correlation of characteristics of the FFS and non-FFS farmers with their awareness, knowledge and adoption

4.4. Regression of characteristics of the FFS and non-FFS farmers with their awareness, knowledge and adoption

4.5. Constraints faced by the respondents

4.6. Suggestive model for improving the extent of adoption

4.1. A comparison of the characteristics of FFS and non-FFS farmers

The mean score and 't' values on the characteristics of FFS and non-FFS farmers is furnished in Table 6.

It is inferred from the table 6 that the FFS farmers had high contact with extension agency, high economic motivation, high scientific orientation, progressive and innovative with high risk orientation. Trainings undergone and possession of plant protection equipments also were higher for FFS farmers. For the remaining variables such as age, education, farm size, farming experience, area under paddy, mass media exposure, social participation and cosmopoliteness the mean score of non-FFS farmers was higher.

Table .6. A comparison of the characteristics of the FFS and Non-FFS farmers

Sl. No	INDEPENDENT VARIABLES	MEAN SCORES		t-value
		FFS-farmers	Non-FFS farmers	
1	Age	40.1167	49.9167	-4.4695
2	Education	4.5667	5.3500	-1.0806
3	Farm size	4.2500	5.0000	-1.1329
4	Farming experience	25.9333	36.7500	-4.642
5	Area under paddy	2.4000	2.8333	-1.3354
6	Mass media exposure	2.7500	3.2166	-1.3688
7	Contact with extension agency	19.2833	16.9333	2.1741*
8	Social participation	0.5500	0.7161	-0.7863
9	Cosmopoliteness	4.9667	5.0500	-0.3862
10	Economic motivation	34.5500	34.3333	0.2134
11	Scientific orientation	30.2167	25.3333	2.8828**
12	Progressiveness.	4.4000	3.4833	3.0142**
13	Innovativeness.	2.4833	1.0000	3.5890**
14	Risk orientation.	28.5333	27.0667	1.2620
15	Training undergone.	2.6667	1.5333	3.5927**
16	Possession of PPE.	1.2833	1.0000	2.1377*

* 5 Per cent level of significance

** 1 Per cent level of significance

Scientific orientation, progressiveness, innovativeness and trainings undergone were positively significant at 1 per cent level of probability, whereas contact with extension agency and possession of plant protection equipments were positively significant at 5 per cent level of probability.

The FFS and non-FFS farmers differed significantly with respect to their contact with extension agency. This was because of the fact that the FFS farmers had participated in FFS trainings and hence were having more contacts with the change agency system. It was found that there were less contact with the change agents In the case of non-FFS villages. Hence the significant difference with respect to this variable is justified.

With regard to the trainings undergone, the FFS farmers were those who attended FFS. Hence this variable exhibited in significant difference. FFS farmers had more awareness towards the use of plant protection equipments, spraying the chemicals etc., through the trainings. The results with regard to the scientific orientation stands testimony to the FFS farmers' desire to go in for scientifically recommended IPM technologies. Their progressiveness and innovativeness also add strength and hence the results are justified.

The data also indicate that there were more young FFS farmers. Though the mean score of FFS farmers was less they had joined FFS on IPM. Farmers with less education, less farm size, less farming experience, less area under paddy, less mass media exposure, less social participation and less cosmopoliteness also had participated in the FFS to learn more about IPM technologies.

Table.7 . Awareness and adoption of IPM- practices among FFS and Non-FFS farmers

IPM -PRACTICES	YELLOW STEM BORER				LEAF FOLDER				GALL MIDGE				BROWN PLANT HOPPER			
	FFS		Non-FFS		FFS		Non-FFS		FFS		Non-FFS		FFS		Non-FFS	
	Aw	Ad	Aw	Ad	Aw	Ad	Aw	Ad	Aw	Ad	Aw	Ad	Aw	Ad	Aw	Ad
I-Agronomic Methods																
1.Summer Ploughing	100.00 (60)	88.33 (53)	100.00 (60)	81.67 (59)	100.00 (60)	88.33 (53)	100.00 (60)	81.67 (59)	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A
2.Selection of variety	53.33 (32)	3.33 (2)	36.67 (22)	3.33 (2)	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	53.33 (32)	3.33 (2)	36.67 (22)	3.33 (2)
3.Trimming and plastering of bunds	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	88.33 (53)	38.33 (23)	66.67 (40)	56.67 (34)	N.A	N.A	N.A	N.A
4.Synchronised sowing	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	51.67 (34)	0 (0)	48.33 (29)	0 (0)	N.A	N.A	N.A	N.A
5. Crop rotation	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	86.67 (52)	51.67 (31)	86.67 (52)	45.00 (27)
6. Optimum spacimg	95.00 (57)	65.00 (39)	81.67 (49)	40.00 (24)	95.00 (57)	65.00 (39)	81.67 (49)	40.00 (24)	95.00 (57)	65.00 (39)	81.67 (49)	40.00 (24)	N.A	N.A	N.A	N.A
7.Optimum dose of fertilizer application.	95.00 (57)	56.67 (34)	95.00 (57)	36.67 (22)	95.00 (57)	56.67 (34)	95.00 (57)	36.67 (22)	95.00 (57)	56.67 (34)	95.00 (57)	36.67 (22)	95.00 (57)	56.67 (34)	95.00 (57)	36.67 (22)
8.Clipping the tips of seedling	30.00 (18)	3.33 (2)	30.00 (18)	0 (0)	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A
9.Alternate floodimg and draining	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	85.00 (51)	43.33 (26)	73.33 (44)	35.00 (21)
10.Monitoring for pests in nursery and mainfield	73.33 (44)	33.33 (20)	26.67 (16)	1.67 (1)	73.33 (44)	33.33 (20)	26.67 (16)	1.67 (1)	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A
II-Physical methods																
11.Use of light traps	93.33 (56)	26.67 (16)	53.33 (32)	0 (0)	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	93.33 (56)	26.67 (16)	53.33 (32)	0 (0)
12.Use of pheromone traps	21.67 (13)	3.33 (2)	15.00 (9)	0 (0)	21.67 (13)	3.33 (2)	15.00 (9)	0 (0)	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A
III-Biological methods																
13.Conservation of natural enemies	95.00 (57)	36.67 (22)	55.00 (33)	3.33 (2)	95.00 (57)	36.67 (22)	55.00 (33)	3.33 (2)	95.00 (57)	36.67 (22)	55.00 (33)	3.33 (2)	95.00 (57)	36.67 (22)	55.00 (33)	3.33 (2)
14.Use of neem products	100.00 (60)	96.67 (58)	100.00 (60)	95.00 (57)	100.00 (60)	96.67 (58)	100.00 (60)	95.00 (57)	100.00 (60)	96.67 (58)	100.00 (60)	95.00 (57)	100.00 (60)	96.67 (58)	100.00 (60)	95.00 (57)
IV-Chemical methods																
15.Seed treatment	95.00 (57)	20.00 (12)	73.33 (44)	8.33 (5)	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	95.00 (57)	20.00 (12)	73.33 (44)	8.33 (5)
16.ETL-based chemical spray.	76.67 (46)	30.00 (18)	26.67 (16)	5.00 (3)	76.67 (46)	30.00 (18)	26.67 (16)	5.00 (3)	76.67 (46)	30.00 (18)	26.67 (16)	5.00 (3)	76.67 (46)	30.00 (18)	26.67 (16)	5.00 (3)
17.Application of herbicide.	N.A	N.A	N.A	N.A	98.33 (59)	30.00 (18)	93.33 (56)	35.00 (21)	98.33 (59)	30.00 (18)	93.33 (56)	35.00 (21)	98.33 (59)	30.00 (18)	93.33 (56)	35.00 (21)

Aw-Awareness Ad-Adoption. (Values in the bracket denotes actual number of respondents) .
N.A-Not applicable

Table.7. Continued.....

IPM –PRACTICES	RAT				BLAST				TUNGRO				BROWN LEAF SPOT			
	FFS		Non-FFS		FFS		Non-FFS		FFS		Non-FFS		FFS		Non-FFS	
	Aw	Ad	Aw	Ad	Aw	Ad	Aw	Ad	Aw	Ad	Aw	Ad	Aw	Ad	Aw	Ad
I-Agronomic Methods																
1.Summer Ploughing.	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	100.00 (60)	88.33 (53)	100.00 (60)	81.67 (59)	N.A	N.A	N.A	N.A
2.Adjusting planting time.	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	38.33 (23)	11.67 (7)	8.33 (5)	3.33 (2)
3.Use of disease free seeds.	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	80.00 (48)	10.00 (6)	61.67 (37)	1.67 (1)
4.Ensuring narrow bunds.	56.67 (34)	20.00 (12)	41.67 (25)	0 (0)	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A
5.Optimum spacing.	N.A	N.A	N.A	N.A	95.00 (57)	65.00 (39)	81.67 (49)	40.00 (24)	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A
6.Use of slow releasing. N-fertilizer	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	96.67 (58)	95.00 (57)	95.00 (57)	78.33 (47)
7.Removal of weeds.	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	100.00 (60)	95.00 (57)	100.00 (60)	96.67 (58)	100.00 (60)	95.00 (57)	100.00 (60)	96.67 (58)
8.Avoiding keeping of haystacks in near by fields.	65.00 (39)	56.67 (34)	48.33 (29)	30.00 (18)	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A
II-Physical methods																
9.Avoiding cultivation of susceptible varieties	N.A	N.A	N.A	N.A	63.33 (38)	8.33 (5)	43.33 (26)	3.33 (2)	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A
10.Removal of infected plant debris	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	80.00 (48)	35.00 (21)	65.00 (39)	10.00 (6)
11.Burning stubbles and infected plant debris.	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	31.00 (19)	6.67 (4)	25.00 (15)	5.00 (3)	N.A	N.A	N.A	N.A
12.Digging burrows and killing Rats	26.67 (16)	3. 33 (2)	23.00 (14)	0 (0)	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A
13.Setup of indegenous rat traps.	90.00 (54)	68.33 (41)	86.67 (52)	65.00 (39)	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A
III-Biological methods																
14.Use of neem products	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	100.00 (60)	96.67 (58)	100.00 (60)	95.00 (57)	N.A	N.A	N.A	N.A
IV-Chemical methods																
15.Seed treatment.	N.A	N.A	N.A	N.A	95.00 (57)	20.00 (12)	73.33 (44)	8.33 (5)	N.A	N.A	N.A	N.A	95.00 (57)	20.00 (12)	73.33 (44)	8.33 (5)
16.Intensity based chemical spray.	N.A	N.A	N.A	N.A	86.67 (52)	73.26 (44)	66.67 (40)	56.67 (34)	86.67 (52)	73.26 (44)	66.67 (40)	56.67 (34)	86.67 (52)	73.26 (44)	66.67 (40)	56.67 (34)
17..Placing two tablets of aluminium phosphide.	31.67 (19)	5.00 (3)	18.33 (11)	5.00 (3)	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A	N.A

Aw-Awareness Ad-Adoption. (Values in the bracket denotes actual number of respondents).
N.A-Not applicable

The FFS farmers had slightly higher economic motivation and risk orientation, though the results were not significant. An overall analysis reveals that there existed favourable tendency among the farmers with varied characteristics to join FFS.

4.2aAwareness and adoption of IPM practices by the FFS and non-FFS farmers

Stem Borer

It is evident from the table 7 that for yellow stem borer cent per cent of the FFS as well as non-FFS farmers were known about the summer ploughing. Majority of them also (88.33% and 81.67% respectively) practiced summer ploughing. The reason for this high level of adoption and awareness is that the farmers were doing the summer ploughing as a regular traditional practice. Hence it had resulted in the high level of awareness and adoption. Majority of the FFS (95.00%) and non-FFS (81.67%) farmers were aware of the optimum spacing. But only 65.00 per cent and 40.00 per cent of the FFS and non-FFS farmers had adopted. The practice of closer planting with the intention of getting higher yield and skill of the labour who transplant were the factors for the variation in the spacing.

In the case of selection of variety, only 53.33 per cent FFS farmers were aware. The FFS farmers came to know about the practice through FFS.

The results indicate that much more emphasis needs to be made on the selection of variety also while imparting trainings through FFS on IPM or for that matter in any other trainings.

With regard to non-FFS farmers, only 36.67 per cent were aware about the selection of suitable variety. This was because of the fact that majority of them had not undergone any trainings. A few alone were aware through mass media exposure, contact with extension agency and other informal sources. But with respect to the adoption, only 3.33 per cent of both FFS and non-FFS farmers adopted suitable varieties. The above results on the selection of variety caution the need for popularising the selection of suitable crop varieties, which form the basis for IPM.

For optimum dose of fertilizer application 95.00 per cent each of FFS and non-FFS farmers were having awareness which 56.67 per cent and 36.67 per cent of them alone adopted. The non-adoption of optimum dose of chemical fertilizer includes either lesser dosage or over dosage of fertilizers. Nitrogenous fertilizers were found to be normally applied in excess due to the observable luxuriant vegetative growth. This leads to more harbouring of pests and diseases. Therefore the results suggest for the need to highlight optimum use of fertilizers to ensure IPM.

Through trainings 73.33 percentage of FFS farmers had known about the monitoring of pests in nursery and main field at ETL level. But only 33.33 per cent adopted the practice due to the fear over ETL-based spray. This amounts to lack of conviction amongst FFS farmers themselves which also indicates the farmer's inability to assess the ETL through various procedure and then take-up spray, needs to be alleviated.

A little above one-fourth of the non-FFS farmers only (26.67%) were aware about the practice. Due to non-conviction 1.67 per cent alone adopted it. This points out the wide gap existing amongst the non-FFS farmers.

The practice of clipping the tips of seedling was known by only 30 per cent each of FFS and non-FFS farmers. But 3.33 per cent of FFS farmers adopted it and none of non-FFS farmers adopted. This practice of clipping the tips of the paddy seedlings after pulling out from the nursery before transplanting in the main field is being recommended to remove the egg masses of the yellow stem borer which are laid usually at the tip of the paddy seedlings. However, the tendency of the farmers and the labourers who transplant was found to be transplanting the seedlings as such without clipping the tip. The time required for clipping the tip of the seedlings and also discarding of the clipped portion would have acted as a limiting factor for adopting this practice.

In the case of the use of light traps 93.33 percentage and 53.33 percentage of FFS and non-FFS farmers were aware about the practice. Majority of the FFS-farmers came to know through the trainings. But for non-FFS as they did not attend any trainings, majority of them were not aware about the practice. With regard to their adoption only a little above one-fourth (26.67%) of FFS were found to use light traps and none of non-FFS farmers used light traps. Using of light traps warrants additional efforts to set the light traps at different locations. In addition to continuous supply of electricity during night, setting of fire as a light trap at individual farmer's fields was also a constraint. A little above one-fifth (21.67%) of FFS farmers and only 15.00 per cent of non-FFS farmers were aware about pheromone trap. Whereas only 3.33 per cent of FFS had

adopted and no non-FFS had used the pheromone trap. The use of pheromone trap warrants purchase of septa specific to the particular pest. The availability of the septa in time, the cost, lack of conviction amongst the farmers on the effectiveness of the pheromone trap might be the reason for the poor adoption.

A vast majority (95.00%) of the FFS farmers and a little half (55.00%) were of non-FFS farmers had awareness about the conservation of natural enemies. Whereas 36.67 per cent of FFS farmers a negligible per cent (3.33%) of non-FFS farmers adopted it. This might be due to their non-conviction over the function of the natural enemies, and in emergent situation they need to go for pesticides. This might be due to the less familiarity of all the natural enemies like parasites and predators by the farmers. It might also be due to the farmer's perception that all the insects seen in paddy fields need to be controlled by some means or other, due to the reason stated above.

As the respondents used the neem products traditionally 100 per cent of both FFS and non-FFS farmers were aware about it. A vast majority of the farmers in both categories had used the neem products (96.67% and 95% respectively). The intensive extension efforts for popularising the neem and neem based products in addition to the farmers indigenous use of neem based products for plant protection coupled with the low cost might have served as the reason for this. The farmer's desire to prefer plant products as against the plant protection chemicals might have added to the effect. 95.00 per cent of the FFS farmers and 73.33 per cent of non-FFS farmers had aware about the seed treatment practice, whereas only 20 per cent and 8.33 per cent of the FFS and non-FFS farmers alone adopted. The lack of observability due to the seed treatment with

fungicides during the earlier crop stages (up to 30-35 days) as claimed by the research system and also the non-availability of chemicals used for seed treatment in smaller quantities as per the farmer's choice, might have hindered large scale adoption of seed treatment. It is also a fact that the seed treatment with fungicides has to be done 24 hours prior to sowing, which may require additional labour, and protection of the treated seeds. The tendency among the children as well as the adult farmers to consume a few seeds either before sowing or during the process of sowing might have acted as a constraint, as reported by the respondents.

It could also be seen from the table 12 that 76.67 per cent and 26.67 per cent of FFS and non-FFS farmers knew ETL-based spray. But only 30 per cent of FFS-farmers and meagre percentage (5.00%) of both the categories had adopted.

The FFS farmers expressed less conviction and fear to control the pest through this method. Their fear was that the pest may multiply and infect very quickly and likely to spread throughout the field. Due to this fear the adoption of ETL-based chemical spray was poor. For non-FFS farmers, majorities of them were not aware about the practice. This might be the reason the main reason for non-adoption. The reasons quoted earlier on the monitoring of pests in nursery and main field based on ETL level hold good here too.

Leaf Folder

In the case of leaf folder the practices such as summer ploughing, optimum spacing, optimum dose of fertilizer application, monitoring the pests in nursery and main field at ETL-level, pheromone trap, conservation of natural enemies, use of neem

products were having similar awareness and adoption as that of yellow stem borer. The reason postulated for yellow stem borer can apply in the case of leaf folder also.

In the case of application of herbicides which was one of the chemical methods for managing leaf folder. 98.33 per cent and 93.00 per cent of FFS and non-FFS were aware about that practice,whereas 30 per cent and 35 per cent of the FFS and non-FFS had adopted it. High cost of pesticides, specific precautions needed while applying herbicides and the belief that the paddy fields applied with herbicides gets hardened might be the reasons for this less adoption.

Gall Midge

For the management of Gall midge in cultural methods both the FFS and non-FFS farmers had more awareness about the optimum spacing and optimum dose of fertilizer application. But 65 per cent and 40 per cent of FFS and non-FFS farmers only had adopted the optimum spacing. Because most of them had done closer spacing with the belief of getting higher yield. Similarly for fertilizer application also only 56.67 per cent and 36.67 per cent of FFS and non-FFS farmers had adopted. The reason for the deviation is the belief of getting higher yield through over dose of fertilizer application.

Trimming and plastering of bunds was known to 88.33 per cent of FFS farmers and 66.67 per cent of non-farmers. But only 38.33 per cent of FFS and 56.67 per cent of non-FFS farmers had adopted it. The unawareness that trimming and plastering of the bunds, by which the population of weed plants is restricted and also the egg masses that are laid on the weed plants get removed had acted as a hindrance for this result. The

reason for a little higher (56.67%) trimming and plastering of bunds by the non-FFS farmers as compared to FFS farmers (38.33%) might be due to their desire to adopt this agronomic practice as a routine. The labour requirement for trimming and plastering of bunds might have also as hindrance to adopt this practice.

In the case of synchronised sowing half (51.67%) of FFS and a little less than half (48.33%) of non-FFS farmers were aware about its importance towards pest control. But no one from FFS farmers and non-FFS farmers had adopted. This was because of the fact that synchronised sowing could be possible only in riverbed area alone. The farmer with wells would have completed their sowing operation earlier while those who don't have the wells were being waited for the tank water or rainwater for sowing. Hence due to this non-uniformity in obtaining and using water for sowing, it was found that nil adoption of synchronised sowing. The non-existence of appropriate communication link together with the lack of awareness on the importance of synchronised sowing coupled with the labour scarcity at a given point of time might have been the cause for this result. With respect to the biological methods which refer to the conservation of natural enemies and use of neem products both the FFS and non-FFS farmers had similar awareness and adoption about yellow stem borer. The reasons explained therein for yellow stem borer can apply in for Gall midge also. In the case of chemical control like ETL-based chemical spray, and application of herbicide identical results as that of leaf folder were obtained with regard to awareness of both FFS and non-FFS farmers. The reasons that were listed for the management of leaf folder hold good for the management of gall midge.

Brown Plant Hopper

With regard to the other practices for the management of Brown plant hopper like optimum dose of fertilizer application, conservation of natural enemies, use of neem products and ETL-based chemical spray consist results were obtained as that of the three pests viz., stem borer, leaf folder and gall midge.

Use of light trap and chemical seed treatment for the management of Brown plant hopper was similar as those for the management of the yellow stem borer. The results on the application of herbicide for the management of this pest were similar to those of Leaf folder and Gall midge.

The practice crop rotation was adopted by only 51.67 per cent of FFS farmers and 45.00 per cent of non-FFS farmers, while 86.67 per cent of each of them were aware about.

The reason for this result in crop rotation is due to the existence of monocropping practices under tank irrigation system instead of rotating with other crops like cotton and pulses. However, the adoption results suggest for intensive efforts to popularise the crop rotation.

It was also found that 85.00 per cent of FFS and 73.33 per cent of non-FFS farmers were having awareness about alternate flooding and draining, but only 43.33 per cent and 35.00 per cent of FFS farmers and non-FFS farmers had adopted this.

In the case of management of Brown plant hopper the data on selection of variety were similar to the results obtained for the management of yellow stem borer. The reasons discussed for the management of yellow stem borer suit to the management of brown plant hopper also. The reason for the low level of adoption was, might be the anxiety of the farmers to hold water in their paddy fields besides their fear that the irrigation water may not available as and when required under tankfed system. Further draining the water requires neighbours co-operation due to field to field irrigation prevailing in the area.

Rat

It could be observed from the table 7 that 56.67 per cent of FFS farmers and 41.67 per cent of non-FFS farmers were having awareness about the practice use of narrow bunds, whereas only 20.00 per cent of FFS farmers and none from non-FFS farmers had adopted.

As stated already the field bunds are being used for growing of pulses and/or as a pathway hence if bunds are narrowed that would hamper walking into the field for effective supervision of the crop growth. The labour intensity involved might also be the another factor. In most of the cases the field bunds act as a common boundary for more than one farmer and hence lack of co-operation among these farmers might be the other cause.

Avoidance of keeping haystacks in nearby fields was done by 56.67 per cent and 30 per cent of FFS farmers and non-FFS farmers respectively, while 65.00 per cent of

FFS farmers and 48.33 per cent of non-FFS farmers were having aware of it. The reason for this low level of adoption might be due to the low level of awareness about the practice and the labour shortage for transporting away from the fields.

Due to the minimum level of awareness (26.67%) and 23.00 per cent by FFS and non-FFS farmers respectively very less (3.3% and 0% of FFS and non-FFS farmers) had adopted the practice, digging burrows and killing the rats. The reasons for the narrow bunds hold good here as well. Moreover rat control can be effective only if done on a collective manner by all the paddy growers in the given paddy belt and not by an individual farmer alone. Set up of indigenous rat traps were practiced by 68.33 per cent and 65.00 per cent of FFS farmers and non-FFS farmers respectively, though 90.00 per cent and 86.67 per cent of these categories of farmers were aware of it. This suggests for strengthening the use of indigenous rat traps which is an age old practice. Use of tablets to control the rat was also practiced only by 5.00 per cent of both the categories. This was due to the fact that only 31.67 per cent and 18.33 per cent were aware about that. The cost of the tablet and also the procedure involved while placing the aluminium phosphide tablets might be the reasons for this result. This also suggests the need for popularising this practice on a larger scale among paddy growers. The higher percentage of setting up of indigenous rat traps which do not involve any chemicals also might be the other reason for the results on the use of aluminium phosphide.

Blast

The data on management of Blast disease, with regard to the practice namely optimum spacing was similar to those employed for the management of the pest yellow

stem borer, leaf folder and also gall midge. The practice of fungicidal seed treatment for Blast management the result was in consistent with the result of yellow stem borer and brown plant hopper. The reasons discussed for those insects are applicable for the Blast disease management also. In the case of Blast optimum spacing, seed treatment were being practiced as that of stem borer. It was also found out that 63.33 per cent and 43.33 per cent of FFS and non-FFS farmers were aware about the practice, the avoidance of cultivating susceptible varieties. But only 8.33 per cent and 3.33 per cent of them had adopted. The FFS farmers and non-FFS farmers had expressed that for selection of a variety they would consider yield alone as primary criteria.

The practice intensity based correct amount of chemical spray was being practiced by 73.26 per cent, 56.65 per cent of FFS and non-FFS farmers respectively. While 86.67 per cent and 66.67 per cent were aware about that practice. While the fact remains that the farmers experienced difficulties on the management of insect pests (the number of which could be observable by their magnitude), it might have been perceived as much more difficult to assess the intensity of the Blast disease, by virtue of the occurrence of the spots and coalescence of the spots at later stage giving a Blast appearance. This might have been the reason for the results on intensity based chemical spray. It was also observed that the farmers found it difficult to remember the "Blast disease intensity based "quantum of fungicidal spray" due to the absence of guidance.

Tungro

In the case of management of Tungro disease caused by a vector, the practice viz., summer ploughing exhibited in similar results with regard to awareness and adoption for

FFS and non-FFS farmers as that of the management practices for yellow stem borer and leaf folder. The removal of weeds for Tungro management was known to cent per cent of the FFS and non-FFS farmers with a vast majority of both these categories of farmers (95.00% and 96.67% respectively) adopting this practice. The gravity in terms of crop loss, due to the Tungro might be attributed for this result. It can also be inferred from the table 7 that 31.00 per cent of FFS and 25.00 per cent of non-FFS alone were aware about burning of stubbles and infected plant debris. Due to low awareness and labour scarcity only 6.67 per cent and 5.00 per cent of them had adopted this practice. The tendency of the paddy growers is to leave the paddy stubbles and infected plant debris in (as is were condition after the harvest of paddy crop). Even in circumstances like rice fallow pulses, the stubbles are allowed to remain with pulses coming up. Farmers have puddled the stubbles in "*in situ* condition" only while they go for the subsequent crop. This might be the reason for not burning the stubbles and infected plant debris by a vast majority of even the FFS-farmers. These results indicate the need for advocating the practice of burning the stubbles and infected plant debris, a far effective Tungro management.

The management of Tungro disease through the practice use of neem products exhibited in the similar results as that of management of yellow stem borer, leaf folder, gall midge and Brown plant hopper with regard to their awareness and adoption of both FFS and non-FFS farmers. While the practice intensity based correct amount of sprayed also exhibited in similar results as that of the management of Blast and BLS with respect to its awareness and adoption.

Brown Leaf Spot

With regard to the management of Brown leaf spot, 38.33 per cent and 8.33 per cent of FFS and non-FFS only were aware for adjusting the planting time among FFS and non-FFS farmers. But it had only minimum adoption (11.67% and 3.33%) by both of them. This might be due to the fact that the planting time is based only on the water availability at every farmer's field level. The prevalence of field to field irrigation would naturally lead to differences in water availability and hence adjusting the planting time might have been a constraint. Hence the practice had shown minimum level of adoption. Similarly even though the FFS farmers were having more awareness (80.00%) about the use of disease free seeds only 10.00 per cent had adopted. In the case of non-FFS farmers 61.67 per cent were aware but only 1.67 per cent adopted it.

This might be due to fact that the farmers had no practice of selecting the seeds for sowing in the nursery, but had the tendency to use either their own seeds without following any norms or use seeds purchased then and there. The practice of fungicidal seed treatment to arrest the seed borne disease was also found to be at the low level ranging between 8.33 per cent and 20.00 per cent only (Table 7). This might be the cause for the poor results. Use of slow releasing N-fertilizer was known to a higher level of awareness (96.67% and 95.00%) of both the categories respectively. This was adopted by 95.00 per cent and 78.33 per cent by both of them respectively. The large scale extension efforts on popularising the use of neem/tar coated urea accelerated by the increased cost of urea and the soluble/volatile nature of this nitrogenous fertilizer had acted as a favourable factors for the adoption of the slow releasing nitrogenous fertilizer at a large

scale. Even though the practice removal of infected plant debris were having high level of awareness (80.00% and 65.00%) by both of FFS and non-FFS farmers, only minimum (35.00% and 10.00%) had adopted it due to the labour scarcity and other reasons related with burning of stubbles and infected plant debris. The results on removal of weeds for Brown leaf spot management were identical to that of Tungro disease management. Similarly the results on the practices viz., seed treatment and intensity based chemical spray were identical to that of Blast disease management.

4.2b Distribution of FFS and non-FFS farmers according to their awareness, knowledge and adoption

It could be observed from the table 8 that high level of awareness of IPM practices was prevalent only amongst 35.00 per cent of the FFS farmers followed by 36.67 per cent of non-FFS farmers who had medium level of awareness. The high level of awareness to the tune of 31.67 per cent amongst non-FFS farmers and 33.33 per cent of them with medium level of awareness is a favourable sign prevailing among the farmers who had not undergone the FFS. The reason for this level amongst them might be due to the other communication sources and their desire to adopt IPM measures. The table also indicated that 28.33 per cent and 35.00 per cent of the FFS and non-FFS farmers had low level of awareness (Fig 3).

With regard to the knowledge, 40.00 per cent of the FFS farmers and 23.33 per cent only of the non-FFS farmers had high level of knowledge. That is the trainings through Farmers Field School, frequent contact with extension agency, FFS farmers enhanced their knowledge about IPM than the non-FFS farmers. Further it was also

FIG.3.DISTRIBUTION OF FFS AND NON-FFS FARMERS ACCORDING TO THEIR AWARENESS

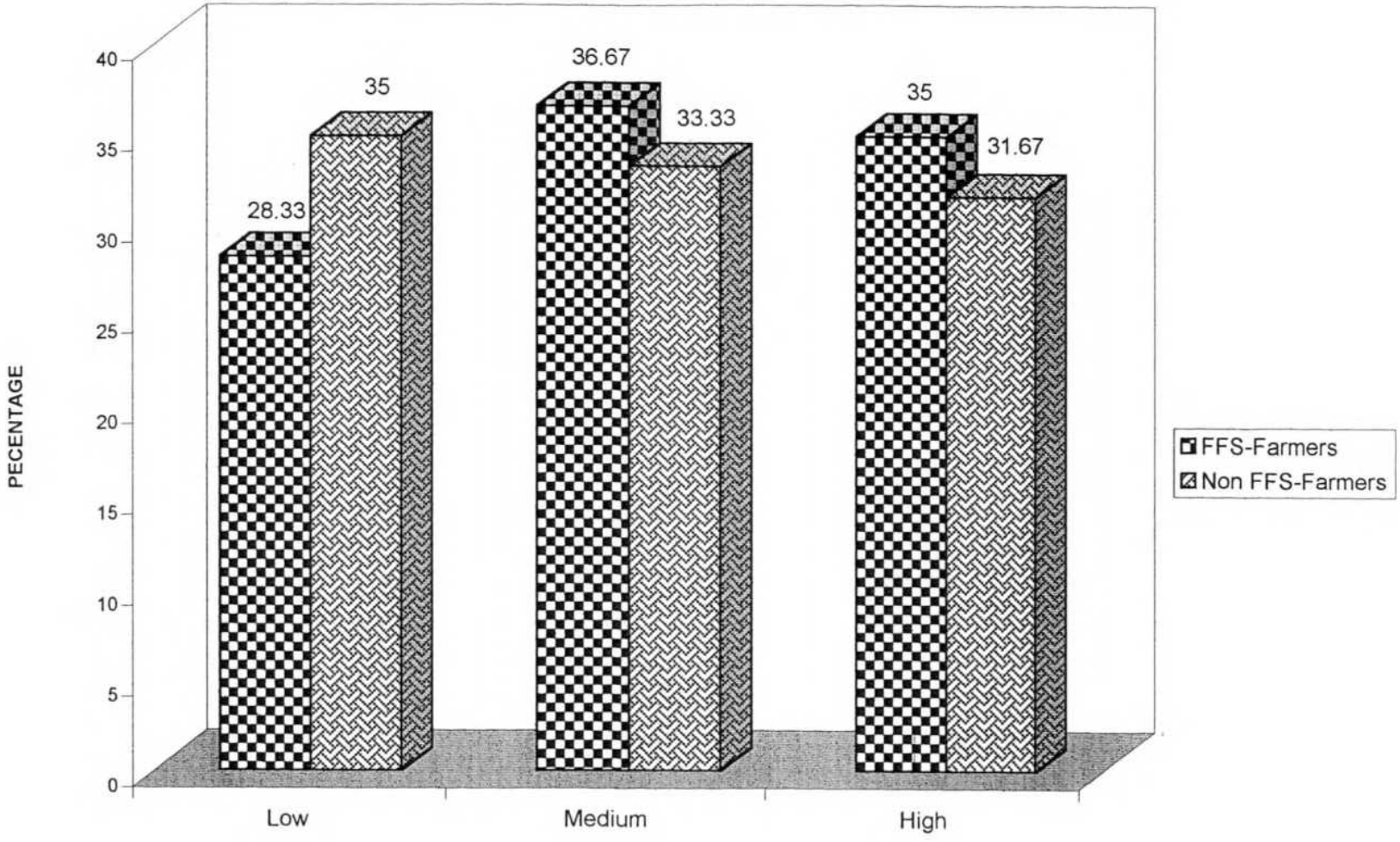
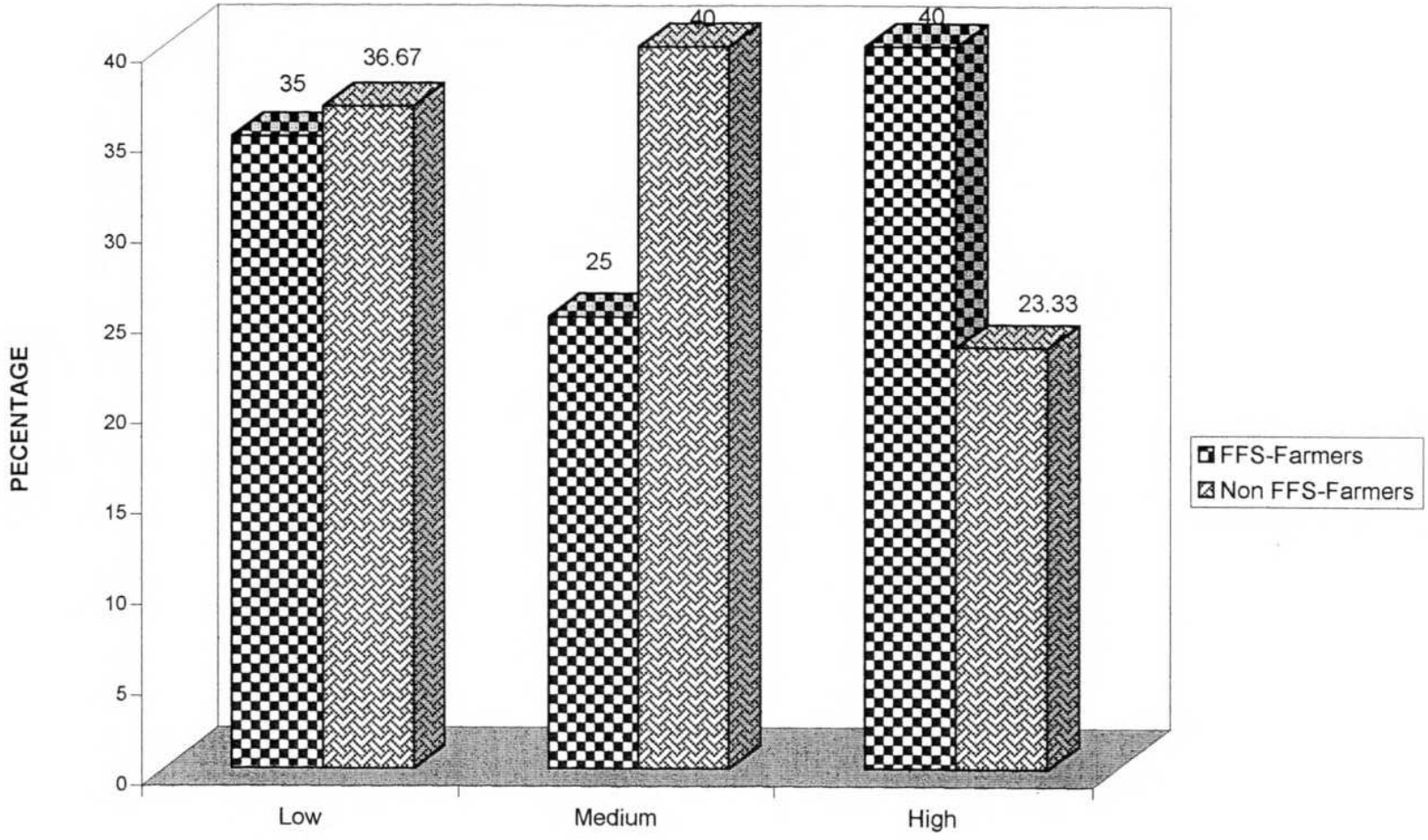


Table.8. Distribution of respondents according to their awareness , knowledge and adoption.

VARIABLES	CATEGORY	FFS		Non-FFS	
		Number	Per cent	Number	Per cent
1.Awareness	Low	17	28.33	21	35.00
	Medium	22	36.67	20	33.33
	High	21	35.00	19	31.67
2.Knowledge	Low	21	35.00	22	36.67
	Medium	15	25.00	24	40.00
	High	24	40.00	14	23.33
3.Adoption	Low	24	40.00	20	33.33
	Medium	19	31.67	22	36.67
	High	17	28.33	18	30.00

FIG.4.DISTRIBUTION OF FFS AND NON-FFS FARMERS ACCORDING TO THEIR KNOWLEDGE



observed that 25.00 per cent and 40.00 per cent of FFS and non-FFS farmers possessed medium level of knowledge, which was followed by low level of knowledge among 35.00 per cent of FFS farmers and 36.67 per cent of non-FFS farmers. The information about the IPM provided for the FFS farmers through trainings facilitated them to have high level of knowledge than the non-FFS farmers(Fig 4).

In the case of adoption it could be seen from the table 8 that 40.00 per cent of FFS farmers and 33.33 per cent of non-FFS farmers had low adoption of IPM practices, while 31.67 per cent and 36.67 per cent of FFS and non-FFS farmers had medium level of adoption. It could also be seen from the table that only 28.33 per cent and 30.00 per cent of FFS and non-FFS farmers had high level of adoption (Fig 5).

The data collection was done (during January 2000). A week prior to that only the FFS was completed and also at that time paddy crop was at harvesting stage. Hence majority of the respondents had expressed that they would adopt the IPM practices learnt from FFS during the ensuing crop season. Hence the low level of adoption is justified. Apart from this, most of the FFS farmers were small and marginal farmers only, which might have also played as one of the factors with regard to adoption. It was also noticed that comparatively the non-FFS farmers were having higher level of farm size, education, economic status and risk orientation than the FFS farmers, which might have facilitated a little higher level of adoption. Even though the FFS machinery had improved the awareness and knowledge of FFS farmers, the time factor was a constraint to assess the improvement in their adoption.

FIG.5.DISTRIBUTION OF FFS AND NON-FFS FARMERS ACCORDING TO THEIR ADOPTION

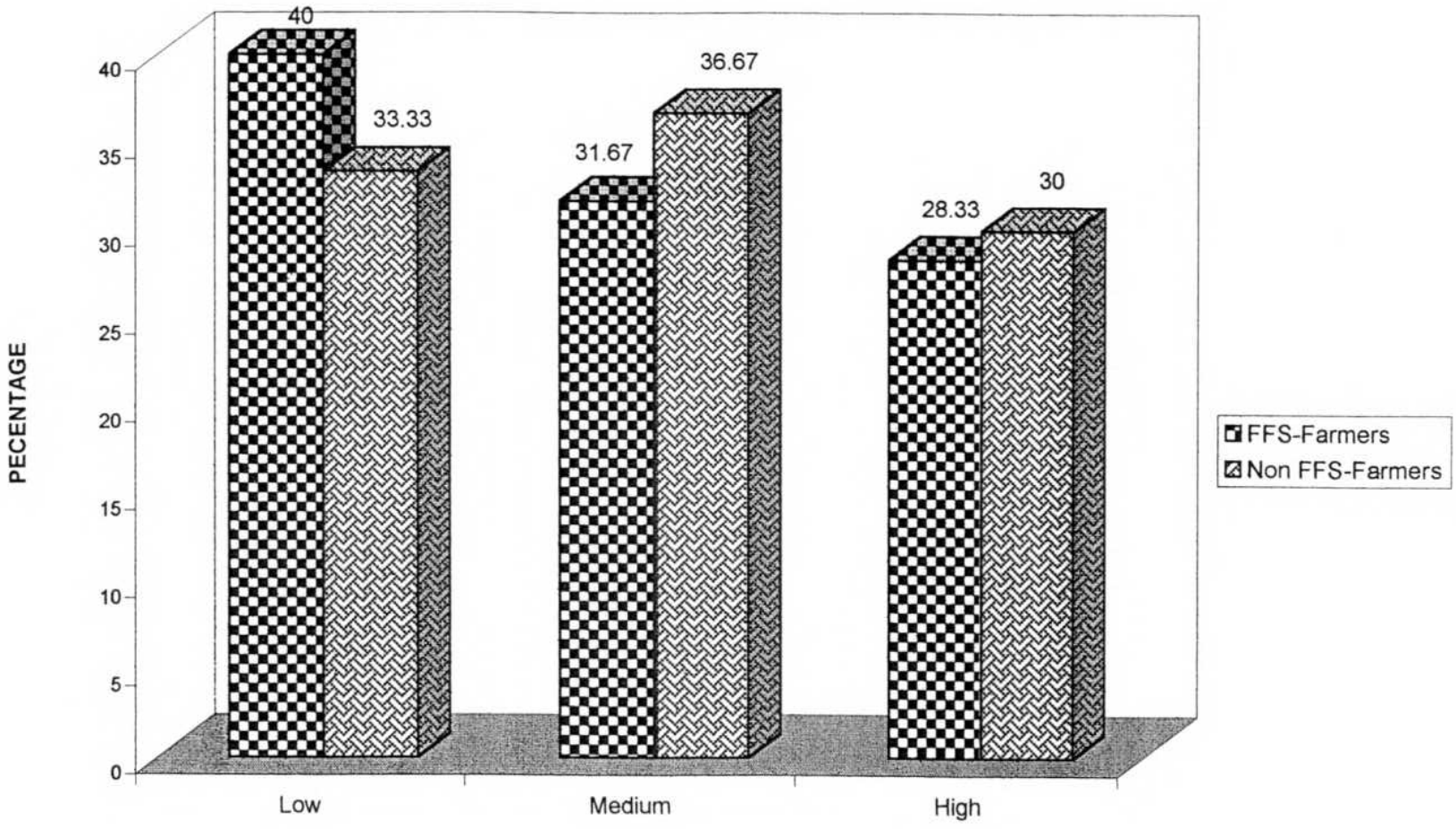


Table.9. Zero order correlation of characteristics of FFS and Non-FFS farmers with their awareness for Stem Borer control

INDEPENDENT VARIABLES	r-value							
	Agronomic methods		Physical methods		Biological methods		Chemical methods	
	FFS	Non-FFS	FFS	Non-FFS	FFS	Non-FFS	FFS	Non-FFS
1.Age	0.2116	0.0212	0.2142	-0.0362	-0.0110	-0.0738	0.1195	0.1502
2.Education	-0.0935	0.1278	0.0206	0.2441	0.1361	0.2452 *	0.0599	0.0634
3.Farm size	0.0640	-0.0558	-0.1510	0.0761	0.0767	-0.0293	-0.1223	0.1926
4.Farming experience	0.0171	-0.0389	0.1068	-0.1148	-0.2081	-0.1421	0.0552	0.1140
5.Area under paddy	0.0257	0.0137	0.0153	-0.0170	0.1023	0.1317	-0.0741	0.1499
6.Mass media exposure	0.0324	0.4169 * *	0.1083	0.3083 *	0.1430	0.0578	0.2446 *	0.2553 *
7.Contact with extension agency	0.0529	0.0887	0.0204	0.0990	0.1679	0.1400	0.0905	0.0785
8.Social participation	-0.0133	0.1210	-0.0416	-0.0321	0.0471	0.1456	0.0806	0.0741
9.Cosmopoliteness	0.0345	0.1687	-0.0700	0.3415 * *	-0.0687	0.0211	0.0585	0.4021 *.*
10.Economic motivation	0.0850	0.2102	0.1054	0.2160	-0.0543	0.1140	0.0715	0.0318
11.Scientific orientation	-0.0793	0.0768	0.3024 *	0.2823 *	0.2082	0.0768	0.1417	-0.0055
12.Progressiveness	0.1750	0.4219 * *	0.1805	0.3466 * *	0.2600 *	0.2559 *	0.1091	0.1127
13.Innovativeness	0.2912 *	0.1930	0.1848	0.2672 *	0.2084	0.0754	0.2483 *	0.0082
14.Risk orientation	0.0297	0.2330	0.1217	0.2686 *	0.1453	0.1591	-0.1294	0.1145
15.Training Undergone	0.0895	0.1468	-0.0153	0.1764	0.0935	0.0576	0.1334	0.0417
16.Possession of PPE	0.1766	0.0405	-0.0498	0.2261	0.2732 *	-0.0532	0.1012	0.3227 * *

* 5 Per cent level of significance

** 1 Per cent level of significance

4.3. Correlation of characteristics of the FFS and non-FFS farmers

4.3.1. Zero-order correlation co-efficient of characters of FFS and non-FFS farmers with their awareness for Stem Borer control

Agronomic methods

It is evident from the table 9 that innovativeness had exhibited in positively significant relationship with regard to the awareness of agronomic methods of control over stem borer among FFS farmers. In the case of non-FFS farmers mass media exposure and progressiveness had resulted in positively significant relationship, with regard to their awareness about the agronomic methods for the management of stem borer.

Though the agronomic methods seems to be old, In the case of integrated pest management it has been given in a modified regular manner. That is why the FFS farmers those who look for new venture (i.e. with high innovativeness) were having significant relationship with the agronomic methods.

In the case of non-FFS farmers the mass media was an important source for them about the IPM practices. Hence the mass media exposure had exhibited in positively significant relationship with them. The progressive nature of non-FFS farmers might have motivated them to look for all ventures to control the pests effectively. As the agronomic methods is one of the main components of IPM, the farmers with progressiveness and risk orientation were having more awareness about the agronomic methods. Hence the variable had significant relationship with regard to the non-FFS farmer's awareness towards the agronomic methods.

Physical methods

A perusal of Table 9 shows that scientific orientation had positive and significant relationship with respect to the awareness of physical methods for FFS farmers. In the case of non-FFS farmers cosmopoliteness and progressiveness had resulted in positive and highly significant relationship with their awareness while the mass media exposure, scientific orientation, innovativeness, risk orientation and possession of plant protection equipments had resulted in a positive and significant relationship with their awareness.

It could be seen that the FFS farmers who had high level of scientific orientation would look for the use of light traps and pheromone traps and it was a new approach towards pest control. Hence the FFS and non-FFS farmers with more scientific orientation had more awareness about the physical methods.

Cosmopoliteness had exhibited in significant relationship with regard to the awareness about physical methods for non-FFS farmers. This was due to the fact that, their high level of urban contact and cosmopolite nature would have lead to more interaction with other farmers. Hence through this nature the non-FFS farmers with high level of cosmopoliteness would have gathered more amount of information about the physical methods of control.

The non-FFS farmer with high level of progressiveness would always be receptive to new methods of pest management. As the use of light trap was new In the case of stem borer management for the non-FFS farmers, those with more progressiveness had more awareness about the physical methods.

Similarly for non-FFS farmers, as the IPM was a new venture for them and the non-FFS farmers who were having high mass media exposure had more awareness about the physical methods than those with low level of exposure to mass media. The farmers with more risk orientation would have sought for information on physical methods, and it was being an entirely new practice for the control of stem borer for them. Hence the variable had significant relationship with regard to the awareness about physical methods.

The possession of plant protection equipments had resulted in positive and significant relationship with regard to the awareness of non-FFS farmers. Further, farmers who were owned plant protection equipments might have been motovated to garher for new methods of pest control than others. Hence the variable resulted with significant relationship with regard to the awareness about physical methods and it was found to be new to them.

Biological methods

It is clear from the table 9 that progressiveness, and possession of plant protection equipments was having positively significant relationship with regard to the awareness of biological control for FFS farmers. In the case of non-FFS farmers, education and progressiveness were having positively significant relationship with their awareness about biological methods.

The farmers who were having high level of progressiveness would always look for new information and modern developments towards pest control. That's why the FFS farmers with high level of progressiveness was having more awareness with regard to the

biological control as it involves the conservation of natural enemies, use of neem products which are all technically sound approaches towards stem borer control. The possession of plant protection equipments was also having the positive and significant relationship with the awareness that was due to the fact that the possession of plant protection equipments by the farmers will facilitate individualistic decision for plant protection irrespective of the method involved. Hence, the significance is observed.

In the case of non-FFS farmers, those who were having high level of education might have come to know about the biological control through several other sources. Similarly the non-FFS farmer who by virtue of their progressiveness might have known about the IPM measures. Hence, this variable had a significant relationship with the awareness about the biological methods for non-FFS farmers.

Chemical methods

It is inferred from the table 9 that for the FFS farmers' mass media exposure and innovativeness were having positively significant relationship with their awareness. In the case of non-FFS farmers cosmopoliteness and possession of plant protection equipments had exhibited in positive and highly and positively significant relationship, while the variable mass media exposure was having positively significant relationship with regard to the awareness of chemical control.

It is quite natural that farmers with high level of mass media exposure would have become more aware about the chemical control, which was observed among FFS as well

as non-FFS farmers. The farmers with more exposure to mass media and participation in exhibitions and meetings might have been provided with the information on the chemical methods such as chemical seed treatment and ETL-based chemical spray. Hence, the mass media exposure had resulted in positive and significant relationship for FFS and non-FFS farmers with regard to their awareness about the chemical methods for the management of stem borer.

In chemical control apart from the usual chemical methods, ETL-based spray has been introduced with the concept of IPM. Here the spraying has to be done only when the incidences of insect cross beyond the ETL level. That is why the FFS farmer who had high innovativeness was having high level of awareness towards chemical control of stem borer.

In the case of non-FFS farmers, those farmers who were having high level of cosmopoliteness, would have been receptive for new information. That is why this variable had significant relation with regard to awareness on chemical method of pest control for non-FFS farmers.

The variable possession of plant protection equipments had also resulted positive and positively significant relationship with awareness about chemical methods of control over yellow stem borer, for non-FFS farmers. The reasons exhibited in for the biological methods of control over yellow stem borer can hold good here also for the management of same insect.

Table.10. Zero order correlation of characteristics of FFS and Non-FFS farmers with their awareness for Leaf Folder control

	r-value							
	Agronomic methods		Physical methods		Biological methods		Chemical methods	
INDEPENDENTVARIABLES	FFS	Non-FFS	FFS	Non-FFS	FFS	Non-FFS	FFS	Non-FFS
1.Age	0.1768	-0.0246	-0.0466	-0.0005	-0.0110	-0.0738	0.0350	-0.0688
2.Education	0.0260	0.1069	0.1134	0.1299	0.1361	0.2452 *	0.0806	0.2371
3.Farm size	-0.0429	-0.0447	-0.1778	0.0747	0.0767	-0.0293	0.0221	-0.0644
4.Farming experience	0.1278	-0.0678	0.0385	-0.0116	-0.2081	-0.1421	-0.0366	0.1184
5.Area under paddy	-0.1787	-0.0381	-0.2085	0.0720	0.1023	0.1317	-0.0868	-0.1354
6.Mass media exposure	0.0461	0.3328 **	0.1611	0.2221	0.1430	0.0578	-0.0843	0.2258
7.Contact with extension agency	0.0234	0.0299	0.0867	-0.0717	0.1679	0.1400	-0.1716	0.0250
8.Social participation	0.1266	0.0637	0.0464	-0.0346	0.0471	0.1456	-0.0616	0.1815
9.Cosmopoliteness	0.1019	0.0911	0.0400	0.1810	-0.0687	0.0211	0.2561 *	0.1731
10.Economic motivation	0.1613	0.0757	0.2022	0.1729	-0.0543	0.1140	0.0148	0.0986
11.Scientific orientation	-0.1191	0.0427	0.2529 *	0.2151	0.2082	0.0768	-0.0322	0.0260
12.Progressiveness	0.1223	0.2246	0.1190	0.2117	0.2600 *	0.2559 *	0.2399	0.3105 *
13.Innovativeness	0.3684 **	0.2163	0.2106	0.1766	0.2084	0.0754	0.2467 *	0.2131
14.Risk orientation	-0.1639	0.1840	0.0560	0.0390	0,1453	0.1591	-0.2683 *	0.2281
15.Training Undergone	0.1960	0.1392	-0.0513	0.0143	0.0935	0.0576	0.0256	0.3068 *
16.Possession of PPE	0.0112	0.1622	-0.1492	0.0581	0.2732	-0.0532	0.2221	0.1503

* 5 Per cent level of significance

** 1 Per cent level of significance

4.3.2. Zero order correlation co-efficient of characteristics of FFS and non-FFS farmers with their awareness on Leaf Folder control

It is clear from the table 10 that innovativeness had exhibited in positive and highly significant relationship with the awareness about agronomic methods for FFS farmers. In the case of non-FFS farmers mass media exposure had resulted in positive and highly significant relationship with regard to the awareness of agronomic practices for leaf folder control.

The FFS farmers those who had high level of innovativeness would always be receptive for the new information and In the case of the agronomic methods which include the practices such as synchronised sowing, need based fertilizer application and monitoring the pests for ETL level was all the practices which have been delivered for the control of leaf folder.

Mass media exposure had resulted in one per cent level of significant relationship with the awareness of agronomic methods of pest control, for non-FFS farmers. This might be due to the fact that for the non-FFS farmers, the mass media was the main information source than the others. Hence, mass media exposure had resulted in positively significant relationship with their awareness about agronomic methods.

Physical methods

It could be inferred from the table 10 that the variables scientific orientation had shown It is positively significant relationship with regard to the awareness for FFS farmers about physical methods. In the case of non-FFS farmers only the minimum

amount of respondents had known about the practice under physical method. Due to this low level of awareness low variation was resulted in their awareness. Hence no variable could find significant relationship with regard to their awareness.

As explained earlier the FFS respondents with the high level of scientific orientation and innovativeness would always have high level of affinity towards the new methods of pest control. As the physical method is one among them (new method), the variables had positive and significant relation with their awareness.

Biological methods

It could also be noticed from the table 10 that for FFS farmers progressiveness and possession of plant protection equipments had resulted in positive and significant relationship with regard to the awareness of biological methods. In the case of non-FFS farmers education and progressiveness were having positive and significant relationship with their awareness.

The farmers those who had high level of progressiveness would always try to receive the information of new and innovative approach viz., the use of plant products for pest control, conservation of natural enemies were all a new approach towards pest control. Hence, it had resulted in a significant relationship with regard to the awareness about biological methods of control over leaf folder.

Education is the key to unlock the mental barriers. Identification and conservation of predators and parasites needs some knowledge due to its complex nature. Hence the

more educated non-FFS farmers were having more awareness than the illiterates or others.

Progressiveness had also exhibited in a significant relationship with the awareness about biological methods for non-FFS farmers. As the progressive farmers were always receptive to the new methods such as biological control of pests it had shown significant relation with the farmers.

Chemical control

It is clear from the table 10 that cosmopoliteness, and innovativeness were having positive and significant relationship with regard to the awareness of chemical control for FFS farmers. It was also found that the risk orientation had resulted in a negative significant contribution with regard to the awareness about chemical control. It means that the farmer with low level of risk orientation would be having more awareness towards chemical control of leaf folder.

In the case of FFS farmers even though they were having low level of risk orientation, due to their cosmopoliteness, progressive and innovative nature they would have been gathered more amount of information about chemical control of leaf folder. Hence the risk orientation had exhibited in negatively significant relationship with their awareness.

Cosmopoliteness had resulted in significant relationship with their awareness. Those who were having more level of outside contact and cosmopolite nature could have gathered more amount of information. Therefore the farmer with more cosmopoliteness

might have more awareness about chemical control of leaf folder. Hence the variable had shown significant relationship with regard to their awareness about chemical control. A progressive and innovative farmer would always try to experiment with new practice. As the practice namely ETL-based spray was new towards the leaf folder control, the farmers with more progressiveness and innovativeness were having more awareness with regard to the chemical control of leaf folder. Similarly the possession of plant protection equipments also had positive and significant relationship with regard to the awareness of chemical methods.

In the case of non-FFS farmers progressiveness and trainings undergone had significant relationship with their awareness about chemical methods. It was also observed that majority of the respondents used to observe the spraying operation, which shows their precautionary nature towards the spraying with regard to chemical control. Therefore to have effective control over the pests, the farmers with more precaution and possession of plant protection equipments would have gathered more amount of information.

Progressiveness and trainings undergone had exhibited in significant relationship with regard to the awareness of non-FFS farmers. The farmer who had undergone trainings might be a progressive farmer, who would be having the eager to gather and try for new approaches towards the pest control. Hence, the variables had resulted in significant relation with the awareness.

Table.11. Zero order correlation of characteristics of FFS and Non-FFS farmers with their awareness for Gall Midge control

INDEPENDENT VARIABLES	r-value					
	Agronomic methods		Biological methods		Chemical methods	
	FFS	Non-FFS	FFS	Non-FFS	FFS	Non-FFS
1.Age	0.1134	-0.1188	-0.0110	-0.0738	0.0350	-0.0688
2.Education	-0.1184	-0.0522	0.1361	0.2452 *	0.0806	0.2371
3.Farm size	0.0678	-0.0507	0.0767	-0.0293	0.0221	-0.0644
4.Farming experience	-0.0186	-0.1187	-0.2081	-0.1421	-0.0366	0.1184
5.Area under paddy	-0.0140	-0.0264	0.1023	0.1317	-0.0868	-0.1354
6.Mass media exposure	-0.0133	0.1524	0.1430	0.0578	-0.0843	0.2258
7.Contact with extension agency	-0.0231	0.1170	0.1679	0.1400	-0.1716	0.0250
8.Social participation	0.1092	-0.0059	0.0471	0.1456	-0.0616	0.1815
9.Cosmopoliteness	-0.0063	-0.1056	-0.0687	0.0211	0.2561 *	0.1731
10.Economic motivation	0.0978	-0.0483	-0.0543	0.1140	0.0148	0.0986
11.Scientific orientation	-0.1333	-0.0997	0.2082	0.0768	-0.0322	0.0260
12.Progressiveness	0.1357	0.0140	0.2600 *	0.2559 *	0.2399	0.3105 *
13.Innovativeness	0.2312	-0.0700	0.2084	0.0754	0.2467 *	0.2131
14.Risk orientation	-0.0475	0.1384	0.1453	0.1591	-0.2683 *	0.2281
15.Training Undergone	0.1240	-0.0238	0.0935	0.0576	0.0256	0.3068 *
16.Possession of PPE	-0.0771	0.0553	0.2732 *	-0.0532	0.2221	0.1503

* 5 Per cent level of significance

** 1 Per cent level of significance

4.3.3. Zero order correlation co-efficient of characteristics of FFS and non-FFS farmers with their awareness for Gall Midge control

Agronomic methods

It could be inferred from the table 11 that for FFS and non- FFS farmers no variable was found to have significant relationship with regard to the awareness about the agronomic methods. This might be due to the fact that the farmers who belonged to both the categories were having awareness about the agronomic practices without much variation. Hence no variable exhibited in significant relationship towards the awareness about agronomic methods for the management of gall midge.

Biological methods

It could be seen from the table 11 that for FFS farmers, progressiveness, and possession of plant protection equipments had resulted in significant relationship with regard to the awareness of biological methods for gall midge control. In the case of non-FFS farmers, education and progressiveness were exhibited in significant relationship with regard to the awareness about the biological methods for gall midge management.

The variable progressiveness had shown a positively significant relationship with regard to the awareness for FFS farmers'. Those who have high level of progressiveness might always look for the information, which is new and intensive in nature. Conservation of natural enemies, i.e., predators and parasites and use of plant products for pest control was considered to be new towards pest control. Hence it had shown a positively significant relationship with the awareness.

Education acts as a key to remove the obstacles for receiving the information. Hence the more educated farmers who belonged to non-FFS category had more awareness than the illiterates. The points discussed under leaf folder pest holds good here too.

Progressiveness had shown a positively significant relationship with the non-FFS farmers. As the progressive farmers were always receptive to the new methods, viz., biological control of pests it had shown positively significant relation with the awareness.

Chemical methods

It could be observed from the table 11 that for FFS farmers the cosmopoliteness, and innovativeness exhibited in a positively significant relationship with the awareness of chemical control, while the variable risk orientation had negative and significant relation towards the awareness. In the case of non-FFS farmers, progressiveness and trainings undergone had exhibited in positively significant relationship with their awareness about chemical methods.

Cosmopoliteness had resulted in positively significant relationship with the awareness of FFS farmers. The farmers with more cosmopoliteness nature could have gathered more information about chemical control. Similarly an innovative farmer would be very eager to experience and practice new methods of farming. Hence he would have gathered more information than others.

Risk orientation had resulted in negatively significant relationship with regard to the awareness about chemical control of gall midge. The reasons discussed under leaf

Table.12. Zero order correlation of characteristics of FFS and Non-FFS farmers with their awareness for Brown Plant Hopper control

INDEPENDENT VARIABLES	r-value							
	Agronomic methods		Physical methods		Biological methods		Chemical methods	
	FFS	Non-FFS	FFS	Non-FFS	FFS	Non-FFS	FFS	Non-FFS
1.Age	0.0877	-0.0214	0.1225	-0.0495	-0.0110	-0.0738	0.0350	0.0142
2.Education	-0.2075	0.1698	-0.0873	0.2990 *	0.1361	0.2452 *	-0.0131	0.0918
3.Farm size	-0.0165	0.0436	0.1771	0.2506 *	0.0767	-0.0293	0.0406	-0.0721
4.Farming experience	-0.1461	-0.0401	0.0835	-0.1243	-0.2081	-0.1421	0.0012	-0.0202
5.Area under paddy	-0.0082	-0.0134	0.0889	0.1131	0.1023	0.1317	-0.0325	-0.1473
6.Mass media exposure	0.1132	0.2796 *	-0.0617	0.2402	0.1430	0.0578	0.1084	0.2878 *
7.Contact with extension agency	0.0389	-0.0231	0.0235	0.2218	0.1679	0.1400	0.3055 *	0.1707
8.Social participation	-0.0948	0.1734	-0.0394	0.1377	0.0471	0.1456	-0.1302	0.0657
9.Cosmopoliteness	-0.0618	0.2373	-0.0048	0.3961 * *	-0.0687	0.0211	0.2536 *	0.1408
10.Economic motivation	-0.1190	0.0104	0.0220	0.0564	-0.0543	0.1140	0.1402	0.0157
11.Scientific orientation	0.1313	-0.0589	0.1923	0.0522	0.2082	0.0768	0.2525 *	0.0199
12.Progressiveness	-0.0088	0.3086 *	0.3431 * *	0.2674 *	0.2600 *	0.2559 *	0.2352	0.2399
13.Innovativeness	0.1613	0.2646 *	0.1842	0.2650 *	0.2084	0.0754	0.1775	0.0729
14.Risk orientation	0.1317	0.2100	-0.0010	0.2700 *	0.1453	0.1591	-0.1623	0.2525 *
15.Training Undergone	-0.0604	0.1145	-0.0802	0.0551	0.0935	0.0576	-0.1630	0.2701 *
16.Possession of PPE	0.0174	0.1697	0.1102	0.2654 *	0.2732	-0.0532	0.1367	0.1636

* 5 Per cent level of significance

** 1 Per cent level of significance

folder hold well here also. A progressive farmer slightly to be one-step ahead in receiving the information and practicing them. Hence the progressive non-FFS farmers might have had more awareness about the chemical control. The trainings undergone also had exhibited in positive and significant relationship with regard to the awareness about chemical control.

As trainings are one of the information disseminating aids in extension, it had increased the awareness and knowledge of the farming community. Hence the variable had resulted in the significant relation with the awareness about the gall midge management using chemical methods.

4.3.4. Zero order correlation co-efficient of characteristics of FFS and non-FFS farmers with their awareness for Brown Plant Hopper control

Agronomic methods

It could be observed from the table 12 that no variable was having significant relation with the awareness about agronomic methods for FFS farmers. This might be due to the low variation among the FFS farmers with regard to their awareness about using the agronomic methods for Brown plant hopper management.

In the case of non-FFS farmers, progressiveness had resulted in a highly and positively significant relationship with their awareness, while the mass media exposure and innovativeness had shown positively significant relationship with regard to their awareness about agronomic methods.

A farmer with more exposure to mass media would have gathered more information about the management of Brown plant hopper through agronomic methods. Hence the mass media exposure had shown positively significant relationship with their awareness. A farmer with progressive and innovative nature might be having more inclination towards new approaches of pest control. As the practices such as the selection of variety, crop rotation, alternate flooding and draining were the new approaches towards the Brown plant hopper control, progressive and innovative farmers were having more awareness about the agronomic methods.

Physical methods

It is evident from the table 12 that for FFS farmers, progressiveness had resulted in highly positively significant relation with their awareness. It meant that the progressive farmers would always be receptive to new approach towards the Brown plant hopper control viz., the use of light trap.

In the case of non-FFS farmers, cosmopoliteness was having highly positively significant relationship with the awareness while education, farm size, progressiveness, innovativeness, risk orientation and possession of plant protection equipments had exhibited in their positively significant relationship with regard to their awareness about physical methods of controlling Brown plant hopper.

It is quite natural that the farmers with high level of cosmopoliteness, would be receptive to new methods (or) any alternative methods of pest control, instead of

following the same methods. Hence the cosmopoliteness had shown significant relationship with the awareness about physical methods.

In the case of non-FFS farmers, those who had higher education might be more enthusiastic to gather information regarding modern methods of Brown plant hopper control. It is relatively easy for the educated farmers to install and maintain the light trap. Hence the variable had resulted in the positive and significant relationship with their awareness. As explained In the case of FFS farmers, the progressiveness had exhibited in significance with regard to the awareness about physical methods for non-FFS farmers.

Big farmers might have been more eager towards the use of light trap. That is why farm size had shown positive and significant relationship with the awareness.

It is a fact that the farmers with high level of innovativeness and risk orientation would be having the receptiveness towards the new methods of pest control viz., using the physical methods for the management of Brown plant hopper. Similarly possession of plant protection equipments also had a positive and significant relationship with the awareness. High level of possession of plant protection equipments positively influenced the awareness towards the physical methods of management for Brown plant hopper.

Biological methods

It is clear from the table 12 that progressiveness, and possession of plant protection equipments revealed a significant relationship with the awareness for FFS farmers. In the case of non-FFS farmers, progressiveness had resulted in positively significant relationship with the awareness about biological methods.

It is quite clear that the farmers who were having high level of progressiveness would always be awaiting for new information and modern developments towards pest control. The FFS and non-FFS farmers with high level of progressiveness would have been receptive for new methods i.e., biological control as it involves the conservation of natural enemies, use of bio-products which were all new approaches towards the control of Brown plant hopper. The possession of plant protection equipments had shown positive and significant relationship with the awareness, which was due to the fact that these farmers have had more inclination towards new (biological) methods. In the case of non-FFS farmers, those with high level of education might have looked for biological control with eagerness to have effective control over Brown plant hopper.

Chemical methods

It could be observed from the table 12 that for the FFS farmers contact with extension agency had resulted in significance towards their awareness about chemical methods of control. In the case of non-FFS farmers, mass media exposure, progressiveness, risk orientation and trainings undergone had resulted in positive and significant relationship towards their awareness.

Contact with extension agency had shown positively significant relation with the awareness of FFS farmers. Through the regular contact with extension agency the FFS farmers would have received more amount of information about the chemical control of BPH.

With regard to the non-FFS farmers, mass media exposure had exhibited in positively significant relationship with their awareness. As the mass media is one of the main information sources for the non-FFS farmers, those who had more exposure to mass media could have gathered more information about chemical control of Brown plant hopper.

The farmers with more cosmopoliteness could have received more information about IPM and its components through increased interaction with resource persons. Hence it was found to have significant with FFS farmers awareness about chemical control of Brown plant hopper. The variable scientific orientation had resulted in positively significant relationship with respect to the awareness of FFS farmers. The farmers with this quality would be eager to hear and try new methods. Hence they were having more awareness about the chemical methods such as seed treatment, ETL-based spray etc., for the management of Brown plant hopper.

Risk orientation had exhibited in the positively significant relation with the awareness of non-FFS farmers. As explained earlier the farmers with more risk orientation would be receptive to new methods. Hence they were having more awareness about the chemical control of Brown plant hopper.

As in the case of leaf folder and gall midge pests, the trainings undergone had exhibited in significant relation with respect to the awareness of non-FFS farmers about chemical control of Brown plant hopper.

Table.13. Zero order correlation of characteristics of FFS and Non-FFS farmers with their awareness for Rat control

INDEPENDENT VARIABLES	r-value					
	Agronomic methods		Physical methods		Chemical methods	
	FFS	Non-FFS	FFS	Non-FFS	FFS	Non-FFS
1.Age	0.1007	-0.1240	0.0435	-0.1339	0.1980	0.1947
2.Education	0.0740	0.1627	-0.0722	-0.1866	0.0532	-0.0344
3.Farm size	0.2057	-0.1160	0.0479	0.0258	0.0473	0.3115*
4.Farming experience	-0.1633	-0.1061	0.0562	-0.1347	0.0604	0.1434
5.Area under paddy	0.1274	-0.0605	0.1139	-0.1849	0.0000	0.1910
6.Mass media exposure	0.2480 *	0.0803	0.1031	-0.0111	0.1424	0.2744 *
7.Contact with extension agency	0.0728	-0.1532	0.0265	-0.0018	-0.0221	-0.0504
8.Social participation	0.1024	0.0946	-0.2063	0.1261	0.0000	-0.0115
9.Cosmopoliteness	0.0422	0.1109	-0.0916	0.0159	-0.0674	-0.0769
10.Economic motivation	0.0995	0.2419	0.2388	-0.0410	-0.0692	0.0297
11.Scientific orientation	-0.0299	0.1098	0.0226	0.0074	0.0768	0.1597
12.Progressiveness	0.2939 *	0.1690	0.1586	0.0022	0.2080	0.2130
13.Innovativeness	0.2332	0.1408	0.1537	0.1045	0.2215	0.2160
14.Risk orientation	0.1123	0.0176	0.1167	0.0073	0.0391	0.2100
15.Training Undergone	0.1654	0.3379 * *	-0.0283	0.1410	-0.0346	0.1123
16.Possession of PPE	0.2431	0.0000	0.1232	0.0000	0.0148	0.0969

* 5 Per cent level of significance

** 1 Per cent level of significance

4.3.5. Zero order correlation co-efficient of characteristics of FFS and Non-FFS farmers with their awareness for Rat control

Agronomic methods

It could be inferred from the table 13 that mass media exposure and progressiveness, had shown positive and significant relationship with regard to the awareness of agronomic practices for FFS farmers, whereas for non-FFS farmers trainings undergone had exhibited in positive and highly significant relationship with regard to their awareness on rat control.

The farmers with high level of mass media exposure and progressiveness might be having more awareness towards the new methods of rat control because of the fact that they tend to be ahead of other farmers in the case of awareness and adoption.

Trainings undergone also act as an important variable to enhance the awareness and knowledge about the IPM. Hence the variable was found to have positively significant relationship with the awareness for non-FFS farmers.

Physical methods

It could be seen from the table 13 that a vast majority of the FFS and non-FFS farmers knew about the use of indigenous rat traps, which would have resulted in the low level of variation with regard to the awareness among the FFS and non-FFS farmers. No variable was found to have positively significant relationship with regard to their awareness about physical methods over the control of rat.

Table.14. Zero order correlation of characteristics of FFS and Non-FFS farmers with their awareness for Blast control

INDEPENDENT VARIABLES	r-value					
	Agronomic methods		Physical methods		Chemical methods	
	FFS	Non-FFS	FFS	Non-FFS	FFS	Non-FFS
1.Age	0.0062	-0.1626	0.1201	0.0000	-0.0015	0.0469
2.Education	-0.1233	0.4321 * *	-0.0937	0.0962	0.0351	0.2914 *
3.Farm size	-0.1131	0.0856	0.2172	-0.1185	0.0627	0.1609
4.Farming experience	0.1100	-0.2396	0.0736	0.0048	0.0927	-0.0083
5.Area under paddy	-0.1108	0.1799	0.0935	-0.0909	0.2171	0.0470
6.Mass media exposure	0.0187	0.4149 * *	-0.0050	0.0486	0.2221	0.4927 * *
7.Contact with extension agency	-0.1115	0.0193	-0.0531	-0.1229	0.2690 *	0.0877
8.Social participation	0.0555	0.0781	-0.1142	0.1043	0.0617	0.2888 *
9.Cosmopoliteness	0.0035	0.3883 * *	-0.2198	0.0853	0.2860 *	0.3993 * *
10.Economic motivation	0.0945	0.2272	0.0829	0.2259	0.2032	0.2154
11.Scientific orientation	-0.2332	0.2478 *	-0.1252	0.0655	0.0863	0.2043
12.Progressiveness	-0.2043	0.4270 * *	0.1462	0.1426	0.2612 *	0.4490 * *
13.Innovativeness	-0.1183	0.4450 * *	-0.0558	-0.0763	0.2437	0.2451 * *
14.Risk orientation	-0.1283	0.2283	-0.0991	0.1048	-0.1692	0.3174 *
15.Training Undergone	-0.0318	0.0591	-0.1794	0.2067	0.0406	0.3783 * *
16.Possession of PPE	-0.2094	0.1997	0.1292	-0.2152	0.1018	0.2921 *

* 5 Per cent level of significance

** 1 Per cent level of significance

Chemical methods

It is evident from the table 13 that no variable had shown any significant relationship with regard to the awareness of chemical control of rat (use of aluminium phosphide tablets). This might be due to the existence of low level of variation among the FFS farmers with regard to their awareness. In the case of non-FFS farmers, farm size and mass media exposure, had shown positive and significant relationship with their awareness about chemical methods of control over rat.

The farmers with more farm size might have tried to control rats with new methods. Hence they would have tried to gather more information regarding chemical control.

More mass media exposure would have made a non-FFS farmer to be equipped with more amount of information regarding the chemical methods through the frequent exposure to mass media. Use of rat control tablets is one among them as a chemical control. Hence the results are justified.

4.3.6. Zero order correlation co-efficient of characteristics of FFS and non-FFS farmers with their awareness for Blast control

Agronomic methods

It is inferred from the table 14 that majority of the FFS farmers knew the practice of optimum spacing which might have resulted in the low level of variation among the FFS farmers with regard to the awareness. Hence no variable was found to have

positively significant relationship with regard to their awareness about physical methods for the control of Blast.

With regard to non-FFS farmers, education, mass media exposure, cosmopoliteness, progressiveness and innovativeness had exhibited in positive and highly significant relationship with the awareness of agronomic methods for the control of Blast, whereas the scientific orientation and risk orientation had shown significant relationship with the awareness of agronomic methods.

Education provided positive and significant influence towards the awareness about agronomic practices for non-FFS farmers. Because the educated farmers might be eager to gather information on any aspect of pest control and would try to understand them, than others.

The non-FFS farmers with high mass media exposure could have got more information regarding the control of Blast through agronomic methods, because mass media was the main source of information for the non-FFS farmers rather than others. Hence the results on the significant relationship with the awareness are justified.

Cosmopoliteness also had a positive and significant relationship with regard to the awareness about agronomic methods. It is natural that a person with more level of outside contact and cosmopolite nature could have gathered more information through the interaction with the outside sources. It is quite natural that the farmers with high level of cosmopoliteness and progressiveness would be receptive to new information with regard to pest control. Though agronomic practices seemed to be not novel, these have been

disseminated. Hence, these variables had shown positive and highly significant relationship with the awareness. As explained earlier, scientific orientation and risk orientation had exhibited in significance with the awareness among non-FFS farmers. The increased scientific orientation and risk orientation justify the results.

Physical methods

It could be observed from the table 14 that for FFS and non-FFS farmers no variable was found to show significant relationship with regard to the awareness about physical methods for Blast control. This might be because of the low variation among the FFS and non-FFS farmers with regard to their awareness about the physical methods for the control of Blast.

Chemical methods

It could be inferred from the table 14 that the FFS farmers were having positive and significant relation with the contact with extension agency, cosmopoliteness, and progressiveness with the awareness.

In the case of non-FFS farmers the variables mass media exposure, cosmopoliteness, progressiveness, and trainings undergone were having positive and highly significant relation with the awareness, while the education, social participation, innovativeness and possession of plant protection equipments had resulted in a positively significant relationship with their awareness about chemical methods.

Contact with extension agency had exhibited in positively significant relationship with the awareness for FFS farmers. It is clear that the farmers with high

level of contact with extension agency might be having more awareness about the chemical control. Similarly mass media exposure was also having positively significant relationship for non-FFS farmers.

Cosmopoliteness had shown positively significant relationship with the awareness of FFS as well as non-FFS farmers. This was due to the fact that the farmer with more level of urban contact and frequent interaction could have gathered information about the seed treatment, correct amount of chemical spray etc.

Progressiveness and innovativeness had exhibited positively significant relation with regard to the awareness among FFS farmers. It is quite natural that the farmers with high level of progressiveness and innovativeness would always be receptive to new approaches. The intensity based chemical spray was found to be new to the respondents with regard to the Blast management. Hence they might have gathered more information about the chemical methods. Similarly for non-FFS farmers also the progressiveness and innovativeness had exhibited in highly significant relationship with their awareness about the chemical methods for the control of Blast.

Trainings undergone also had shown a positively significant relationship with the awareness among non-FFS farmers. The farmers who had undergone trainings had more awareness than others with regard to the chemical control of Blast.

Similarly, education and social participation had also resulted in positively significant relation with awareness, as it was relatively simple for those educated farmers to remember chemical name, dosage and correct time of spraying.

Table.15. Zero order correlation of characteristics of FFS and Non-FFS farmers with their awareness for Tungro control

INDEPENDENT VARIABLES	r-value					
	Physical methods		Biological methods		Chemical methods	
	FFS	Non-FFS	FFS	Non-FFS	FFS	Non-FFS
1.Age	0.1735	0.1434	-0.2438	0.0758	0.0899	0.0613
2.Education	0.0117	-0.1496	0.0554	-0.0365	0.0002	0.0876
3.Farm size	-0.0072	0.4065 **	0.1136	0.0000	-0.0071	0.0256
4.Farming experience	-0.0926	0.1410	0.0597	0.1068	-0.0311	0.0713
5.Area under paddy	0.0087	0.2618 *	0.1631	0.0579	-0.0495	0.0345
6.Mass media exposure	0.2834 *	0.1680	0.0643	-0.1850	0.2130	0.2410
7.Contact with extension agency	0.3040	-0.0380	0.1650	-0.0508	0.1652	0.1704
8.Social participation	-0.0832	-0.0923	-0.0636	-0.0298	0.1149	0.1923
9.Cosmopoliteness	-0.0400	-0.0188	0.2435	-0.2273	0.0216	0.0978
10.Economic motivation	0.1844	-0.0097	-0.0693	-0.1666	0.2438	-0.0707
11.Scientific orientation	0.1301	0.0649	-0.0486	0.0813	0.2726 *	0.0982
12.Progressiveness	0.1265	0.0701	-0.1754	-0.0750	0.1431	0.1623
13.Innovativeness	-0.0797	0.0822	-0.0981	0.0208	0.2064	0.1805
14.Risk orientation	0.0263	0.0187	-0.0045	-0.0966	-0.1674	0.2802 *
15.Training Undergone	-0.0788	-0.0164	-0.1749	-0.0203	-0.0071	0.1714
16.Possession of PPE	0.2523 *	0.0738	-0.0654	0.0000	0.0139	0.1114

* 5 Per cent level of significance

** 1 Per cent level of significance

The farmers with high level of innovativeness and possession of plant protection equipments could be expected to be eager to gather information and use the correct chemical with exact dosage to have effective control over the pests. Hence the variable had resulted in significant relationship, towards the awareness about chemical methods among non-FFS farmers.

4.3.7. Zero order correlation co-efficient of characteristics of FFS and non-FFS farmers with their awareness for Tungro control

Agronomic methods

Both the FFS and non-FFS farmers were having the cent per cent awareness about the agronomic practices summer ploughing and removal of weeds for the management of tungro. Hence due to the absence of variation no value could be obtained to identify the significant relationship of independent variables towards the awareness.

Physical methods

It is inferred from the table 15 that the mass media exposure contact with extension agency and Possession of plant protection equipment's had shown a positively significant relationship for FFS farmers with regard to their awareness towards physical methods for the tungro management. There were more chances for those farmers with high level of exposure to mass media to receive more information about the usage of physical method to control tungro.

The farmers contact with extension agency had exhibited in positively significant relationship with the awareness about physical methods. It shows the efforts

taken by the extension agency to disseminate the IPM towards the respondents. Possession of plant protection equipments also had exhibited in its positive and positively significant relationship with the awareness, due to the fact that the farmers with high level of possession might have gathered more information about the control of tungro by several means.

In the case of non-FFS farmers, farm size had shown positive and highly significant relationship with the awareness and the area under paddy resulted in the significant relationship with regard to their awareness about physical methods for the control of tungro.

The big farmers might have gathered information with regard to modern approaches in agriculture. Physical method of control was one of the latest concepts for controlling the pests. Hence the variable had shown its significant relationship with the awareness about physical methods of controlling tungro.

The farmers with large area under paddy would have experimented with new methods of pest control, of having the same one. Physical method was one of the new methods recommended for the control of Blast. Hence the results are justified.

Biological methods

The results of table 15 revealed that for FFS and non-FFS farmers, no variable was found to show significant relationship with regard to the awareness about biological methods for tungro management. This might be because of the reason that almost all of them knew about the use of neem products. Hence the very meagre amount of variation

Table.16. Zero order correlation of characteristics of FFS and Non-FFS farmers with their awareness for Brown Leaf Spot control

INDEPENDENT VARIABLES	r-value					
	Agronomic methods		Physical methods		Chemical methods	
	FFS	Non-FFS	FFS	Non-FFS	FFS	Non-FFS
1.Age	0.1544	0.0511	0.0535	-0.0988	-0.0015	0.0469
2.Education	0.2147	-0.1881	-0.1465	0.0396	0.0351	0.2914 *
3.Farm size	0.0746	0.0362	-0.0658	-0.0502	0.0627	0.1609
4.Farming experience	0.0060	0.0846	0.0972	-0.0350	0.0927	-0.0083
5.Area under paddy	0.0442	-0.0578	-0.1087	-0.0123	0.2171	0.0470
6.Mass media exposure	0.2721 *	0.0463	-0.1672	-0.0571	0.2221	0.4927 * *
7.Contact with extension agency	0.2927 *	-0.0658	-0.1035	0.1167	0.2690 *	0.0877
8.Social participation	0.1494	-0.1081	-0.0636	0.0493	0.0617	0.2888 *
9.Cosmopoliteness	0.2443	-0.1498	-0.1218	0.1579	0.2860 *	0.3993 * *
10.Economic motivation	0.0495	0.0294	-0.1058	-0.0048	0.2032	0.2154
11.Scientific orientation	0.1951	-0.1853	0.1441	0.1123	0.0863	0.2043
12.Progressiveness	0.3012 *	-0.0910	0.0292	0.1887	0.2612 *	0.4490 * *
13.Innovativeness	0.0988	-0.2159	-0.0140	0.0111	0.2437	0.2451 *
14.Risk orientation	0.1487	-0.0763	0.1978	0.0606	-0.1692	0.3174 * *
15.Training Undergone	0.2965 *	-0.0136	0.0437	0.2048	0.0406	0.3783 * *
16.Possession of PPE	0.1875	0.0000	-0.2336	0.0547	0.1018	0.2921 *

* 5 Per cent level of significance

** 1 Per cent level of significance

had lead to non-significant relationship by all the variables towards the awareness about biological methods among both the categories.

Chemical methods

A perusal of Table 15 revealed that for FFS farmers, scientific orientation had positively significant relationship with the awareness, while the risk orientation had shown the positively significant relationship with the awareness on chemical methods for non-FFS farmers. The farmers with these qualities might have been motivated to try new methods for the management of tungro.

4.3.8. Zero order correlation co-efficient of characteristics of FFS and non-FFS farmers with their awareness for Brown Leaf Spot control

Agronomic methods

It was found from the table 16 that the variables mass media exposure, contact with extension agency, progressiveness and trainings undergone were having positive and significant relationship with the awareness about agronomic methods for the FFS farmers. In the case of non-FFS farmers it was found that no variable was found to have significant relationship with the awareness, due to the low variation with their awareness of agronomic methods for the management of brown leaf spot.

Mass media exposure exhibited positive and significant relationship with the awareness. This might be because of the fact that the FFS farmers those who had high level of mass media exposure would have gathered more amount of information with regard to the management of brown leaf spot through agronomic methods.

Contact with extension agency had resulted in significant relation with the awareness. The farmers with high level of extension agency contact might have been equipped with all sort of information about the control of brown leaf spot through agronomic methods.

It is a fact that the farmers with a progressive nature would always tend to be receptive towards any new kind of information. That is why the variable had a significant relationship with their awareness about the practices such as adjusting the planting time, use of disease free seeds and application of neem coated urea etc.

Trainings undergone also had shown a significant relationship with regard to the awareness among the FFS farmers. This was because of the fact that in the study area, the FFS farmers had undergone training through Farmer's field school, through which they had heard and learnt more information regarding the agronomic methods of pest control.

Physical methods

It is learnt from the table 16 that no variable was found to have significant relationship towards the awareness about physical methods among both the categories. This might be due to the fact that, both the FFS and non-FFS farmers had known about the practice of removal of infected plant debris without much variation in their awareness. Hence, the non-significant relationship by the independent variables towards the awareness has resulted for both the categories.

Chemical methods

It is evident from the table 16 that the variables, contact with extension agency, cosmopoliteness, and progressiveness had resulted in positively significant relationship towards the awareness about physical methods for FFS farmers. In the case of non-FFS farmers, mass media exposure, cosmopoliteness, progressiveness, risk orientation and trainings undergone had resulted in positive and highly significant relationship with their awareness on chemical methods, whereas the variables education, social participation, innovativeness and possession of plant protection equipments had exhibited their significant relationship with their awareness about chemical methods.

The contact with extension agency also had shown significant relation with the awareness of FFS farmers. The non-FFS farmers with more exposure to mass media had more awareness, about chemical methods of controlling Brown leaf spot. Cosmopoliteness had shown significant relationship with awareness among FFS and non-FFS farmers. It means that the farmers with more cosmopoliteness nature had high level of awareness through the interaction. The non- FFS farmers, with high level of social participation had more awareness.

Progressiveness had shown a significant relationship with regard to the awareness of FFS farmers. The farmers with this quality would always tend to have more awareness. Progressiveness, risk orientation and trainings undergone were having highly significant relationship with the awareness for non-FFS farmers. The farmers with progressive nature and high level of orientation towards risk with more trainings might be having

Table.17. Zero order correlation of characteristics of FFS and Non-FFS farmers with their adoption for Stem Borer control

INDEPENDENT VARIABLES	r-value					
	Agronomic methods		Biological methods		Chemical methods	
	FFS	Non-FFS	FFS	Non-FFS	FFS	Non-FFS
1.Age	-0.0813	-0.0053	-0.0146	-0.0591	0.0947	0.0054
2.Education	0.3607 * *	0.1979	0.2508 *	0.2674 *	0.2759 *	-0.0007
3.Farm size	0.0783	0.1358	-0.0297	0.1077	0.0217	0.2042
4.Farming experience	-0.0790	-0.0630	0.1659	-0.0648	-0.1421	0.0235
5.Area under paddy	-0.0201	0.1368	-0.0616	0.0755	-0.1030	0.1409
6.Mass media exposure	0.1512	0.3707 * *	0.0273	0.2823 *	0.4408 * *	0.1900
7.Contact with extension agency	0.2605 *	0.1061	0.2841 *	0.0530	0.4239 * *	-0.0060
8.Social participation	0.2148	0.1950	0.0630	0.1468	0.2396	0.0402
9.Cosmopoliteness	0.1136	0.1466	0.2743 *	0.3369 * *	0.0794	0.0971
10.Economic motivation	-0.1614	0.0635	0.0625	-0.0917	0.0169	0.0730
11.Scientific orientation	0.0643	0.1650	0.1858	0.0378	0.3224 * *	0.0878
12.Progressiveness	0.1551	0.1962	0.0994	0.2392	0.2476 *	0.1511
13.Innovativeness	0.1872	0.2033	0.3157 *	0.1018	0.2318	0.0657
14.Risk orientation	0.1692	0.4168 * *	-0.1223	0.2939 *	0.1375	0.2433
15.Training Undergone	0.1028	0.2316	-0.0465	0.1693	0.1766	0.0617
16.Possession of PPE	0.0797	0.0264	-0.0040	0.2514 *	-0.0203	0.2781 *

* 5 Per cent level of significance

** 1 Per cent level of significance

more affinity towards the new approaches in the case of pest control. Hence these variables had resulted in significant relationship with their awareness about chemical methods. Economic motivation, scientific orientation, innovativeness and possession of plant protection equipments had exhibited the significant relationship with regard to the adoption of chemical methods. Similarly innovativeness and possession of plant protection equipments had also exhibited significant relationship with the awareness about the chemical methods for non-FFS farmers.

4.3.9. Zero order correlation coefficient of characteristics of FFS and non-FFS farmers with their adoption for Stem Borer control

Agronomic practices

It is evident from the table 17 that education was having positive and highly significant relationship with the adoption and contact with extension agency had positively significant relationship with regard to the adoption of agronomic practices for the control of stem borer by FFS farmers.

In the case of non-FFS farmers it was found that mass media exposure and risk orientation had resulted in positive and highly significant relationship with regard to their adoption of the agronomic methods for the management of stem borer.

It is clear from the table 17 that the educated farmers would have adopted new agronomic methods. The FFS farmers with high level of extension agency contact had more adoption of agronomic methods.

In the case of non-FFS farmers, those who were having high level of mass media exposure, might have been motivated to adopt the agronomic methods. Hence the variable had exhibited a highly significant relationship with adoption.

The non-FFS farmers who were having high level of orientation towards risk had shown significant relationship with adoption.

Physical methods

With regard to the physical methods 'zero' per cent adoption of pheromone trap was observed among the non-FFS farmers (Table 17). Hence due to the absence of variation, no values was obtained for this method to determine the significance.

Biological methods

It is clear from the table 17 that for FFS farmers innovativeness, contact with extension agency and cosmopoliteness had shown positive and significant relationship with regard to their adoption. In the case of the non-FFS farmers, cosmopoliteness had exhibited highly significant relationship with regard to their adoption of biological methods, while the education, mass media exposure, risk orientation and possession of plant protection equipments shown significant relationship with the adoption.

It is quite natural that the farmers with more contact with extension agency would have got more exposure to new ventures through change agents, which might have motivated them to adopt.

Cosmopoliteness had significant relationship with the adoption of FFS as well as non-FFS farmers. The farmers with more level of cosmopoliteness would have been motivated to adopt. Innovativeness was found to have significant relationship with the adoption of biological methods. The biological methods which were new towards the management of stem borer were adopted by the majority of innovative farmers.

Education had positive and significant relationship with the adoption of biological methods by the non-FFS farmers also which involve some complex methods and need knowledge.

Similarly, mass media exposure had resulted in significant relationship towards the adoption. Participation in demonstrations by the non-FFS farmers, exhibitions and forum through mass media might have motivated them to adopt. Hence it had shown significant relationship with the adoption.

Risk orientation had expressed significant relationship towards the adoption of biological methods. It is quite natural that the farmers with high level of risk orientation would be having the capacity to bear risk and to adopt any new method of pest control viz., the biological method which needs the risk bearing capacity to adopt.

More possession of plant protection equipments had resulted in significant relationship with their adoption of biological control.

Chemical methods

It is revealed from the table 17 that mass media exposure, contact with extension agency and scientific orientation were having positive and highly significant relationship for FFS farmers, while the education and progressiveness had significant relationship with the adoption of chemical control. In the case of non-FFS farmers possession of plant protection equipments had resulted in significant relation with regard to the adoption of chemical control.

The FFS-farmers with more mass media exposure and contact with extension agency had more adoption. This might be due to the fact that those with more change agency contact and regular mass media exposure would get updated with latest developments in pest management and its procedures, problems and their solutions.

Education had shown significant relationship with regard to the adoption of chemical control by the FFS and non-FFS farmers. This might due to the fact that it was also easy for the educated farmers to remember the ETL of stem borer and procedure for its control. Hence the significant relationship towards the adoption of chemical control is justified.

It is quite natural that the farmers with more level of scientific orientation would to practice new scientific approaches to adopt earlier. Hence the variable had shown significant relationship with adoption by FFS farmers. Similarly a progressive farmer would also have more level adoption of chemical methods. Hence the variable had exhibited its significant relationship with the adoption.

Table.18. Zero order correlation of characteristics of FFS and Non-FFS farmers with their adoption for Leaf Folder control

INDEPENDENT VARIABLES	Agronomic methods		Physical methods		Biological methods		Chemical methods	
	FFS	Non-FFS	FFS	Non-FFS	FFS	Non-FFS	FFS	Non-FFS
1.Age	0.0395	-0.0603	0.0440	0.0490	-0.0146	-0.0591	0.0887	0.0685
2.Education	0.4085 * *	0.2169	0.0670	0.1200	0.2508 *	0.2674*	0.3660 * *	0.2878 *
3.Farm size	0.0598	0.1061	-0.1176	-0.0270	-0.0297	0.1077	-0.1369	0.0516
4.Farming experience	-0.1365	-0.1167	0.3007*	0.0421	0.1659	-0.0648	0.0505	0.0253
5.Area under paddy	-0.1147	0.1399	-0.1487	0.0661	-0.0616	0.0755	-0.2326	0.1240
6.Mass media exposure	0.2176	0.3336 * *	0.0330	0.0743	0.0273	0.2823*	0.3567. * *	0.1139
7.Contact with extension agency	0.3039 *	0.1197	0.1191	-0.0575	0.2841 *	0.0530	0.4761 * *	-0.0266
8.Social participation	0.2165	0.2766 *	0.2427	-0.1074	0.0630	0.1468	0.1941	0.0530
9.Cosmopoliteness	0.2387	0.1652	0.1312	0.0748	0.2743 *	0.3369 * *	0.2187	0.2534 *
10.Economic motivation	-0.1723	0.0126	0.1291	0.0835	0.0625	-0.0917	-0.0325	-0.0225
11.Scientific orientation	0.0893	0.1962	0.1972	0.1126	0.1858	0.0378	0.1278	0.3013 *
12.Progressiveness	0.2595 *	0.2342	0.0400	0.1069	0.0994	0.2392	0.0035	0.1172
13.Innovativeness	0.3052 *	0.2399	0.2228	0.1189	0.3157 *	0.1018	0.0236	0.1945
14.Risk orientation	0.1240	0.4204 * *	-0.2491 *	-0.0176	-0.1223	0.2939 *	-0.1998	0.1964
15.Training Undergone	0.1869	0.2363	0.0187	-0.0796	-0.0465	0.1693	0.1265	0.1185
16.Possession of PPE	0.1383	0.0578	-0.1773	-0.1468	-0.0040	0.2514 *	0.0698	0.0937

* 5 Per cent level of significance

** 1 Per cent level of significance

In the case of non-FFS farmers, risk orientation had exhibited significant relationship with their adoption. It might be due to reason that the practice such as ETL-based spray of chemicals to conserve natural enemies sometimes involves risk. As explained earlier the farmer with high level possession of plant protection equipments had more adoption, which might be due to their enthusiasm to adopt any new method. Hence it had shown significant relationship with their adoption of chemical control by non-FFS farmers as well.

4.3.10. Zero order correlation co-efficient of characteristics of FFS and non-FFS farmers with their adoption for Leaf Folder control

Agronomic Methods

It could be observed from the table 18 that education resulted in positive and highly significant relationship with regard to their adoption of agronomic methods by the FFS farmers for the control of leaf folder. Mass media exposure, contact with extension agency, social participation, cosmopoliteness, progressiveness and innovativeness had exhibited positively significant relationship with the FFS farmers. In the case of non-FFS farmers, mass media exposure and risk orientation were having highly significant relationship with regard to their adoption and social participation resulted in significant relationship with regard to their adoption of agronomic methods for the management of leaf folder.

Education had shown a positive and significant relationship with adoption of control measures for leaf folder by FFS farmers. This might be due to the fact that the

complex nature of technology several practices such as monitoring pests at ETL level, require certain degree of education. Hence the farmers would have easily adopted the agronomic methods.

Contact with extension agency had exhibited significant contribution towards the adoption by the FFS farmers. The FFS farmers who had more contact with extension agency would have got more information regarding agronomic methods.

Progressiveness and innovativeness had significant contribution towards the adoption among the FFS and non-FFS farmers. It is quite natural that the farmers with progressive and innovative nature would tend to adopt any practice. Hence those farmers with high level of innovativeness might have adopted. Similarly progressiveness was also found to have significance with the adoption by FFS as well as non-FFS farmers.

Mass media exposure was having significant relationship with the adoption of agronomic methods by FFS as well as non-FFS farmers. It was clear from the finding that mass media was one of the main sources of information which regularly provide the information with regard to IPM and it's all components, through the radio rural forum and some regular programmes which facilitated the FFS as well as non-FFS farmers to get motivated for the adoption of agronomic methods.

Social participation also had significant relationship with adoption by FFS as well as non-FFS farmers. The farmers with high level of social participation would have got more chance to interact with others, to gather their experiences and gain knowledge. Risk orientation also had significant contribution towards the adoption by non-FFS farmers.

As stated earlier the person with more level of risk orientation would always be very much eager to experiment the new methods.

Physical methods

The table 17 reveals that farming experience had significant relationship with the adoption of physical methods by FFS farmers. It was also observed that risk orientation had negatively significant relationship with their adoption of physical methods.

In the case of non-FFS farmers, no variation was found among them with regard to their adoption, which lead to non-significant relationship of all variables with regard to the adoption by non-FFS farmers.

Biological methods

It is evident from the table 18 that education, contact with extension agency , cosmopoliteness and innovativeness had significant relationship with the adoption of biological methods for the control of leaf folder by FFS farmers. In the case of non-FFS farmers, cosmopoliteness was found to have highly significant relationship with regard to their adoption of biological methods and education, mass media exposure, risk orientation and possession of plant protection equipments had significant relationship with respect to adoption.

Education had positive and significant relationship with adoption by the non-FFS farmers also. The use of biological methods involves some complex practices, which need to be understood by the farmers. Hence the use of biological methods was found to be more among the educated persons of FFS as well as non-FFS category. It is quite

natural that the farmers with more contact with extension agency would have got more exposure about new methods through change agents and their participation in meetings conducted by the extension functionaries. These might have motivated them to adopt the biological methods.

Cosmopoliteness had significant relationship with the adoption of FFS as well as non-FFS farmers. The farmers with more cosmopoliteness, would have got more chances to contact the outside people and to benefit from their experiences, which could have motivated them to adopt.

The non-FFS farmers had to depend mainly on mass media exposure and neighbours for the adoption of new methods. Apart from this, participation in demonstrations, exhibitions and through the exposure to mass media they might have been motivated to adopt the biological methods. Hence it had shown significant relationship with their adoption. Innovativeness was found to have significant relationship for FFS farmers, while for non-FFS farmers progressiveness and risk orientation had significant relationship. The farmers with high level of innovativeness, progressiveness and risk orientation would be relatively easy and have the capacity to bear risk to adopt any new method such as biological method.

A farmer with more amount of risk orientation would try to experiment with new approaches. Here the conservation of natural enemies was a new approach towards the management of leaf folder, it was found that the farmers with these qualities had more adoption, and hence the variable had resulted in significance. Possession of plant

protection equipments was found to be significant with the adoption by non-FFS farmers. Those with high possession might have adopted the biological methods. Hence this variable had shown significant relationship.

Chemical methods

It could be observed from the table 18 that for FFS farmers, education, mass media exposure and contact with extension agency had shown highly significant relationship with regard to the adoption. In the case of non-FFS farmers, scientific orientation had resulted in positive and highly significant relationship with the adoption, while education and cosmopoliteness had exhibited significant relationship with the adoption.

Education is one of the key elements to facilitate adoption. Hence the educated farmers with more knowledge had high adoption, which was observed among FFS and non-FFS farmers. Mass media exposure and contact with extension agency had significant relation with the adoption of FFS farmers. The farmers with more contact might have been motivated to adopt chemical methods. Scientific orientation had shown positive and significant relation with the adoption of chemical methods for non-FFS farmers. Their high level of orientation towards the new practice viz., ETL-based spray, might be the reason for this result.

Table.19. Zero order correlation of characteristics of FFS and Non-FFS farmers with their adoption for Gall Midge control

INDEPENDENT VARIABLES	r-value					
	Agronomic methods		Biological methods		Chemical methods	
	FFS	Non-FFS	FFS	Non-FFS	FFS	Non-FFS
1.Age	0.0104	-0.1629	-0.0146	-0.0591	0.0887	0.0685
2.Education	0.2066	0.1734	0.2508*	0.2674 *	0.3660 * *	0.2878 *
3.Farm size	0.0049	0.0772	-0.0297	0.1077	-0.1369	0.0516
4.Farming experience	-0.2489 *	-0.1787	0.1659	-0.0648	0.0505	0.0253
5.Area under paddy	-0.1229	0.0998	-0.0616	0.0755	-0.2326	0.1240
6.Mass media exposure	0.1058	0.1214	0.0273	0.2823 *	0.3567 * *	0.1139
7.Contact with extension agency	0.2115	0.0375	0.2841 *	0.0530	0.4767 * *	-0.0266
8.Social participation	0.1567	0.1995	0.0630	0.1468	0.1941	0.0530
9.Cosmopoliteness	0.0651	0.1250	0.2743 *	0.3369 * *	0.2187	0.2534 *
10.Economic motivation	-0.1379	-0.0342	0.0625	-0.0917	-0.0325	-0.0225
11.Scientific orientation	-0.0074	0.0922	0.1858	0.0378	0.1278	0.3013 *
12.Progressiveness	0.3605 * *	0.0902	0.0994	0.2392	0.0035	0.1172
13.Innovativeness	0.2649 *	0.2646 *	0.3157 *	0.1018	0.0236	0.1945
14.Risk orientation	0.2845 *	0.3830 * *	-0.1223	0.2939 *	-0.1908	0.1964
15.Training Undergone	0.1078	0.1014	-0.0465	0.1693	0.1265	0.1185
16.Possession of PPE	0.1306	0.1502	-0.0040	0.2514 *	0.0698	0.0937

* 5 Per cent level of significance

** 1 Per cent level of significance

4.3.11. Zero order correlation co-efficient of characteristics of FFS and non-FFS farmers with their adoption for Gall Midge control

Agronomic methods

It could be seen from the table 19 that progressiveness had shown positive and highly significant relation with the adoption agronomic practices for the control of gall midge by FFS farmers, while the innovativeness and risk orientation had positively significant relationship with their adoption of agronomic methods and the farming experience had negatively significant relationship with their adoption. In the case of non-FFS farmers, risk orientation had resulted in highly significant with the adoption, while the innovativeness had shown significant relationship with their adoption.

The progressive farmers wish to try new methods. Hence, progressiveness had contributed significantly with the adoption of chemical methods among FFS farmers.

Innovativeness and risk orientation had positively significant relationship with regard to the adoption by FFS as well as non-FFS farmers. Innovative farmers and a farmers with more risk bearing capacity would try to adopt any methods suggested as new in the case of pest control.

Biological methods

It is evident from the table 19 that education, contact with extension agency cosmopoliteness and innovativeness were having positively significant relationship with the adoption of biological methods by FFS farmers. In the case of non-FFS farmers, cosmopoliteness had exhibited highly significant relationship with their adoption and

Table.20. Zero order correlation of characteristics of FFS and Non-FFS farmers with their adoption for Brown Plant Hopper control

INDEPENDENT VARIABLES	r-value							
	Agronomic methods		Physical methods		Biological methods		Chemical methods	
	FFS	Non-FFS	FFS	Non-FFS	FFS	Non-FFS	FFS	Non-FFS
1.Age	0.0218	0.0927	-0.0464	0.0353	-0.0146	-0.0591	0.1860	0.0465
2.Education	0.1925	0.1176	0.1866	-0.1743	0.2508 *	0.2674 *	0.3832 * *	0.3012 *
3.Farm size	-0.1449	0.2682 *	0.0587	-0.0539	-0.0297	0.1077	-0.0308	0.0863
4.Farming experience	-0.1686	0.0585	0.0479	0.0551	0.1659	-0.0648	0.0537	0.0119
5.Area under paddy	-0.2554 *	0.2955 *	-0.0041	-0.0331	-0.0616	0.0755	-0.0628	0.1826
6.Mass media exposure	0.2447 *	0.2382	0.0292	-0.1153	0.0273	0.2823 *	0.3423 * *	0.1413
7.Contact with extension agency	0.3018 *	0.2644 *	0.2523 *	-0.0220	0.2841 *	0.0530	0.5268 * *	-0.0045
8.Social participation	0.1912	0.3212 * *	0.0032	-0.1074	0.0630	0.1468	0.3154 * *	0.0636
9.Cosmopoliteness	0.1807	0.1930	0.2649 *	-0.1746	0.2743 *	0.3369 * *	0.2506 *	0.2835 *
10.Economic motivation	-0.1956	-0.1124	0.0391	0.0450	0.0625	-0.0917	-0.0600	0.0617
11.Scientific orientation	0.1027	-0.1422	0.1683	-0.1457	0.1858	0.0378	0.1067	0.2996 *
12.Progressiveness	0.1504	0.1951	0.2165	0.0018	0.0994	0.2392	0.0289	0.1339
13.Innovativeness	0.1139	0.0329	0.3366 * *	-0.0297	0.3157 * *	0.1018	0.0110	0.2047
14.Risk orientation	0.2432	0.2276	-0.0387	-0.1419	-0.1223	0.2939 *	-0.0560	0.1548
15.Training Undergone	0.0489	0.0613	-0.1156	-0.0796	-0.0465	0.1693	0.2164	0.1418
16.Possession of PPE	-0.0578	0.2705 *	0.0805	0.0000	-0.0040	0.2514 *	0.0721	0.1410

* 5 Per cent level of significance

** 1 Per cent level of significance

education, mass media exposure, risk orientation and possession of plant protection equipments had significant relationship with the adoption of biological methods. The reasons discussed earlier hold good here too for the relationship of the different variables.

Chemical methods

It is evident from the table 19 that for FFS farmers, education, mass media exposure and contact with extension agency had shown positive and highly significant relationship with their adoption of chemical methods for the management of gall midge. In the case of non-FFS farmers education, cosmopoliteness and scientific orientation had resulted in positive and significant relationship with the adoption of chemical methods.

4.3.12. Zero order correlation co-efficient of characteristics of FFS and non-FFS farmers with their adoption for Brown Plant Hopper control

Agronomic methods

In the case of FFS farmers it was observed that contact with extension agency had exhibited highly significant relationship and the mass media exposure and risk orientation had resulted in significant relationship with the adoption of agronomic methods for the control of brown plant hopper. It was also found that area under paddy was having negatively significant relationship with the adoption of agronomic methods. In the case of non-FFS farmers it was found that social participation was having positive and highly significant relation with the adoption, while the farm size, area under paddy, contact with extension agency and possession of plant protection equipments had resulted in significant relationship with adoption of agronomic methods (Table 20).

Contact with extension agency had shown positively significant relation with the adoption by FFS farmers as well as non-FFS farmers. The farmers with more extension agency contact would have been motivated to follow the agronomic methods such as selection of resistant varieties, crop rotation, alternate flooding and drying, removal of alternate hosts etc., through their regular contact with change agents. Similarly for the FFS farmers the increased exposure to mass media might have motivated to take up the agronomic methods.

Risk orientation had contributed significantly towards the adoption by FFS farmers. The farmers with more capacity to bear risk would be ready to follow the new recommendations. Hence the results are justified.

Social participation also had contributed significantly on the adoption by the non-FFS farmers. The farmers with more social participation could have been motivated. Farm size and area under paddy too contributed significantly in a positive manner for the non-FFS farmers.

Those who were in possession of plant protection equipments might be ready to adopt the plant protection recommendations due to their eagerness to practice the farming intensively. This justifies the results.

Physical methods

It is clear from the table 20 that innovativeness had exhibited positive and highly significant relationship with the adoption of physical methods, whereas the contact with

extension agency and cosmopoliteness had correlated significantly towards their adoption by the FFS farmers, for the control of brown plant hopper.

The farmers with more innovativeness, might be having the enthusiasm to follow new recommendations. As the use of light trap was new, they had adopted it. Hence the significant result is justified.

Contact with extension agency had significant contribution towards the adoption by the FFS farmers. This was due to the reason that the farmers with high level of extension agency contact could gather more amount of information on various problems regarding the usage of physical methods. Cosmopoliteness also had contributed significantly towards the adoption of physical methods.

In the case of non-FFS farmers, no variable was found to have significant relationship with the adoption of physical methods for the control of brown plant hopper.

Biological methods

It is clear from the table 20 that innovativeness had shown positive and highly significant relationship with adoption of biological methods and education, contact with extension agency and cosmopoliteness had significant relation with the adoption by FFS farmers. In the case of non-FFS farmers, cosmopoliteness had highly significant relationship with the adoption, while the variables, education, mass media exposure, risk orientation and possession of plant protection equipments had shown significant relationship with regard to the adoption.

Education had positive and significant relationship with the adoption of biological methods among FFS as well as non-FFS farmers. The use of biological methods involve some complex procedure and needs knowledge to follow it. Hence the results are justified. Contact with extension agency was found to have significant relation with adoption.

Cosmopoliteness was having significant relation with the adoption among FFS and non-FFS farmers. It is clear that the farmers with more cosmopoliteness, would have had more exposure, which could have motivated them to adopt.

Mass media exposure also had resulted in significantly towards the adoption of biological method, as it is a main information source for the non-FFS farmers, as well.

Risk orientation and possession of plant protection equipments had significant relationship towards the adoption by non-FFS farmers. This might be due to the reason that the farmers with more risk bearing capacity might have adopted the biological methods better than others due to their readiness to try new methods. As explained earlier, possession of plant protection equipments also had contributed significantly towards their adoption.

Chemical methods

In the case of FFS farmers, it was found that education, mass media exposure, contact with extension agency and social participation had exhibited positive and highly significant relationship with the adoption of chemical methods, while the cosmopoliteness had resulted in significant relationship with the adoption. In the case of

Table.21. Zero order correlation of characteristics of FFS and Non-FFS farmers with their adoption for Rat control

INDEPENDENT VARIABLES	r-value					
	Agronomic methods		Physical methods		Chemical methods	
	FFS	Non-FFS	FFS	Non-FFS	FFS	Non-FFS
1.Age	0.0245	-0.1540	0.0918	0.0443	-0.0500	-0.0558
2.Education	-0.0402	0.1515	-0.2003	-0.0141	-0.2354	0.2389
3.Farm size	-0.0033	0.0208	0.1059	-0.0710	0.1072	0.1225
4.Farming experience	-0.1185	-0.1132	0.1087	0.0701	-0.0855	-0.1253
5.Area under paddy	0.0395	0.0989	0.1579	-0.0467	0.2193	0.2523 *
6.Mass media exposure	0.2658 *	0.2540 *	0.1367	0.0098	0.0769	0.2745 *
7.Contact with extension agency	0.0091	-0.0489	0.0131	-0.0862	-0.1036	-0.0128
8.Social participation	0.0402	-0.0756	-0.0303	0.2269	-0.0127	0.0203
9.Cosmopoliteness	0.2556 *	0.0978	-0.1449	0.0954	-0.1564	0.0405
10.Economic motivation	0.0273	0.0644	0.3613 * *	0.0435	-0.0894	0.0292
11.Scientific orientation	0.0966	0.1866	0.0836	0.0785	0.0231	0.1764
12.Progressiveness	0.1893	0.2195	0.2734 *	0.2009	0.0175	0.0882
13.Innovativeness	0.1298	0.0631	0.1608	0.0056	0.1340	0.1448
14.Risk orientation	0.2088	0.0524	0.0268	-0.0152	0.1196	0.1783
15.Training Undergone	0.0000	0.0851	-0.0325	0.1919	-0.0980	0.0117
16.Possession of PPE	0.1555	0.1133	0.0437	0.1105	-0.0949	-0.1907

* 5 Per cent level of significance

** 1 Per cent level of significance

non-FFS farmers, education, cosmopoliteness and scientific orientation had resulted in significant relationship with the adoption of chemical methods for the management of brown plant hopper.

Education, contact with extension agency and mass media exposure had significant relationship with the adoption by FFS farmers. The respondents with more education, mass media exposure and change agency contact might be better adopters.

Social participation had shown significant relationship with the adoption by FFS farmers. The farmers with more social participation might have got motivated to adopt. Cosmopoliteness also exhibited significant relationship with the adoption of chemical methods by the FFS as well as non-FFS farmers.

Scientific orientation had also shown significant relation with the adoption by non-FFS farmers, because the farmers with high orientation towards science would have adopted earlier than the others.

4.3.13. Zero order correlation co-efficient of characteristics of FFS and non-FFS farmers with their adoption for Rat control

Agronomic methods

It could be observed from the table 21 that the mass media exposure and cosmopoliteness had positively significant relationship towards the adoption by the FFS farmers. In the case of non-FFS farmers, mass media exposure was found to have positively significant relationship towards their adoption of agronomic methods, for the control of rats.

Mass media exposure was found to have significant contribution towards the adoption by FFS as well as non-FFS farmers. It was clear that those who had mass media exposure and who had attended the exhibitions and demonstrations would have been motivated to adopt the agronomic practices.

Cosmopoliteness also had contributed significantly towards the adoption of agronomic practices by the FFS-farmers. It might be due to the reason that the farmer with more level of cosmopolite tendency could share other's experience, which would act as a motivating factor to adopt.

Physical methods

It is inferred from the table 21 that for the FFS farmers, economic motivation had exhibited highly significant relationship with the adoption, while the variable progressiveness resulted in positive and significant relationship with regard to the adoption. In the case of non-FFS farmers, it was found that none from the selected variable exhibited significant relationship with the adoption of physical methods for the management of Rat menace. This was due to the fact that the practice use of indigenous rat traps was practiced by the farmers without much variation. Hence non-significant relationship by the independent variables has resulted.

The farmers with more economic motivation would try to adopt different methods to control a pest, with the aim of getting maximum profit. Physical method is one among them and hence it had resulted in significantly towards the adoption of physical methods by the FFS farmers.

Progressiveness had resulted in significant contribution towards the adoption by the FFS as well as non-FFS farmers. The physical method is the important one (i.e. the use of rat trap) to control rat. That's why it had contributed significantly towards the adoption by the FFS farmers.

Chemical methods

It is inferred from the table 21 that no variable was found to have significant relationship with regard to the adoption of chemical methods by the FFS farmers due to the variation in their adoption.

It is inferred from the table 21 that area under paddy had positively significant contribution towards the adoption of chemical methods by non-FFS farmers. This might be due to reason that the farmers with more area under paddy might have been eager to adopt the chemical method and control the rats.

Mass media exposure also had resulted in significant contribution with adoption. It is clear that farmers with more mass media exposure could have received more information regarding the use of tablets for Rat control and might also have had more knowledge about its usage. Hence this variable had contributed significantly towards the adoption by non-FFS farmers.

Table.22. Zero order correlation of characteristics of FFS and Non-FFS farmers with their adoption for Blast control

INDEPENDENT VARIABLES	r-value			
	Agronomic methods		Chemical methods	
	FFS	Non-FFS	FFS	Non-FFS
1.Age	0.0820	-0.1351	0.1312	-0.0337
2.Education	0.1881	0.3574 * *	0.0766	0.0498
3.Farm size	-0.0311	0.1749	0.1262	0.0354
4.Farming experience	-0.0109	-0.1965	0.0664	0.0224
5.Area under paddy	-0.1176	0.1552	0.1610	0.0380
6.Mass media exposure	-0.0773	0.4465 * *	0.1662	0.1828
7.Contact with extension agency	0.1396	-0.1062	0.2973 *	0.1688
8.Social participation	0.1171	0.1556	-0.0788	0.1664
9.Cosmopoliteness	0.0107	0.3335 * *	-0.0775	0.0846
10.Economic motivation	-0.1318	0.2544 *	0.2807 *	-0.1687
11.Scientific orientation	-0.0826	0.2228	0.0666	0.1941
12.Progressiveness	0.0141	0.4475 * *	0.1548	0.0973
13.Innovativeness	0.2144	0.3807 * *	0.1227	0.1074
14.Risk orientation	0.0007	0.3732 * *	0.0079	0.2638 *
15.Training Undergone	0.2015	0.1050	-0.0661	0.1483
16.Possession of PPE	0.1070	0.0000	0.0748	0.0964

* 5 Per cent level of significance

** 1 Per cent level of significance

4.3.14. Zero order correlation co-efficient of characteristics of FFS and non-FFS farmers with their adoption for Blast control.

Agronomic methods

It could be observed from the table 22 that majority of the FFS farmers had adopted the agronomic methods for blast control without much variation. In the case of non-FFS farmers education, mass media exposure, cosmopoliteness, progressiveness, innovativeness and risk orientation had resulted in positive and highly significant relation towards the adoption, while the economic motivation had resulted in positive and significant relation with the adoption of agronomic methods.

The farmers with more education and exposure to mass media would be familiar with the latest recommendations for pest control. Agronomic method is one of the latest methods recommended for blast control in IPM. That's why these variables had contributed significantly towards the adoption of agronomic methods.

It is clear that the farmers with more outside contact could have got more chances to have interaction with other farmers and change agents which might have motivated them to adopt.

Progressiveness, innovativeness and risk orientation had contributed significantly towards the adoption of agronomic methods by non-FFS farmers. It is quite natural that the farmers with these qualities would tend to be very much receptive to new approaches or recommendations towards the pest control to take up action. Similarly economic

motivation also had shown significant contribution towards the adoption by the non-FFS farmers.

Physical methods

In the case of non-FFS farmers with regard to the adoption of physical methods nil variation was observed among them. Hence the significance could not be found among the respondents with respect to the adoption of physical methods for the control of blast disease.

Chemical methods

It is inferred from the table that for FFS farmers, contact with extension agency had shown a highly significant relationship and the economic motivation had exhibited significant relationship with regard to their adoption of chemical methods. In the case of non-FFS farmers, risk orientation alone had exhibited significant relationship with adoption.

Contact with extension agency had significant relationship with adoption by FFS farmers, because through regular contact with extension agency a farmer could experience the success in adopting a technology by overcoming the technical obstacles through the guidance of change agents. Hence the variable contact with extension agency had resulted in significant relationship with adoption.

Economic motivation and risk orientation also had their significant relation with FFS and non-FFS farmers respectively. The FFS farmers with high level of economic motivation and risk orientation might have practiced new methods in pest control. As the

Table.23. Zero order correlation of characteristics of FFS and Non-FFS farmers with their adoption for Tungro control

INDEPENDENT VARIABLES	r-value							
	Agronomic methods		Physical methods		Biological methods		Chemical methods	
	FFS	Non-FFS	FFS	Non-FFS	FFS	Non-FFS	FFS	Non-FFS
1.Age	0.1032	0.1261	-0.0288	0.1719	-0.1520	-0.0177	0.1375	-0.0125
2.Education	0.0720	0.1693	-0.1759	-0.1969	0.0722	0.0254	0.0750	0.1028
3.Farm size	-0.1311	0.2133	-0.1117	0.2695 *	0.0804	0.0293	0.0223	0.0691
4.Farming experience	0.0661	0.0793	-0.0162	0.1718	-0.0502	-0.0505	0.0995	0.0024
5.Area under paddy	-0.2625	0.1903	-0.1016	0.2149	0.1787	0.0479	0.0045	0.0727
6.Mass media exposure	-0.0564	0.0831	-0.0267	0.0269	0.0000	0.0967	0.0798	0.2347
7.Contact with extension agency	-0.0134	0.1167	0.0151	0.0134	0.1638	0.1466	0.2889 *	0.1878
8.Social participation	0.0650	-0.0072	-0.0968	-0.0325	-0.0760	0.1529	-0.0929	0.2251
9.Cosmopoliteness	0.1094	0.1914	-0.1466	-0.1746	-0.0564	0.0090	-0.0473	0.1279
10.Economic motivation	-0.2207	0.1432	0.2560 *	-0.2441	0.1341	0.0814	0.2555 *	-0.1059
11.Scientific orientation	-0.1855	0.1004	0.0776	-0.1457	-0.0482	-0.0408	0.0804	0.1418
12.Progressiveness	-0.0897	0.1489	-0.0486	-0.1560	0.1485	0.0870	0.0193	0.1657
13.Innovativeness	-0.1044	0.0428	-0.1687	-0.1784	0.0921	0.0862	-0.0545	0.1852
14.Risk orientation	-0.0941	0.0553	0.1391	-0.1575	0.1968	0.0942	0.0004	0.2401
15.Training Undergone	0.0479	0.0364	-0.0454	-0.0796	-0.0490	0.0996	-0.0868	0.1917
16.Possession of PPE	-0.1679	0.1056	-0.0660	-0.1468	0.1703	0.3191 *	-0.0549	0.1076

* 5 Per cent level of significance

** 1 Per cent level of significance

seed treatment and intensity based correct amount of chemical spray was found to be the new towards the control of pest for them, the adoption of chemical methods had resulted in significant contribution with these variables.

4.3.15. Zero order correlation co-efficient of characteristics of FFS and non-FFS farmers with their adoption for Tungro control

Agronomic methods

It could be seen from the table 23 that, for FFS farmers the variable area under paddy alone exhibited negatively significant relationship towards their adoption of agronomic methods. In case of non-FFS farmers, no variable had resulted in significant relationship with the adoption, due to low level of variation in their adoption.

Physical methods

The variable economic motivation had shown significant relationship towards the adoption by FFS farmers. The farmers with high level of economic motivation might have been motivated to adopt the physical methods of control over tungro. In case of non-FFS farmers, farm size was having positively significant relationship with their adoption of physical methods. It might be due to the fact that the farmers with big farm size might have adopted new recommendations.

Biological methods

It was found that for the FFS farmers no variable exhibited significant relationship with regard to the adoption of Biological methods which was because of the fact that the biological method was adopted almost by ninety per cent of the farmers with no

Table.24. Zero order correlation of characteristics of FFS and Non-FFS farmers with their adoption for Brown Leaf Spot control

INDEPENDENT VARIABLES	r-value					
	Agronomic methods		Physical methods		Chemical methods	
	FFS	Non-FFS	FFS	Non-FFS	FFS	Non-FFS
1.Age	0.0062	0.0002	0.1603	0.0307	0.1312	-0.0337
2.Education	0.3262 **	-0.0010	0.1283	-0.0555	0.0766	0.0498
3.Farm size	-0.0435	0.1227	0.0756	-0.1129	0.1262	0.0354
4.Farming experience	0.0736	-0.0251	-0.0384	-0.0175	0.0664	0.0224
5.Area under paddy	-0.1108	0.0627	0.0000	-0.1484	0.1610	0.0380
6.Mass media exposure	0.1311	0.1638	0.1221	0.0482	0.1662	0.1828
7.Contact with extension agency	0.3525 **	0.1264	0.2034	0.4833 **	0.2973 *	0.1688
8.Social participation	0.0555	-0.1163	0.1340	0.1658	-0.0788	0.1664
9.Cosmopoliteness	0.0833	0.0139	-0.0096	0.0846	-0.0775	0.0846
10.Economic motivation	-0.0913	0.1443	0.1673	0.0807	0.2807 *	-0.1687
11.Scientific orientation	0.1047	-0.0794	0.1471	0.0297	0.0666	0.1941
12.Progressiveness	0.0511	0.1966	0.2311	0.2549 *	0.1548	0.0973
13.Innovativeness	0.0653	-0.0406	0.2215	0.1245	0.1227	0.1074
14.Risk orientation	0.1269	0.0318	0.2470 *	0.1172	0.0079	0.2638 *
15.Training Undergone	0.1114	0.2316	0.0346	0.3116 *	-0.0661	0.1483
16.Possession of PPE	0.0354	0.0446	0.2364	-0.0878	0.0748	0.0964

* 5 Per cent level of significance

** 1 Per cent level of significance

variation. In the case of non-FFS farmers possession of plant protection equipments alone was found to have positively significant relation with the adoption of biological methods.

Chemical methods

It is evident from the table 23 that the variables contact with extension agency and economic motivation had positive and significant relation with the adoption by FFS farmers. In the case of non-FFS farmers, it was observed that no variable had shown significant relationship with regard to the adoption of chemical methods by the non-FFS farmers. This might be due to the fact that, the non-FFS farmers adopted the chemical methods without much variation among them.

The farmers with more contact with extension agency could adopt the chemical method by having the guidance for identifying correct stage of tungro disease to spray insecticides (to control the vector) and the appropriate chemical name with the dosage. Hence those farmers with more contact with extension agency might have found it easy for. The farmers with high level of economic motivation might have been motivated to take up chemical methods to have effective control over the vector of tungro.

4.3.16. Zero order correlation co-efficient of characteristics of FFS and non-FFS farmers with their adoption for Brown Leaf Spot Control

Agronomic methods

Education and contact with extension agency had resulted in positive highly significant relationship towards the adoption of agronomic methods by the FFS farmers for the control of Brown leaf spot. In the case of non-FFS farmers, it was observed that

no variable had significant relationship with regard to the adoption of the agronomic methods. This might be due to the existence of low variation in the adoption of agronomic methods for the control of brown leaf spot (Table 24).

The FFS farmers with more education and extension agency contact had more level of adoption of agronomic methods. This might be due to the reason that the farmers with more contact with extension agency and education would have been favourable towards the adoption of new recommendations. The practices such as use of neem coated urea, removal of collateral host and use of disease free seeds were recommended for the control of Blast instead of depending upon the chemicals alone which all seemed to be new towards the control of brown leaf spot. Hence the results are justified.

Physical methods

Risk orientation was found to have significant relation towards the adoption of physical methods by the FFS farmers. In the case of non-FFS farmers, it was found that contact with extension agency had exhibited highly significant relationship towards its adoption, while the progressiveness and trainings undergone resulted in the significant relationship with the adoption of physical methods.

The farmers who had more capacity to bear risk would have been ready to adopt new practices. Similarly progressiveness was also found to have significant relationship with the adoption by non-FFS farmers.

Those who had regular contact with extension agency might have got more information for the various problems with regard to the pest management. Hence they might have been motivated to adopt physical methods through extension agency contact.

As that of the agronomic methods of Brown leaf spot control, trainings undergone was found to have significant contribution towards the adoption of physical methods of the non-FFS farmers.

Chemical methods

Table 24 explains that contact with extension agency and economic motivation had positive and significant relationship with the adoption of chemical methods for FFS farmers at 0.01, 0.05 level of probability respectively. In the case of non-FFS farmers, risk orientation alone had positive and significant relationship with the adoption.

Through frequent contact with extension agency the farmers could have known about the correct stage of the disease, which needs the fungicide spray, correct dosage with appropriate chemical etc. Hence the farmers with more contact with extension agency would have adopted more.

Economic motivation and risk orientation had resulted in the significant relationship with FFS and non-FFS farmers respectively. A farmer with more risk orientation and economic motivation would be always trying to practice an effective method to control the pests. As the chemical method is one among them the variable had resulted in the significant relationship with the adoption of chemical methods for the management of brown leaf spot.

Table.25. Zero order correlation of characteristics of FFS farmers with their awareness, knowledge and adoption on IPM practices

INDEPENDENT VARIABLES	Awareness	Knowledge	Adoption
1.Age	0.0655	0.1427	0.1109
2.Education	0.0117	0.3453 * *	0.4408 * *
3.Farm size	0.1445	0.1156	-0.0638
4.Farming experience	0.0136	0.0971	0.0260
5.Area under paddy	0.0516	0.1803	-0.1510
6.Mass media exposure	0.2370	0.1695	0.2730*
7.Contact with extension agency	0.2135	0.3374 * *	0.3925**
8.Social participation	0.0146	0.0747	0.2418
9.Cosmopoliteness	0.1265	0.1693	0.1464
10.Economic motivation	0.1364	0.0597	-0.0299
11.scientific orientation	0.1657	0.1283	0.1955
12.progressiveness	0.3753 * *	0.1326	0.3003 *
13.Innovativeness	0.4177 * *	0.1563	0.3607 * *
14.Risk orientation	-0.0054	0.1583	0.0921
15.Training Undergone	0.0739	0.1017	0.1536
16.Possession of PPE	0.2294	0.4437 * *	0.1176

* 5 Per cent level of significance

** 1 Per cent level of significance

4.3.17. Zero order correlation co-efficient of characteristics of FFS farmers with their awareness, knowledge and adoption of IPM practices

Awareness

It is evident from the table 25 that among the sixteen variables, progressiveness and innovativeness had their positive and highly significant relation with respect to the awareness. The farmer with progressive and innovative nature might have had more awareness about the IPM.

Knowledge

It is clear from the table 25 that education, contact with extension agency and possession of plant protection equipments had resulted in highly significant relationship with the knowledge of FFS farmers about IPM.

Education had shown significant relationship towards knowledge. This falls in line with the findings of Dharmalingam (1990), Krishnakumar (1996) and Kavitha (1998) and against to the finding of Venkatachalam (1999).

Contact with extension agency had also shown significant relationship with respect to the knowledge of FFS farmers. This finding derives support from the findings of Subramanian (1987), Jayaraman (1988), Santha (1992) and Sivakumar (1997).

Adoption

Education, contact with extension agency and innovativeness had resulted in highly significant relationship and the mass media exposure and progressiveness had shown significant relationship with regard to their adoption of IPM practices (Table 25).

Education had exhibited positive and significant relationship with the adoption. This finding derives support from the findings of Adhiguru (1991), Sophia (1991), Rajkumar (1992), Santha (1992) and Jayaraj (1997).

Contact with extension agency had exhibited highly significant relationship with regard to the adoption of IPM practices by the FFS farmers. Those who were having more contact with extension agency would also have been motivated by the change agents to follow IPM. Mass media exposure also had shown significant relationship, because those who had more exposure to mass media participation in demonstration and exhibition would have been motivated to follow IPM practices.

This is in line with the findings of Dharmalingam (1990), Adhiguru (1991), Sriram (1997), Anitha (1998) and Sudhakar (1998).

Progressiveness and innovativeness also had significant contribution towards adoption. A progressive and innovative farmers would try to follow new approaches. As the IPM was a new one, it had been adopted by them.

Table.26. Zero order correlation of characteristics of Non-FFS farmers with their awareness, knowledge and adoption on IPM practices

INDEPENDENT VARIABLES	Awareness	Knowledge	Adoption
1.Age	-0.0384	0.0565	-0.0133
2.Education	0.2958 *	0.1361	0.3161*
3.Farm size	0.0646	0.1853	0.2327
4.Farming experience	-0.1152	-0.0257	-0.0736
5.Area under paddy	0.0372	0.1423	0.2782 *
6.Mass media exposure	0.3204 * *	0.1196	0.3143 *
7.Contact with extension Agency	0.1105	0.1252	0.1502
8.Social participation	0.2050	0.1580	0.3215 * *
9.Cosmopoliteness	0.3151 *	0.2098	0.3166 *
10.Economic motivation	0.2284	0.1379	0.0193
11.scientific orientation	0.1374	0.1962	0.1774
12.progressiveness	0.5301 * *	0.3753 * *	0.3866 * *
13.Innovativeness	0.3044 *	0.2638 *	0.3128 *
14.Risk orientation	0.2749 *	0.3355 * *	0.4170 * *
15.Training Undergone	0.3113 *	0.2655*	0.3241 * *
16.Possession of PPE	0.2127	0.1057	0.2503 *

* 5 Per cent level of significance

** 1 Per cent level of significance

4.3.18. Zero order correlation co-efficient of characteristics of non-FFS farmers with their awareness, knowledge and adoption of IPM practices

Awareness

It could be observed from the table 26 that mass media exposure and progressiveness had exhibited highly significant relationship with the awareness of non-FFS farmers, while the education, cosmopoliteness, innovativeness, risk orientation and trainings undergone had resulted in significant relationship towards the awareness.

Education had resulted in significant relationship with the awareness. It might be due to the reason that the educated farmers would be having very much eager to learn about new approaches. As the IPM was a new one, the educated farmers had more awareness. This falls in line with the findings of Theodore (1988), Adhiguru (1991), Sophia (1991) and Sriram (1997). Those who had more cosmopoliteness could gather more information about the new approaches such as IPM by having more level of urban contact and cosmopolite nature. Hence this variable had shown significant relation with the awareness. This derives support from the finding of Sophia (1991).

Innovativeness and risk orientation had significant relationship with the FFS farmers awareness. It is quite natural that those who had more risk bearing capacity and innovative nature would be very much receptive to the new information. That's why they had more awareness about IPM.

This is in line with the findings of Theodore (1988), Santha (1992) and Sriram (1997).

Knowledge

It is clear from the table 26 that the progressiveness and risk orientation had exhibited positive and highly significant relationship with their knowledge, while innovativeness and trainings undergone had resulted in significant relationship with the knowledge about IPM.

Progressiveness had resulted in highly significant relationship with their knowledge, which derives the support from the findings of Jayaraman (1988) and Kavitha (1998).

The farmers with high level of progressiveness and risk orientation would always try to learn about new approaches. As the IPM was a new approach toward pest control, which also needs some knowledge to follow, the farmers with above said qualities would have got more knowledge. Similarly those who attended trainings would have got more knowledge about the IPM and its components. This falls in line with Santha (1992) and Krishnakumar (1996).

Trainings undergone had shown significant relationship with regard to their knowledge. This is in line with the findings of Venkatachalam (1999).

Adoption

It is evident from the table 26 that the social participation, progressiveness, risk orientation and trainings undergone had positive and exhibited highly significant relationship with regard to the adoption of IPM practices by the non-FFS farmers. It was

Table.27. Multiple regression of characteristics of FFS and Non-FFS farmers with their awareness for Stem Borer control

INDEPENDENT VARIABLES	t-stat							
	Agronomic methods		Physical methods		Biological methods		Chemical methods	
	FFS	Non-FFS	FFS	Non-FFS	FFS	Non-FFS	FFS	Non-FFS
Intercept	4.1714	4.6458	0.7905	0.9183	9.2335	3.8315	2.0812	1.2710
1.Age	0.9809	-0.1996	1.4755	0.9750	-0.3405	0.4592	0.1551	0.4335
2.Education	-0.3803	-1.2204	1.3110	1.1418	0.1676	0.6337	-0.2294	0.1698
3.Farm size	0.5828	-1.5974	-3.2248 * *	0.9203	-0.8171	-1.0477	-1.0055	0.1177
4.Farming experience	0.1061	-0.0191	1.4686	-0.7335	-0.1211	-0.5902	1.1285	-0.1424
5.Area under paddy	-0.8129	1.0600	2.8687 * *	-1.4998	0.4481	0.9499	0.4431	0.3176
6.Mass media exposure	0.0148	2.1850 *	-0.8282	0.3654	0.0880	-0.4605	0.7588	0.9930
7.Contact with extension agency	0.8093	-0.5657	0.9763	1.2005	0.6931	0.6332	0.7044	0.7261
8.Social participation	-1.0386	0.5095	-0.5886	-1.4048	-0.7396	0.3349	-0.7668	-0.2102
9.Cosmopoliteness	0.5413	-0.2875	-0.0463	0.8548	-0.9209	-0.7437	0.2112	2.3873 *
10.Economic motivation	-0.1709	0.8040	0.6803	0.0339	-1.2795	-0.0058	-0.0243	-0.1682
11.Scientific orientation	-0.8616	-1.3629	2.8862 * *	1.2728	0.9323	-0.3322	1.1552	-0.4412
12.Progressiveness	-0.4437	1.9845	0.4613	0.3981	0.5093	1.3699	-0.5212	-0.6902
13.Innovativeness	1.9193	0.3952	0.5750	-0.5715	0.4319	-0.4171	1.7007	-0.6209
14.Risk orientation	-0.0349	0.8275	0.1945	-0.1855	0.2416	0.4882	-0.9415	0.0141
15.Training Undergone	1.0293	-0.8450	0.3751	0.5025	0.8842	-0.5723	0.8924	0.0854
16.Possession of PPE	1.1156	0.0046	-0.8277	0.6525	1.5432	0.1425	0.8964	1.0469
R-square	0.2294	0.3321	0.3839	0.2956	0.2166	0.1881	0.2278	0.2879
F-value	0.8001	1.3362	1.6744	1.1278	0.7430	0.6227	0.7930	1.0866

* 5 Per cent level of significance

** 1 Per cent level of significance

also found that the variables, education, area under paddy, cosmopoliteness, innovativeness and possession of plant protection equipments had resulted in the positive and significant relationship with their adoption of IPM practices.

Mass media exposure had significant relationship with the adoption. This derives the support from the findings of Krishnamoorthy (1988), Adhiguru (1991), Sophia (1991), Santha (1992), Krishnakumar (1996) and Sriram (1997).

Social participation also had significant contribution towards adoption, because through the interaction with other people and change agents they would have been motivated and followed IPM. This falls in line with the findings of Rathinasabapathy (1987), Dharmalingam (1990), Sophia (1991), Jayaraj (1997), Sudhakar (1998) and Kavitha (1998).

Progressiveness and risk orientation had exhibited significant relation with the adoption, which finds support from the findings of Jayaraman (1988) and Kavitha (1998).

4.4. Multiple regression of characteristics of FFS and non-FFS farmers with their awareness for Stem Borer control

Agronomic methods

It could be observed from the table 27 that the multiple regression (R^2) for FFS farmers is 0.229 which is non-significant in it's contribution towards all the variables with their awareness. Further, the independent variables of FFS farmers did not show any variation in their awareness. This was due to the fact that most of the respondents were aware about the agronomic methods.

In the case of non-FFS farmers it was found that all the sixteen variables together contributed 33.20 per cent of variation in their awareness about agronomic methods. It was also found that the mass media exposure had exhibited significant influence towards the awareness.

It means that a unit increase in mass media exposure would increase their awareness by 1.6756 unit *ceteris paribus*. Hence it could be explained that the farmers with high level of mass media exposure could get more information and are receptive to any new information.

Physical methods

It could be inferred from the table 27 that, all the selected variables together contributed only 38.4 per cent of variation in the awareness among the FFS farmers about the physical methods. Area under paddy and scientific orientation had positive and highly significant contribution towards the awareness, whereas the variable farm size had contributed negatively at one percent level of probability towards the awareness about physical methods.

A unit increase in area under paddy and a similar increase in scientific orientation would increase the awareness by 6.242 and 0.6005 units respectively. A unit increase in farm size would decrease the awareness by –3.063 units *ceteris paribus*.

In the case of non-FFS farmers, the multiple regression (R^2) value 0.295 which was non-significant in its contribution towards the variation in their awareness. Further

all the independent variables of non-FFS farmers showed only 29.5 per cent of variation in their awareness.

Biological methods

It could be seen from the table that the multiple determinant (R^2) value was 0.2165 for FFS farmers. It meant that all the variables contributed only 21.65 per cent variation in their awareness.

In the case of non-FFS farmers also the R^2 value 0.1881 that was found to be non-significant in its contribution towards variation in their awareness. All the variables together contributed only 18.18 per cent variation towards their awareness.

It was due to the fact that the biological method viz., the use of neem products for pest control was being adopted by the farmers traditionally. Hence almost all the farmers were aware about that practice, which might have lead to minimum level of variation in the awareness among FFS as well as non-FFS farmers.

Chemical methods

It is evident from the table 27 that the R^2 value (0.2278) for FFS farmers was non-significant in its contribution towards their awareness. Further, all the independent variables of FFS farmers for the study did not show any variation in their awareness.

In the case of non-FFS farmers it was found that 28.79 per cent variation was found with awareness. The variable cosmopoliteness alone was found to have significant

Table.28. Multiple regression of characteristics of FFS and Non-FFS farmers with their awareness for Leaf Folder control

INDEPENDENT VARIABLES	t-stat							
	Agronomic methods		Physical methods		Biological methods		Chemical methods	
	FFS	Non-FFS	FFS	Non-FFS	FFS	Non-FFS	FFS	Non-FFS
Intercept	9.6238	6.7003	-0.8522	0.4639	9.2335	3.8315	1.9853	4.6898
1.Age	0.9311	0.0089	-0.7890	0.0658	-0.3405	0.4592	0.1192	-0.3199
2.Education	-0.3265	-0.3890	1.2838	0.0763	0.1676	0.6337	0.8411	1.2286
3.Farm size	1.8253	-1.1838	-0.3372	0.0308	-0.8171	-1.0477	0.4330	0.6196
4.Farming experience	0.7490	-0.2945	1.3441	0.2512	-0.1211	-0.5902	0.0296	-0.0251
5.Area under paddy	-2.3392 *	0.6446	-0.6859	-0.1292	0.4481	0.9499	-1.1736	-1.4520
6.Mass media exposure	-0.0898	1.9638	0.4857	0.7489	0.0880	-0.4605	-0.4839	-0.0324
7.Contact with extension agency	0.3336	-0.3992	0.0619	-0.3670	0.6931	0.6332	1.2546	-0.3836
8.Social participation	-0.4527	0.0156	0.5501	-0.3304	-0.7396	0.3349	-0.4594	0.0345
9.Cosmopoliteness	0.7096	-0.9036	0.4773	0.4730	-0.9209	-0.7437	2.1017 *	-0.6755
10.Economic motivation	0.9466	-0.2629	1.7586	0.5275	-1.2795	-0.0058	0.0603	-0.0836
11.Scientific orientation	-1.1046	-1.3125	1.4850	0.9230	0.9323	-0.3322	0.8513	-1.0839
12.Progressiveness	-0.9716	0.5146	-0.2488	0.5179	0.5093	1.3699	1.3347	1.4669
13.Innovativeness	3.3925 * *	1.0417	1.5073	0.3757	0.4319	-0.4171	1.2979	-0.5504
14.Risk orientation	-1.0524	0.1319	0.7431	-0.7134	0.2416	0.4882	-2.6480 * *	0.4236
15.Training Undergone	0.7922	0.2912	-1.5638	-0.7912	0.8842	-0.5723	0.1570	1.7558
16.Possession of PPE	0.1132	1.3770	-0.8432	-0.3176	1.5432	0.1425	1.4442	1.4327
R-square	0.4067	0.2116	0.3189	0.1369	0.2166	0.1881	0.3853	0.2946
F-value	1.8419	0.7215	1.2584	0.4263	0.7430	0.6227	1.6847	1.2250

* 5 Per cent level of significance

** 1 Per cent level of significance

contribution towards their awareness. A unit increase in their cosmopoliteness was found to increase their awareness by 5.9268 units *ceteris paribus*.

4.4.2. Multiple regression of characteristics of FFS and non-FFS farmers with their awareness for Leaf Folder control

It could be inferred from the table 28 that 40.67 and 21.16 per cent of variation occurred with the awareness about agronomic methods among the FFS as well as non-FFS farmers. Innovativeness was found to have positively influenced the awareness about agronomic methods for the FFS farmers. Area under paddy was found to have negatively significant contribution towards the awareness. In the case of non- FFS farmers, no variable was found to have significant contribution towards the awareness about agronomic methods for leaf folder management, due to the very low level of variation in their awareness.

It could be explained that a unit increase in innovativeness would increase the awareness by 5.6273 units *ceteris paribus*. Apart from these variables, the other variables had non significant influence towards the awareness among the FFS farmers.

Physical methods

It could be seen from the table 28 that the multiple regression value (R^2 = 0.3189) had non-significant contribution towards the awareness of FFS farmers. Further it could be inferred that less level of variation (31.89%) occurred among them with regard to their awareness. This might be due to reason that the use of pheromone traps was known to only less per cent of the farmers.

In the case of non-FFS farmers also the R^2 value (0.1369) was found to show non-significant contribution towards awareness. This shows that only 13.08 per cent variation occurred among the non-FFS farmers with regard to their awareness. Here also only minimum amount of the respondents were aware about the use of pheromone traps.

Biological methods

It is evident from the table 28 that no variable was found to have significant contribution towards their awareness among FFS and non-FFS farmers. The R^2 value 0.2165 and 0.1881 for FFS and non-FFS farmers respectively was found to be non-significant towards their awareness.

The reason for this non-significant contribution of all variables might be due to the fact that the vast majority of FFS and non-FFS respondents were aware about the biological methods.

Chemical methods

It is clear from the table 28 that R^2 value (0.3853) obtained for FFS farmers explained the existence of only 38.53 per cent of variation with respect to their awareness about chemical methods. Among the variables, cosmopoliteness had positive and significant contribution towards their awareness, while the risk orientation had negative and highly significant contribution with respect to the awareness.

It could be explained that a unit increase in cosmopoliteness would increase the awareness by 0.1611 units *ceteris paribus*, because the farmers with more

Table.29. Multiple regression of characteristics of FFS and Non-FFS farmers with their awareness for Gall Midge control

INDEPENDENT VARIABLES	t Stat					
	Agronomic methods		Biological methods		Chemical methods	
	FFS	Non-FFS	FFS	Non-FFS	FFS	Non-FFS
Intercept	6.8685	6.5018	9.2335	3.8315	10.9853	4.6898
1.Age	0.9331	-0.8749	-0.3405	0.4592	0.1192	-0.3199
2.Education	-0.9437	-0.8697	0.1676	0.6337	0.8411	1.2286
3.Farm size	0.3797	-0.9452	-0.8171	-1.0477	0.4330	0.6196
4.Farming experience	-0.8701	0.0941	-0.1211	-0.5902	0.0296	-0.0251
5.Area under paddy	-0.8739	0.9007	0.4481	0.9499	-1.1736	-1.4520
6.Mass media exposure	-0.1316	1.5599	0.0880	-0.4605	-0.4839	-0.0324
7.Contact with extension agency	0.1826	0.1059	0.6931	0.6332	1.2546	-0.3836
8.Social participation	0.3737	0.1404	-0.7396	0.3349	-0.4594	0.0345
9.Cosmopoliteness	0.1870	-1.0901	-0.9209	-0.7437	2.1017 *	-0.6755
10.Economic motivation	0.5310	-0.2064	-1.2795	-0.0058	0.0603	-0.0836
11.Scientific orientation	-1.5069	-1.6227	0.9323	-0.3322	0.8513	-1.0839
12.Progressiveness	0.0631	0.3973	0.5093	1.3699	1.3347	1.4669
13.Innovativeness	1.3167	-0.4664	0.4319	-0.4171	1.2979	-0.5504
14.Risk orientation	-0.7864	1.4272	0.2416	0.4882	-2.6480 **	0.4236
15.Training Undergone	0.3350	0.2565	0.8642	-0.5723	0.1570	1.7558
16.Possession of PPE	-1.1317	0.7807	1.5432	0.1425	1.4442	1.4327
R-square.	0.2114	0.2071	0.2166	0.1881	0.3853	0.2946
F-value	0.7206	0.7018	0.7430	0.6227	1.6847	1.2250

* 5 Per cent level of significance

** 1 Per cent level of significance

cosmopoliteness would have gathered more information. Hence the variable had contributed significantly with regard to their awareness. Risk orientation had negative and significant contribution towards the awareness. Even though the farmers were having less level of risk orientation, they came to know about the IPM practices through other communication sources. Hence the results are justified.

In the case of non-FFS farmers the multiple determinant (R^2) value (0.2979) denoted non-significant contribution of independent variables towards the awareness.

4.4.3. Multiple regression of characteristics of FFS and non-FFS farmers with their awareness for Gall Midge control

Agronomic methods

It could be seen from the table 29 that the multiple determinant (R^2) values for FFS and non-FFS farmers were 0.2114 and 0.2070 respectively. It was also found that no variable had significant contribution towards the awareness among both the categories of farmers. The practices such as use of optimum spacing, removal of alternate hosts and need based fertilizer management was known to majority of the respondents who belonged to both the categories

Biological methods

It is inferred from the table 29 that the awareness of both the categories of farmers were having the variation of 23.66 per cent and 18.81 per cent respectively. At the same time these influence by all the variables was not having significant contribution towards the awareness.

Table.30. Multiple regression of characteristics of FFS and Non-FFS farmers with their awareness for Brown Plant Hopper control

INDEPENDENT VARIABLES	t-stat							
	Agronomic methods		Physical methods		Biological methods		Chemical methods	
	FFS	Non-FFS	FFS	Non-FFS	FFS	Non-FFS	FFS	Non-FFS
Intercept	6.6499	7.8475	1.8828	1.8893	9.2335	3.8315	0.9889	3.6676
1.Age	0.2627	-1.1761	0.2697	0.5580	-0.3405	0.4592	0.3717	-0.4433
2.Education	-2.1328 *	-0.3508	-0.6954	1.7148	0.1676	0.6337	-1.3397	0.9043
3.Farm size	0.6135	-0.5907	0.7938	1.5484	-0.8171	-1.0477	-0.7657	0.6186
4.Farming experience	-0.4081	0.8056	1.0651	-0.5115	-0.1211	-0.5902	-0.1484	0.2861
5.Area under paddy	-0.6968	0.3468	-0.5727	-1.2635	0.4481	0.9499	0.1731	-1.3977
6.Mass media exposure	1.4571	1.0382	-0.6943	0.0635	0.0880	-0.4605	-0.9757	0.7461
7.Contact with extension agency	0.8448	-1.3700	0.0157	2.0136 *	0.6931	0.6332	2.8926 * *	0.9601
8.Social participation	-1.0708	0.8037	0.0053	-0.1204	-0.7396	0.3349	-1.2941	-0.7325
9.Cosmopoliteness	-0.3773	0.2300	0.8030	1.6635	-0.9209	-0.7437	3.2656 * *	-0.4421
10.Economic motivation	-1.9527	-1.0821	-0.3371	-0.9277	-1.2795	-0.0058	1.1475	-0.9136
11.Scientific orientation	0.3077	-2.6280 *	1.2425	-0.7239	0.9323	-0.3322	1.6573	-0.1225
12.Progressiveness	-2.1108 *	1.8013	1.9017	-0.1141	0.5093	1.3699	1.2420	0.9496
13.Innovativeness	2.2348 *	1.3369	-0.2531	0.1597	0.4319	-0.4171	1.0319	-1.6158
14.Risk orientation	1.1121	0.7955	-0.5945	0.2258	0.2416	0.4882	-2.2465 *	1.2307
15.Training Undergone	0.2978	-0.3394	0.1438	-0.2085	0.8842	-0.5723	-0.5371	1.7886
16.Possession of PPE	0.7347	0.9066	0.3088	0.6089	1.5432	0.1425	0.6312	1.3985
R-square	0.2800	0.3139	0.2305	0.3648	0.2166	0.1881	0.4769	0.2929
F-value	1.0453	1.2295	0.0805	1.5437	0.7430	0.6227	2.4505	1.1133

* 5 Per cent level of significance

** 1 Per cent level of significance

Chemical methods

It could be observed from the table 29 that all the variables together contributed 38.53 per cent of variation with the awareness of FFS farmers. Among the sixteen variables cosmopoliteness had positive and significant contribution with respect to the awareness. The other variable risk orientation had resulted in negative and significant contribution towards awareness.

In the case of non-FFS farmers all the variables together contributed 29.79 per cent of variation in their awareness. Due to this low level of variation with respect to their awareness, non-significant contribution of variables towards awareness had resulted.

4.4.4. Multiple regression of characteristics of FFS and non-FFS farmers with their awareness for Brown Plant Hopper control

Agronomic methods

It could be observed from the table 30 that there was 28.00 per cent and 31.40 per cent variation among the FFS and non-FFS farmers with respect to their awareness about agronomic methods.

In the case of FFS farmers the innovativeness had resulted in positively significant contribution with respect to the awareness, whereas education and progressiveness were negatively significant towards the awareness. A unit increase in innovativeness would increase the awareness by 5.8261 units *ceteris paribus*.

In the case of non-FFS farmers scientific orientation had contributed in a negatively significant manner, which might be due to the fact that, a respondent with more orientation towards science might not have perceived the agronomic practices as a new venture.

Physical methods

It could be seen from the table 30 that the multiple determinant (0.2305) for FFS farmers was non-significant in it's contribution towards variation in their awareness. Further all these independent variables of FFS farmers for the study showed only 23.05 per cent of variation in their awareness levels. This might be due to the fact that through Farmer's Field School, most of the respondents came to know about the physical methods.

In the case of non-FFS farmers, the variation among the respondents was 36.48 per cent through the influence of independent variables. Only one variable contact with extension agency could influence significantly in a positive manner, while the remaining variables were non-significant with regard to their awareness about physical methods. A unit increase in contact with extension agency would increase in awareness by 0.6148 units *ceteris paribus*.

Biological methods

It is clear from the table 30 that the multiple determinant (R^2) value (0.2366, 0.1881) meant that the variation in their awareness of biological methods of FFS and non-FFS farmers was as 23.66 per cent and 18.81 per cent respectively. However, the

Table.31. Multiple regression of characteristics of FFS and Non-FFS farmers with their awareness for Rat control

INDEPENDENT VARIABLES	t Stat					
	Agronomic methods		Physical methods		Chemical methods	
	FFS	Non-FFS	FFS	Non-FFS	FFS	Non-FFS
Intercept	2.4750	2.7704	1.3029	4.1302	1.5874	0.9730
1.Age	0.0737	-0.9530	-0.4451	-0.1767	0.7501	0.3619
2.Education	-0.7355	0.1549	0.0473	-2.2115 *	0.6581	-0.7670
3.Farm size	1.6769	-0.1867	-0.6830	1.6359	1.0348	1.1764
4.Farming experience	-0.5373	0.5286	0.5886	-0.6881	0.7453	0.0133
5.Area under paddy	-1.2917	0.0246	0.3189	-1.6130	-0.8577	-0.2038
6.Mass media exposure	1.7882	0.2650	1.1452	-0.1381	1.1303	1.1215
7.Contact with extension agency	-0.9865	-1.4379	0.2577	-0.8687	-0.5774	-0.7822
8.Social participation	-0.2744	-0.3190	-0.3524	1.4785	-0.2576	-0.2207
9.Cosmopoliteness	0.1889	-0.3706	0.1057	0.2255	-0.7912	-1.8559
10.Economic motivation	0.0009	0.8091	1.2659	0.1327	-1.0752	0.0179
11.Scientific orientation	-1.2087	-0.7231	-0.6285	-0.2882	0.0754	0.4386
12.Progressiveness	0.7337	0.4988	0.1541	0.0375	0.0732	0.7710
13.Innovativeness	0.2385	-0.2214	0.7734	0.5875	1.1916	0.8834
14.Risk orientation	0.4014	-0.4595	0.7687	0.2364	0.2466	0.3112
15.Training Undergone	0.7249	2.2484 *	-1.8229	0.9026	-0.3622	0.3175
16.Possession of PPE	0.9421	0.4151	0.4245	-0.4081	-0.3308	0.1687
R-square	0.2518	0.2355	0.2335	0.2899	0.1679	0.3007
F-value	0.9045	0.8281	0.8186	1.0969	0.5421	1.1554

* 5 Per cent level of significance

** 1 Per cent level of significance

variations through independent variables were not much enough to have significant contribution towards their awareness. Hence, no variable could influence the awareness about biological methods.

Chemical methods

In the case of FFS farmers, it was found that 47.69 per cent of variation occurred among the respondents with respect to their awareness about chemical methods, through the influence of independent variables. Contact with extension agency and cosmopoliteness had resulted in positive and highly significant contribution towards the awareness, whereas risk orientation had negatively significant contribution towards the awareness.

4.4.5. Multiple regression of characteristics of FFS and non-FFS farmers with their awareness for Rat control

Agronomic methods

It is inferred from the table 31 that the R^2 value (0.2355) for FFS farmers showed non-significant contribution by the independent variables towards the variation in awareness of FFS farmers. Further the variation was found to be only 25.18 per cent. Hence no independent variable had significant contribution with respect to the awareness about agronomic methods by the FFS farmers.

In the case of non-FFS farmers the R^2 value (0.2355) explained the existence of variation as 23.55 per cent in their awareness. The variable trainings undergone alone had

positively significant contribution towards their awareness. Through trainings the non-FFS farmers awareness would have been increased.

Physical methods

In the case of FFS farmers the R^2 value (0.2335) had non-significant contribution towards the awareness about the physical methods (Table 31). It meant that through independent variables, only 23.34 per cent variation occurred among them with regard to their awareness. No other variable could influence significantly their awareness, because of less level of variation due to the exposure to trainings.

In the case of non-FFS farmers the variation resulted among them was 28.98 per cent. The variable education alone had contributed in a negatively significant manner with their awareness about physical methods. While all the other fifteen variables had non-significant contribution towards their awareness.

Chemical methods

In the case of FFS and non-FFS farmers the R^2 value of 0.1678 and 0.3006 respectively had shown non-significant contribution towards the variation in their awareness (Table 31). All the variables together contributed 16.78 per cent and 30.06 per cent of variation in their awareness of FFS and non-FFS farmers respectively. Though the FFS farmers had attended trainings there existed only minimum level of awareness about the use of tablets for rat control. Similarly for non-FFS farmers also, minimum per cent of awareness was observed.

Table.32. Multiple regression of characteristics of FFS and Non-FFS farmers with their awareness for Blast control

INDEPENDENT VARIABLES	t-stat					
	Agronomic methods		Physical methods		Chemical methods	
	FFS	Non-FFS	FFS	Non-FFS	FFS	Non-FFS
Intercept	9.1253	2.3035	3.8802	1.0420	1.0415	2.3706
1.Age	0.0402	0.4944	0.2024	-1.0186	1.1295	-0.5770
2.Education	-0.5113	0.6329	-0.2630	0.0780	-1.6866	1.4367
3.Farm size	0.6027	-1.8551	2.2501 *	0.9127	0.7468	1.9070
4.Farming experience	-0.3089	-0.6139	-0.0751	1.0036	-1.2161	0.6736
5.Area under paddy	-0.4660	1.5546	-1.7122	-1.1507	-1.9382	-1.9930
6.Mass media exposure	0.9166	1.6412	1.1688	-0.0962	-0.2593	0.1747
7.Contact with extension agency	-0.5058	-0.0533	-0.9140	-1.1098	1.6719	-0.2689
8.Social participation	1.1743	-0.4079	0.3911	0.4249	-0.6586	0.4797
9.Cosmopoliteness	0.1123	0.8010	-1.3741	0.6379	3.0568 **	0.4707
10.Economic motivation	1.2542	-0.3861	-0.0283	1.8049	2.0770 *	-0.0354
11.Scientific orientation	-1.6730	-0.9346	-1.8050	0.2487	-0.4426	0.1226
12.Progressiveness	-0.6725	1.0323	1.3651	0.7914	1.3711	1.4120
13.Innovativeness	-0.0305	2.1737	-1.1623	-2.2258 *	1.2417	-1.5861
14.Risk orientation	-0.1605	-0.8233	-0.6256	1.3159	-1.6945	0.7790
15.Training Undergone	-1.1062	-1.4209	-0.9638	0.7058	-0.1156	1.8653
16.Possession of PPE	-1.1084	1.0604	0.3285	-2.1479 *	0.7863	1.4060
R-square.	0.1925	0.4348	0.2829	0.2862	0.4881	0.4300
F-value	0.6407	2.0679	1.0603	1.0775	2.5621	2.0274

* 5 Per cent level of significance

** 1 Per cent level of significance

4.4.6. Multiple regression of characteristics of FFS and non-FFS farmers with their awareness for Blast control

Agronomic methods

In the case of FFS farmers it was observed from the table 32 that all the variables together contribute only 19.25 per cent variation in their awareness. It meant the non-significant contribution towards the variation in their awareness with respect to the agronomic methods. The reason for this low level of variation was that majority of the FFS farmers became aware about the agronomic method of optimum spacing in IPM through trainings.

In the case of non-FFS farmers the variation (43.48%) was comparatively higher than the FFS farmers variation in their awareness. The variable innovativeness had resulted in significant contribution towards the awareness in a positive manner. It meant that a unit increase in their innovativeness would increase the awareness about agronomic methods of pest control by 11.961 units *ceteris paribus*.

Physical methods

It is clear from the table 32 that the R^2 value (0.2829) for FFS farmers explained the variation as 28.29 per cent. In the case of non-FFS farmers, the variation was 28.62 per cent ($R^2 = 0.2862$).

In the case of FFS farmers, the farm size had contributed significantly towards their awareness about physical methods. It meant that a unit increase in farm size would increase their awareness by 1.5805 units *ceteris paribus*. In the case of non-FFS farmers,

Table.33. Multiple regression of characteristics of FFS and Non-FFS farmers with their awareness for Tungro control

INDEPENDENT VARIABLES	t-stat					
	Physical methods		Biological methods		Chemical methods	
	FFS	Non-FFS	FFS	Non-FFS	FFS	Non-FFS
Intercept	0.1482	1.6008	1.6644	5.4577	-0.3138	1.4642
1.Age	0.7234	-0.1313	-1.2876	0.0685	2.0482	-1.2168
2.Education	-0.8354	-1.2721	-0.2213	0.7232	-0.5139	0.0037
3.Farm size	-1.2295	1.7100	-0.2713	-0.4536	-0.2751	-0.3731
4.Farming experience	-0.2364	0.2659	0.3774	0.3968	-1.8076	1.4275
5.Area under paddy	0.5482	0.0673	1.0222	0.4210	0.3606	0.2053
6.Mass media exposure	0.9486	0.9263	0.8878	-1.2839	-0.4713	1.0969
7.Contact with extension agency	1.9080	-0.5919	1.0514	-0.0942	1.0224	0.9066
8.Social participation	-0.4058	-0.5045	0.0148	-0.2532	0.3446	0.8480
9.Cosmopoliteness	-0.0886	-0.2873	1.5889	-1.7491	0.5301	-0.3685
10.Economic motivation	0.8831	0.2228	-0.0129	-1.4241	2.1332 *	-0.7904
11.Scientific orientation	0.1208	0.1452	-0.1449	1.2606	1.6460	0.1720
12.Progressiveness	0.7766	0.2338	-1.0832	0.4128	0.0356	0.0398
13.Innovativeness	-1.3320	0.5511	0.5638	0.8080	1.0696	0.3117
14.Risk orientation	-0.1234	-0.2750	0.0410	-0.7995	-1.4888	1.6169
15.Training Undergone	-0.3553	0.2622	-1.6184	0.0773	-0.1709	-0.1074
16.Possession of PPE	1.6504	-0.6001	-0.9582	1.1368	-0.6467	0.7748
R-square	0.3155	0.2697	0.2818	0.2068	0.3290	0.2222
F-value	1.2389	0.9924	1.0544	0.7007	1.3179	0.7678

* 5 Per cent level of significance

** 1 Per cent level of significance

the variables, innovativeness and possession of plant protection equipments had negatively significant contribution towards their awareness about physical methods.

Chemical methods

In the case of FFS and non-FFS farmers the R^2 value (0.4889 and 0.4368) denoted the variation by 48.89 per cent and 43.68 per cent with respect to their awareness about chemical methods. In the case of FFS farmers, cosmopoliteness and economic motivation had contributed significantly. Hence it can be explained that as, a unit increase in cosmopoliteness and economic motivation would increase the awareness by 0.1800 and 0.0235 units *ceteris paribus* respectively. It is inferred that the farmers who wish to have more profit would try to gather all sorts of information to reduce the loss through pests.

In the case of non-FFS farmers, no variable had exhibited significant contribution towards the awareness due to the low level of variation among them with regard to their awareness about chemical methods of controlling blast disease.

4.4.7. Multiple regression of characteristics of FFS and non-FFS farmers with their awareness for Tungro control

Agronomic methods

Cent per cent awareness was observed among both the categories of farmers for the practices summer ploughing and removal of weeds. Hence due to the nil amount of variation the values had come out with infinity.

Physical methods

It could be observed from the table 33 that for the FFS farmers the R^2 value (0.3155) was non-significant in its contribution towards variation in their awareness. Further all the independent variables of non-FFS farmers had shown only 31.55 per cent of variation in their awareness. The reason might be that there exists very low level of variation with regard to the awareness about the physical methods.

In the case of non-FFS farmers also the R^2 value (0.2696) showed non-significant contribution towards the awareness. It meant that the variation in their awareness was 26.96 per cent and no other independent variables had shown their significant contribution towards the awareness.

Biological methods

It could be observed from the table 33 that the R^2 values (0.2818, 0.2068) for FFS and non-FFS farmers were found to show non-significant contribution with regard to their awareness. It had explained the existence of variation by 28.18 per cent and 20.68 per cent among the FFS and non-FFS farmers with respect to their awareness. The reason for this low level of variation might be that the use of neem oil for the pest control was being practiced by majority of the farmers for years together.

Chemical methods

It is observed from the table 33 that for FFS farmers the 32.91 per cent (R^2 = 0.3291) variation with their awareness was observed, through the contribution of variables. Among the variables, age and economic motivation alone contributed in

Table.34. Multiple regression of characteristics of FFS and Non-FFS farmers with their awareness for Brown Leaf Spot control

INDEPENDENT VARIABLES	t-stat					
	Agronomic methods		Physical methods		Chemical methods	
	FFS	Non-FFS	FFS	Non-FFS	FFS	Non-FFS
Intercept	3.5875	6.5320	2.5416	2.8250	1.0415	2.3706
1.Age	0.5849	-0.7565	0.1292	-1.9375	1.1295	-0.5770
2.Education	-0.3006	-0.5435	-0.4254	0.1580	-1.6866	1.4367
3.Farm size	-0.5621	0.9315	0.6170	0.0293	0.7468	1.9070
4.Farming experience	1.5972	0.4089	1.2636	1.6578	-1.2161	0.6736
5.Area under paddy	0.3908	-0.4574	-0.7597	-0.0308	-1.9382	-1.9930
6.Mass media exposure	0.1457	1.2794	-0.6773	-1.5419	-0.2593	0.1747
7.Contact with extension agency	0.7197	-0.8274	-0.3558	0.3485	1.6719	-0.2689
8.Social participation	-0.8773	-0.3817	-0.5512	-0.7516	-0.6586	0.4797
9.Cosmopoliteness	1.7602	-0.8142	-0.5320	0.7511	3.0568 **	0.4707
10.Economic motivation	0.1283	0.8791	-1.1199	-1.0860	2.0770 *	-0.0354
11.Scientific orientation	1.9058	-1.1141	1.4913	0.2828	-0.4426	0.1226
12.Progressiveness	1.8922	0.1729	0.1406	1.7300	1.3711	1.4120
13.Innovativeness	-1.2541	-1.3565	-0.1516	-1.3020	1.2417	-1.5861
14.Risk orientation	0.5186	0.2633	1.6578	0.7792	-1.6945	0.7790
15.Training Undergone	2.3282 *	1.1452	1.3030	1.3558	-0.1156	1.8653
16.Possession of PPE	1.0980	-0.1206	-0.6771	0.4473	0.7863	1.4060
R-square	0.3795	0.1830	0.2343	0.2362	0.4881	0.4300
F-value	1.6439	0.6021	0.8223	0.8311	2.5621	2.0274

* 5 Per cent level of significance

** 1 Per cent level of significance

positive and significant manner with their awareness. It can be explained that a unit increase in age and economic motivation would increase their awareness by 0.0637 and 0.0235 units *ceteris paribus* respectively.

In the case of non-FFS farmers it was found that the R^2 value (0.2444) had indicated no significant contribution towards the variation in their awareness. Further all the variables together contributed less level of variation in their awareness about chemical control of tungro disease.

4.4.8. Multiple regression of characteristics of FFS and non-FFS farmers with their awareness for Brown Leaf Spot control

Agronomic methods

It could be observed from the table 34 that the R^2 value (0.3795) explained the existence of variation of 37.95 per cent only among the FFS farmers with respect to their awareness about agronomic methods. It was also found that trainings undergone had positive and significant contribution. Apart from this, no other variable had shown significant contribution towards their awareness about agronomic methods for FFS farmers.

It is clear that a unit increase in the trainings undergone had increased their awareness by 1.7114 units. In the case of non-FFS farmers the multiple determinant (R^2) value (0.1830) was found to have non-significant contribution to the variation in their awareness about agronomic methods.

Table.35. Multiple regression of characteristics of FFS and Non-FFS farmers with their adoption for Stem Borer control

INDEPENDENT VARIABLES	t-stat					
	Agronomic methods		Physical methods		Chemical methods	
	FFS	Non-FFS	FFS	Non-FFS	FFS	Non-FFS
Intercept	4.1885	4.2899	-2.0258	7.3850	0.0048	3.9126
1.Age	-0.4714	-0.4807	0.5058	-1.6741	0.7097	-1.4665
2.Education	1.6850	0.0747	2.2059 *	1.7058	0.7948	-0.9664
3.Farm size	0.9604	0.3937	-1.3813	0.4107	1.0673	0.1487
4.Farming experience	0.5822	0.3909	2.0105 *	1.3702	0.5405	1.2318
5.Area under paddy	-1.2259	0.0100	0.8117	-0.3117	-1.0893	0.4649
6.Mass media exposure	0.3675	1.7989	-1.7026	0.7541	1.6809	0.4309
7.Contact with extension agency	0.5041	0.7152	3.2185 * *	0.2033	1.6473	-0.6899
8.Social participation	0.6364	0.5463	-0.1939	-0.5430	0.5318	0.3128
9.Cosmopoliteness	-0.6737	-0.1122	2.2328 *	1.0034	-0.6275	-0.3424
10.Economic motivation	-1.2853	0.2416	1.1118	-2.3640 *	-0.4035	0.2152
11.Scientific orientation	-0.0012	-0.3693	2.3420 *	-1.4408	1.4715	-0.4762
12.Progressiveness	-0.3069	-0.8591	-1.1051	0.9797	-0.4231	0.8028
13.Innovativeness	1.3095	-0.1884	4.0151 * *	-1.3643	1.4292	-0.4567
14.Risk orientation	1.1525	2.0492 *	-1.7613	1.3078	0.6210	1.7585
15.Training Undergone	-0.8926	0.6482	-1.5773	1.2788	-0.3886	0.2435
16.Possession of PPE	0.0617	-0.5818	-1.0933	1.3993	-1.0165	1.2483
R Square	0.2643	0.2723	0.5661	0.3751	0.4153	0.2018
F-value	0.9655	1.0058	3.5061	1.6129	1.9087	0.6792

* 5 Per cent level of significance

** 1 Per cent level of significance B -Biological methods

Physical methods

It could be seen from the table 34 that all the sixteen variables together contributed 23.42 per cent and 23.62 per cent of variation in their awareness for FFS and non-FFS farmers. Most of the FFS and non-FFS farmers had maximum level of awareness about the physical practices.

Chemical methods

It is inferred from the table 34 that the R^2 value of 0.4889 and 0.4368 denotes the existence of variation by 48.89 per cent and 43.68 per cent among the FFS and non-FFS farmers. For FFS farmers, cosmopoliteness and economic motivation had shown positive and significant contribution at 0.01 and 0.05 level of probability. It could be explained that a unit increase in cosmopoliteness and economic motivation had increased the awareness by 0.1800 and 0.0235 units *ceteris paribus* respectively. In the case of non-FFS farmers, no variable had exhibited significant contribution towards the awareness about chemical methods for controlling brown leaf spot due to the low level of variation with their awareness.

4.4.9. Multiple regression of characteristics of FFS and non-FFS farmers with their adoption for Stem Borer control

Agronomic methods

It could be observed from the table 35 that the R^2 value (0.2643 and 0.2723) meant that all the variables together influenced 26.43 per cent, 27.23 per cent variation in adoption of agronomic methods by FFS and non-FFS farmers respectively.

In the case of FFS farmers it was found that no variable had significant contribution with respect to their adoption.

In the case of non-FFS farmers it was found that the risk orientation had positive and significant contribution towards the adoption of agronomic methods. It meant that a unit increase in risk orientation had increased their adoption by 0.4379 units *ceteris paribus*.

Biological methods

It could be inferred from table 35 that all the variables together contributed 56.61 per cent (R^2 = 0.56608) of variation for adoption by FFS farmers. Among the variables, contact with extension agency and innovativeness showed positive and highly significant contribution, while education, cosmopoliteness and scientific orientation showed significant contribution with regard to their adoption of biological methods.

It could be inferred that a unit increase in education farming experience, contact with extension agency, cosmopoliteness, scientific orientation and innovativeness would increase the adoption by 1.058, 0.307, 2.154, 2.891, 0.405 and 14.412 unit *ceteris paribus* respectively.

It was found that 37.50 per cent variation occurred with respect to adoption by non-FFS farmers. Economic motivation alone contributed in a negatively significant manner. It meant that a unit increase in economic motivation would decrease the adoption of biological method by –0.5622 units *ceteris paribus*.

Table.36. Multiple regression of characteristics of FFS and Non-FFS farmers with their adoption for Leaf Folder control

INDEPENDENT VARIABLES	t-stat							
	Agronomic methods		Physical methods		Biological methods		Chemical methods	
	FFS	Non-FFS	FFS	Non-FFS	FFS	Non-FFS	FFS	Non-FFS
Intercept	4.5484	5.1446	-0.3539	2.1927	-2.0258	7.3850	0.0034	1.5255
1.Age	0.2492	-0.5991	0.4994	0.2513	0.5058	-1.6741	0.8319	0.6778
2.Education	1.6602	-0.2392	0.9213	0.4099	2.2059 *	1.7058	1.1092	2.1670 *
3.Farm size	1.8326	-0.1817	-0.7002	-0.7317	-1.3813	0.4107	-0.5170	-0.1016
4.Farming experience	0.2964	0.3373	2.8318 * *	0.3226	2.0105 *	1.3702	-0.6068	0.1798
5.Area under paddy	-2.4484 *	0.3972	0.4681	0.5570	0.8117	-0.3117	-0.4932	0.2719
6.Mass media exposure	0.3715	1.2521	-1.4890	0.1971	-1.7026	0.7541	0.2062	-0.7290
7.Contact with extension agency	0.6060	0.5113	1.7001	-0.0544	3.2185 * *	0.2033	2.9431 * *	1.0473
8.Social participation	-0.2447	1.1692	2.4411 *	-0.7736	-0.1939	-0.5430	-0.2348	-1.0914
9.Cosmopoliteness	0.2586	-0.1594	1.2705	0.6935	2.2328 *	1.0034	0.0178	0.8671
10.Economic motivation	-1.6539	-0.3865	1.9524	0.2510	1.1118	-2.3640 *	0.0548	-1.2560
11.Scientific orientation	-0.0796	-0.3649	2.8251 * *	0.6725	2.3420 *	-1.4408	0.6729	2.0792 *
12.Progressiveness	-0.1502	-0.3005	-0.5747	0.3365	-1.1051	0.9797	-0.6185	-0.8775
13.Innovativeness	2.2356 *	0.1610	2.3802 *	0.8887	4.0151 * *	-1.3643	1.0804	-0.0928
14.Risk orientation	0.7999	2.0826 *	-2.1336 *	-0.5336	-1.7613	1.3078	-1.4152	-0.0008
15.Training Undergone	-0.2396	0.2961	-1.6391	-1.4239	-1.5773	1.2788	-0.2789	0.4911
16.Possession of PPE	0.5358	-0.0335	-1.8632	-1.3376	-1.0933	1.3993	0.4438	0.4539
R Square	0.4114	0.2722	0.5361	0.1725	0.5661	0.3751	0.4219	0.2777
F-value	1.8785	1.0051	3.1055	0.5603	3.5061	1.6129	1.9610	1.0335

* 5 Per cent level of significance

** 1 Per cent level of significance

Chemical methods

The R^2 value (0.4152, 0.2018) for FFS and non-FFS farmers was non-significant in its contribution towards the variation in their adoption (Table 35). It was also found that there existed only low level of adoption In the case of FFS farmers with regard to the ETL-based spray and seed treatment due to non-conviction which resulted in low variation. Due to low level of adoption of chemical methods, less variation was observed among non-FFS farmers also.

4.4.10. Multiple regression of characteristics of FFS and non-FFS farmers with their adoption for Leaf Folder control

Agronomic methods

It is evident from the table 36 that all the variables together contributed 41.14 per cent (R^2 = 0.4114) variation with respect to the adoption of agronomic methods for leaf folder control by FFS farmers. In the case of non-FFS farmers the variation with respect to the adoption of agronomic methods by the non-FFS farmers was 27.22 per cent.

Innovativeness had positively significant relationship with respect to the adoption by the FFS farmers, whereas the area under paddy had negative and significant contribution towards the adoption of agronomic methods. In the case of non-FFS farmers risk orientation had positively significant relation with regard to the adoption. A unit increase in innovativeness and risk orientation for the FFS and non-FFS farmers respectively would increase their adoption by 6.0681, 0.4748 units *ceteris paribus* respectively.

Physical methods

The variables selected for the study together contributed 53.61 per cent (R^2 = 0.5361) of variation with respect to the adoption of physical methods by the FFS farmers (Table 36). Farming experience and scientific orientation had positive and highly significant contribution towards the adoption while the social participation, innovativeness had resulted in positive and significant contribution towards the adoption. It was also found that risk orientation had resulted in negatively significant contribution towards the adoption at 0.05 level of probability.

A unit increase in farming experience, social participation, scientific orientation and innovativeness would increase the adoption by 0.37008, 3.7698, 0.4185 and 7.3206 units *ceteris paribus* respectively, whereas a unit increase in risk orientation would decrease the adoption by –0.4304 units respectively.

Due to the low level of variation (17.25%) in their adoption, the independent variables selected for the study could not influence the adoption of physical methods by non-FFS farmers. This was due to the fact that almost majority of the non-FFS farmers, were not aware about the physical method, the use of pheromone traps.

Biological methods

All the variables together contributed 56.61 per cent of variation in the adoption by FFS farmers (Table 36). The contact with extension agency and innovativeness showed the highly significant contribution, whereas the education, cosmopoliteness and

scientific orientation had significant contribution with the adoption of biological methods.

A unit increase in education, farming experience, contact with extension agency, cosmopoliteness, scientific orientation and innovativeness would increase 1.058, 0.307, 2.154, 2.891, 0.405, 14.412 units *ceteris paribus* respectively. Hence it could be inferred that farmers with high level of education, farming experience, contact with extension agency, scientific orientation and innovativeness would be receptive to the new approaches and eager to receive and follow it.

In the case of non-FFS farmers economic motivation showed its negatively significant contribution towards the adoption of biological methods. Even though majority of them were having medium and high level of economic motivation, due to the less conviction over the biological methods only very meagre had adopted it. Hence the results are justified.

Chemical methods

It could be seen from the table 36 that 42.18 per cent and 31.15 per cent of variation occurred in the adoption of chemical methods by the FFS and non-FFS farmers. In the case of FFS farmers, contact with extension agency showed it's positive and highly significant contribution. A unit increase in extension agency contact would increase the adoption by 0.1052 units *ceteris paribus*.

In the case of non-FFS farmers, education and scientific orientation had shown positive and significant contribution towards adoption. A unit increase in education and

Table.37. Multiple regression of characteristics of FFS and Non-FFS farmers with their adoption for Gall Midge control

INDEPENDENT VARIABLES	t-stat					
	Agronomic methods		Biological methods		Chemical methods	
	FFS	Non-FFS	FFS	Non-FFS	FFS	Non-FFS
Intercept	5.0286	4.6251	-2.0258	7.3850	0.0034	1.5255
1.Age	-0.3328	-1.2931	0.5058	-1.6741	0.8319	0.6778
2.Education	0.4264	-0.8887	2.2059 *	1.7058	1.1092	2.1670 *
3.Farm size	1.1145	-1.0204	-1.3813	0.4107	-0.5170	-0.1016
4.Farming experience	-0.8315	0.7098	2.0105 *	1.3702	-0.6068	0.1798
5.Area under paddy	-2.3275 *	1.2027	0.8117	-0.3117	-0.4932	0.2719
6.Mass media exposure	0.0515	-0.0671	-1.7026	0.7541	0.2062	-0.7290
7.Contact with extension agency	0.4463	-0.2918	3.2185 * *	0.2033	2.9431 * *	1.0473
8.Social participation	0.2620	1.3482	-0.1939	-0.5430	-0.2348	-1.0914
9.Cosmopoliteness	-0.4219	0.0257	2.2328 *	1.0034	0.0178	0.8671
10.Economic motivation	-1.4396	-0.6793	1.1118	-2.3640 *	0.0548	-1.2560
11.Scientific orientation	-1.6527	-1.3926	2.3420 *	-1.4408	0.6729	2.0792 *
12.Progressiveness	1.4294	-0.3383	-1.1051	0.9797	-0.6185	-0.8775
13.Innovativeness	0.7718	1.4711	4.0151 * *	-1.3643	1.0804	-0.0928
14.Risk orientation	1.8305	2.7408 * *	-1.7613	1.3078	-1.4152	-0.0008
15.Training Undergone	-0.6167	-0.2276	-1.5773	1.2788	-0.2789	0.4911
16.Possession of PPE	0.9591	0.9327	-1.0933	1.3993	0.4438	0.4539
R Square	0.3836	0.3023	0.5661	0.3751	0.4219	0.2777
F-value	1.6727	1.1644	3.5061	1.6129	1.9610	1.0335

* 5 Per cent level of significance

** 1 Per cent level of significance B -Biological methods

scientific orientation would increase the adoption by 0.0716 and 0.0226 units *ceteris paribus* respectively.

4.4.11. Multiple regression of characteristics of FFS and non-FFS farmers with their adoption for Gall Midge control

Agronomic methods

Area under paddy had contributed significantly in a negative manner for FFS farmers (Table 37). A unit increase in area under paddy would decrease the adoption by –3.458 units *ceteris paribus*. In the case of FFS farmers, the R^2 value (0.3836) showed the existence of variation by 38.36 per cent towards adoption.

In the case of non-FFS farmers R^2 value (0.3023) explained the variation as 30.23 per cent towards the adoption by the influence of independent variables. Among the independent variables risk orientation alone contributed in positive and highly significant manner towards the adoption of agronomic methods. It meant that a unit increase in risk orientation would increase the adoption by 0.7060 units *ceteris paribus*.

Biological methods

All the variables together contributed 56.61 per cent of variation in the adoption among FFS farmers (Table 37). The variables contact with extension agency and innovativeness had contributed in a positive and highly significant manner with the adoption of biological methods, while education, farming experience, cosmopoliteness and scientific orientation and had their positive and significant contribution towards adoption. A unit increase in education, farming experience, contact with extension

Table.38. Multiple regression of characteristics of FFS and Non-FFS farmers with their adoption for Brown Plant Hopper control

INDEPENDENT VARIABLES	t-stat							
	Agronomic methods		Physical methods		Biological methods		Chemical methods	
	FFS	Non-FFS	FFS	Non-FFS	FFS	Non-FFS	FFS	Non-FFS
Intercept	3.5306	5.4281	-0.6763	6.8301	-2.0258	7.3850	-0.7534	3.8268
1.Age	-0.1948	-0.8484	-0.1910	-0.0819	0.5058	-1.6741	1.1501	0.6852
2.Education	0.0438	0.1132	1.0521	-1.3850	2.2059 *	1.7058	0.8633	2.5651 *
3.Farm size	0.8238	-0.5026	-0.3630	-1.0596	-1.3813	0.4107	1.1673	-0.3431
4.Farming experience	-0.0240	0.5735	0.9906	-0.1298	2.0105 *	1.3702	-0.4728	-0.5637
5.Area under paddy	-2.1157 *	1.7400	-0.1104	1.1185	0.8117	-0.3117	0.8850	0.3838
6.Mass media exposure	1.0149	1.0673	-1.2738	-0.3167	-1.7026	0.7541	-0.2226	-0.2386
7.Contact with extension agency	1.1140	1.1887	2.0350 *	-0.9601	3.2185 * *	0.2033	3.2671 * *	0.5595
8.Social participation	0.9221	1.6390	-0.3016	-0.0919	-0.1939	-0.5430	0.4954	-0.9514
9.Cosmopoliteness	0.2673	0.2180	2.2108 *	-0.9719	2.2328 *	1.0034	0.1653	-0.6782
10.Economic motivation	-1.3760	-1.4532	0.5113	0.4915	1.1118	-2.3640 *	-0.0098	-0.2598
11.Scientific orientation	-0.3778	-2.7795 * *	1.1392	-1.1044	2.3420 *	-1.4408	1.2510	-0.0506
12.Progressiveness	-0.0178	0.6442	-0.0193	1.2102	-1.1051	0.9797	-0.1695	0.0232
13.Innovativeness	0.8531	-0.1863	2.8663 * *	0.9973	4.0151 * *	-1.3643	0.3003	-0.4740
14.Risk orientation	2.2514 *	1.4556	-0.9775	-0.2952	-1.7613	1.3078	-0.5802	-0.2744
15.Training Undergone	-1.5967	-0.0745	-1.6803	-0.3402	-1.5773	1.2788	0.2938	0.0455
16.Possession of PPE	0.1752	1.8393	-0.2956	0.6009	-1.0933	1.3993	0.0139	-0.1383
R Square	0.3627	0.4538	0.4160	0.1469	0.5661	0.3751	0.4322	0.2407
F-value	1.5298	2.2327	1.9144	0.4626	3.5061	1.6129	2.0447	0.8519

* 5 Per cent level of significance

** 1 Per cent level of significance

agency, cosmopoliteness, scientific orientation and innovativeness would increase the adoption 1.058, 0.307, 2.154, 2.891, 0.405 and 14.412 units *ceteris paribus* respectively.

Economic motivation showed its negatively significant contribution towards the adoption by non-FFS farmers. A unit increase in economic motivation would decrease the adoption of biological practices by –0.6293 units *ceteris paribus*.

Chemical methods

It could be inferred from the table 37 that the multiple determinant (R^2) value for FFS farmers and non-FFS farmers was 0.4218 and 0.3115, which explained the contribution of independent variables selected for the study towards the adoption of chemical methods.

The contact with extension agency had highly significant contribution for FFS farmers whereas for non-FFS farmers, education and scientific orientation had significant contribution towards their adoption. A unit increase in contact with extension agency, education and scientific orientation would increase the adoption of FFS and non-FFS farmers by 0.1052, 0.0716 and 0.0226 units *ceteris paribus* respectively.

4.4.12. Multiple regression of characteristics of FFS and non-FFS farmers with their adoption for Brown Plant Hopper control

Agronomic methods

It could be seen from the table 38 that the R^2 value (0.36275) for FFS farmers showed the variation by 36.28 per cent by the influence of independent variables. In the

case of non-FFS farmers, the R^2 value (0.4537) explained the existence of 45.38 per cent variation among them, with respect to their adoption.

The variable risk orientation had contributed significantly with their adoption. It was also found that area under paddy had exhibited negatively significant contribution towards the adoption among FFS farmers. A unit increase in risk orientation would increase the adoption of agronomic methods by 0.48821 units *ceteris paribus*. A unit increase in area under paddy would decrease adoption by –3.523 units *ceteris paribus*. Similarly for non-FFS farmers, scientific orientation had resulted in negatively significant contribution towards their adoption at 0.01 level of probability. This might be due to the fact that a farmer with high level of scientific orientation might have perceived the agronomic practices as an age old practice, and hence would not have adopted.

Physical methods

It is clear from the table 38 that the R^2 value (0.4159) for FFS farmers denoted that the existence of 41.59 per cent variation among them with regard to their adoption of physical methods. Among the variables, innovativeness had contributed positive and highly significant manner with respect to their adoption, while contact with extension agency and cosmopoliteness had significant contribution towards their adoption. A unit increase in innovativeness, contact with extension agency and cosmopoliteness would increase their adoption by 11.1936, 1.482 and 3.115 units *ceteris paribus* respectively.

The R^2 value (0.14685) denoted the variation of 14.68 per cent among the non-FFS farmers with regard to their adoption. The use of light traps was not adopted by them.

Biological methods

It is inferred from the table 38 that 56.61 per cent variation among the FFS farmers and 37.51 per cent variation among the non-FFS farmers was observed through the influence of selected independent variables. In the case of FFS farmers the variables such as contact with extension agency had exhibited highly significant contribution towards their adoption, while the education, farming experience, cosmopoliteness and scientific orientation had their positive and significant contribution towards adoption. A unit increase in education, farming experience, contact with extension agency, cosmopoliteness, scientific orientation and innovativeness would increase 1.058, 0.307, 2.154, 2.891, 0.405 and 14.412 units *ceteris paribus* respectively.

Economic motivation resulted in negatively significant contribution towards the adoption by non-FFS farmers. Even though the non-FFS farmers were having medium and high levels of economic motivation, they had not adopted the biological methods due to the less conviction over it.

Chemical methods

The contact with extension agency had contributed at 1% level of significance with the variation in adoption by 43.22% (R^2 – 0.4322). A unit increase in contact with extension agency would increase their adoption by 0.1692 units *ceteris paribus*.

Table.39. Multiple regression of characteristics of FFS and Non-FFS farmers with their adoption for Rat control

INDEPENDENT VARIABLES	t-stat					
	Agronomic methods		Physical methods		Chemical methods	
	FFS	Non-FFS	FFS	Non-FFS	FFS	Non-FFS
Intercept	1.2950	4.3580	1.3858	4.1302	3.2145	0.9730
1.Age	-1.0791	-1.5991	-0.3089	-0.1767	-0.3688	0.3619
2.Education	-1.8980	0.5441	-0.5969	-2.2115 *	-1.4681	-0.7670
3.Farm size	0.0135	-0.6340	-0.5983	1.6359	0.0948	1.1764
4.Farming experience	0.4429	1.2247	0.7415	-0.6881	-0.6177	0.0133
5.Area under paddy	-0.5385	0.7535	0.7998	-1.6130	1.0816	-0.2038
6.Mass media exposure	2.2272 *	1.3413	1.5591	-0.1381	1.7317	1.1215
7.Contact with extension agency	-1.3480	-0.6072	0.3673	-0.8687	-0.1961	-0.7822
8.Social participation	0.0876	-1.3753	-0.9167	1.4785	0.3768	-0.2207
9.Cosmopoliteness	2.6350 * *	-0.6181	0.4682	0.2255	-0.9689	-1.8559
10.Economic motivation	0.2102	-0.8729	2.1613 *	0.1327	-1.3124	0.0179
11.Scientific orientation	0.2547	-0.0811	-0.4764	-0.2882	-0.3966	0.4386
12.Progressiveness	0.7252	1.5112	1.4736	0.0375	-1.0063	0.7710
13.Innovativeness	-0.3781	-0.8939	0.1788	0.5875	1.1705	0.8834
14.Risk orientation	1.9174	-0.3382	-0.3897	0.2364	0.4796	0.3112
15.Training Undergone	-0.4030	0.8824	-1.6060	0.9026	-0.5389	0.3175
16.Possession of PPE	1.7139	0.9761	-0.6508	-0.4081	-1.1586	0.1687
R Square	0.3225	0.2298	0.3829	0.2070	0.2747	0.3007
F-value	1.2792	0.8017	1.6676	0.7014	1.0179	1.1554

* 5 Per cent level of significance

** 1 Per cent level of significance

Education had contributed positive and significantly towards the adoption of chemical methods. A unit increase in education would increase the adoption by 0.0499 units *ceteris paribus*, of non-FFS farmers.

4.4.13. Multiple regression of characteristics of FFS and non-FFS farmers with adoption for Rat control

Agronomic methods

The R^2 value (0.3224) explained (Table.39) that there was 32.24 per cent variation in the adoption by FFS farmers. Cosmopoliteness exhibited positive and highly significant contribution and the mass media exposure was having significant contribution towards the adoption. A unit increase in mass media exposure and cosmopoliteness would increase the adoption by 3.639 and 5.4113 units respectively.

Physical methods

Economic motivation had positive and significant contribution towards the adoption of physical methods at five per cent level of probability. A unit increase in economic motivation would increase the adoption by 0.6304 units *ceteris paribus*, among the FFS farmers (Table 39).

Education had negatively contributed towards the adoption by non-FFS farmers. The reason for the negative contribution might be the more educated person would look for the new and effective approaches.

Table.40. Multiple regression of characteristics of FFS and Non-FFS farmers with their adoption for Blast control

INDEPENDENT VARIABLES	t-stat					
	Agronomic methods		Physical methods		Chemical methods	
	FFS	Non-FFS	FFS	Non-FFS	FFS	Non-FFS
Intercept	1.4018	2.3035	1.4148	1.0420	-0.5919	2.8876
1.Age	0.9857	0.4944	2.7944	-1.0186	1.7888	-1.0868
2.Education	0.9133	0.6329	0.3656	0.0780	0.4911	0.0022
3.Farm size	0.5049	-1.8551	1.4117	0.9127	-1.3419	0.0364
4.Farming experience	0.0555	-0.6139	2.7488 **	1.0036	-1.4379	1.0631
5.Area under paddy	-1.1817	1.5546	-0.3195	-1.1507	1.8009	-0.1714
6.Mass media exposure	-1.4453	1.6412	1.3078	-0.0962	-0.5414	0.8137
7.Contact with extension agency	1.5061	-0.0533	-0.4255	-1.1098	2.4322 *	1.1799
8.Social participation	-0.8113	-0.4079	0.7731	0.4249	-1.1362	0.6068
9.Cosmopoliteness	-1.1584	0.8010	-0.8734	0.6379	-0.5822	-0.2678
10.Economic motivation	-1.4842	-0.3861	-0.2660	1.8049	1.9226	-1.4629
11.Scientific orientation	-0.4743	-0.9346	1.0564	0.2487	0.0620	1.2552
12.Progressiveness	-1.4824	1.0323	0.9409	0.7914	0.4460	-0.1517
13.Innovativeness	2.6229 **	2.1737 *	-0.7165	-2.2258 *	0.6359	-0.5510
14.Risk orientation	-0.0546	-0.8233	-0.1161	1.3159	-0.7583	1.5769
15.Training Undergone	1.1474	-1.4209	0.3319	0.7058	0.1670	0.3690
16.Possession of PPE	0.8780	1.0604	1.1065	-2.1479 *	-1.0118	0.7889
R Square	0.3055	0.4348	0.4918	0.2862	0.3158	0.2406
F-value	1.1824	2.0679	2.6005	1.0775	1.2407	0.8516

* 5 Per cent level of significance

** 1 Per cent level of significance

Chemical methods

The R^2 value for FFS and non-FFS farmers (0.2747 and 0.3006) showed non-significant contribution towards the adoption. Further it had shown that only 27.47 per cent and 30.06 per cent of variation existed among both the categories. It was also observed that very low level of use of rat tablets had resulted due to the low level of awareness.

4.4.14. Multiple regression of characteristics of FFS and non-FFS farmers with their adoption for Blast control

Agronomic methods

Innovativeness had significant contribution towards the adoption for FFS as well as non-FFS farmers (Table.40). The multiple determinant (R^2) value (0.3055 and 0.4348) denoted the existence of variation by 30.55 per cent and 43.48 per cent with respect to the adoption by FFS and non-FFS farmers. A unit increase in innovativeness had increased the adoption by FFS and non-FFS farmers to the tune of 21.0667 and 11.9608 unit *ceteris paribus* respectively.

Physical methods

The R^2 value 0.4917 denoted the existence of 49.17 per cent variation in the adoption of physical methods among the FFS farmers, while for non-FFS farmers, the R^2 value 0.2862 denotes that 28.62 per cent variation with regard to the adoption of physical methods among the FFS farmers.

Table.41. Multiple regression of characteristics of FFS and Non-FFS farmers with their adoption for Tungro control

INDEPENDENT VARIABLES	t-stat							
	Agronomic methods		Physical methods		Biological methods		Chemical methods	
	FFS	Non-FFS	FFS	Non-FFS	FFS	Non-FFS	FFS	Non-FFS
Intercept	6.424	7.4978	2.3789	1.6008	0.2619	5.4577	-0.6252	1.8842
1.Age	0.2287	0.8126	-0.5503	-0.1313	-1.0677	0.0685	1.2177	-1.1516
2.Education	0.2771	1.6936	-1.0068	-1.2721	0.3566	0.7232	0.6794	0.0620
3.Farm size	1.4875	1.2306	-0.5611	1.7100	-1.7499	-0.4536	-0.8363	-0.0309
4.Farming experience	-0.2024	-0.1516	0.1982	0.2659	0.0756	0.3968	-0.8650	1.1369
5.Area under paddy	-2.0152	-0.6728	-0.1884	0.0673	1.3746	0.4210	0.8077	0.1022
6.Mass media exposure	-0.0937	-0.5422	-0.0151	0.9263	-0.4182	-1.2839	-0.8215	1.0752
7.Contact with extension agency	-0.3079	1.5881	0.2104	-0.5919	1.2918	-0.0942	2.1999 *	1.0461
8.Social participation	0.1117	-1.0703	0.2062	-0.5045	-0.5725	-0.2532	-0.6195	0.8841
9.Cosmopoliteness	-0.0147	0.7403	-0.1212	-0.2873	-0.3286	-1.7491	-0.3016	-0.2496
10.Economic motivation	-1.0276	0.4469	1.7700	0.2228	0.6278	-1.4241	2.0243 *	-1.2269
11.Scientific orientation	-1.3035	0.9675	0.3534	0.1452	-0.7212	1.2606	0.3806	0.3475
12.Progressiveness	0.1861	-0.3228	0.3456	0.2338	0.7774	0.4128	0.2458	-0.0466
13.Innovativeness	-0.0049	-0.9931	-1.5131	0.5511	-0.0121	0.8080	-0.1484	0.1859
14.Risk orientation	0.1222	-0.3250	1.3303	-0.2750	0.6485	-0.7995	-0.2527	1.0940
15.Training Undergone	-0.2151	0.3964	0.0863	0.2622	-0.2154	0.0773	-0.2423	0.2891
16.Possession of PPE	-0.3853	-0.1928	0.4574	-0.6001	0.6288	1.1368	-1.1340	0.7546
R Square	0.1921	0.1928	0.2040	0.2697	0.1986	0.2068	0.2508	0.2187
F-value	0.6388	0.6645	0.6889	0.9924	0.6658	0.7007	0.8995	0.7523

* 5 Per cent level of significance

** 1 Per cent level of significance

In the case of FFS farmers, farming experience had exhibited highly significant contribution towards their adoption. A unit increase in family experience would increase their adoption of physical methods by 0.5175 units *ceteris paribus*, whereas for non-FFS farmers innovativeness and possession of plant protection equipments had shown negative and significant contribution towards the adoption. This was due to the fact that innovative farmers and those who were having high possession of plant protection equipments might not have favoured the physical method.

Chemical methods

The contact with extension agency alone had resulted in positive and significant contribution towards the adoption by FFS farmers. It meant that a unit increase in contact with extension agency would increase the adoption by 0.0905 units *ceteris paribus*.

4.4.15. Multiple regression of characteristics of FFS and non-FFS respondents with the adoption for Tungro control

Agronomical methods

It could be seen from the table 41 that the R^2 value (0.1921, 0.1928) obtained for FFS farmers and non-FFS farmers had shown the existence of variation by 19.21 per cent and 19.28 per cent respectively. In the case of FFS farmers, area under paddy alone was found to have negatively significant contribution towards the adoption. This might be due to the fact that even though the farmers were low level area under paddy they would have adopted the agronomic methods with the intention of controlling the Tungro disease effectively. For non-FFS farmers due to the low level of variation in their adoption of agronomic methods no variable was found to have significant contribution.

Physical methods

The multiple determinant R^2 value (0.2040 and 0.2696) for FFS and non-FFS farmers explained that there was non-significant contribution of independent variables towards the adoption. The reason for the low level of variation might be that, majority of the farmers have not adopted the practice as it required more amount of labour.

Biological methods

It is evident from the table 41 that the low level of variation 19.85 per cent (R^2 = 0.1985) and 20.68 per cent (R^2 = 0.2068) observed among FFS and non-FFS farmers denotes that the non-significant contribution of selected variables towards the adoption. Here the practice that has been included under this component, the use of neem oil was used by majority of the farmers with less level of variation. Hence the selected variables could not influence the adoption of both the categories.

Chemical methods

In the case of FFS farmers it could be seen from the table 41 that the variables contact with extension agency and economic motivation had resulted in their significant contribution towards the adoption of chemical methods. Hence it could be explained as a unit increase in extension agency contact and economic motivation would increase the adoption by 0.1305 and 0.0455 units *ceteris paribus* respectively. In the case of non-FFS farmers it is observed that the low level of variation 22.01 per cent produced by the influence of independent variables could not contributed significantly. So it is clear that the non-significant contribution by variables was resulted towards the adoption among

Table.42. Multiple regression of characteristics of FFS and Non-FFS farmers with their adoption for Brown Leaf Spot control

INDEPENDENT VARIABLES	t-stat					
	Agronomic methods		Physical methods		Chemical methods	
	FFS	Non-FFS	FFS	Non-FFS	FFS	Non-FFS
Intercept	4.6435	6.5320	-0.5103	2.8250	-0.5919	2.8876
1.Age	0.0499	-0.7565	0.6751	-1.9375	1.7888	-1.0868
2.Education	1.6633	-0.5435	0.2573	0.1580	0.4911	0.0022
3.Farm size	-0.2615	0.9315	0.5176	0.0293	-1.3419	0.0364
4.Farming experience	1.6962	0.4089	0.8126	1.6578	-1.4379	1.0631
5.Area under paddy	-0.5422	-0.4574	-1.2440	-0.0308	1.8009	-0.1714
6.Mass media exposure	-0.2752	1.2794	-0.0047	-1.5419	-0.5414	0.8137
7.Contact with extension agency	2.0197 *	-0.8274	0.5176	0.3485	2.4322 *	1.1799
8.Social participation	-0.9702	-0.3817	1.0079	-0.7516	-1.1362	0.6068
9.Cosmopoliteness	-0.7596	-0.8142	-0.1198	0.7511	-0.5822	-0.2678
10.Economic motivation	-1.0350	0.8791	0.8118	-1.0860	1.9226	-1.4629
11.Scientific orientation	0.9498	-1.1141	0.5595	0.2828	0.0620	1.2552
12.Progressiveness	-0.6538	0.1729	-0.2526	1.7300	0.4460	-0.1517
13.Innovativeness	1.1833	-1.3565	0.7347	-1.3020	0.6359	-0.5510
14.Risk orientation	1.0203	0.2633	1.8175	0.7792	-0.7583	1.5769
15.Training Undergone	0.3777	1.1452	-0.7798	1.3558	0.1670	0.3690
16.Possession of PPE	0.3448	-0.1206	1.4308	0.4473	-1.0118	0.7889
R Square	0.2981	0.1830	0.2514	0.2362	0.3158	0.2406
F	1.1414	0.6021	0.9024	0.8311	1.2407	0.8516

* 5 Per cent level of significance

** 1 Per cent level of significance

non-FFS farmers as there was less level of variation in their adoption of chemical methods.

4.4.16. Multiple regression of characteristics of FFS and non-FFS farmers with their adoption for Brown Leaf Spot control

Agronomic methods

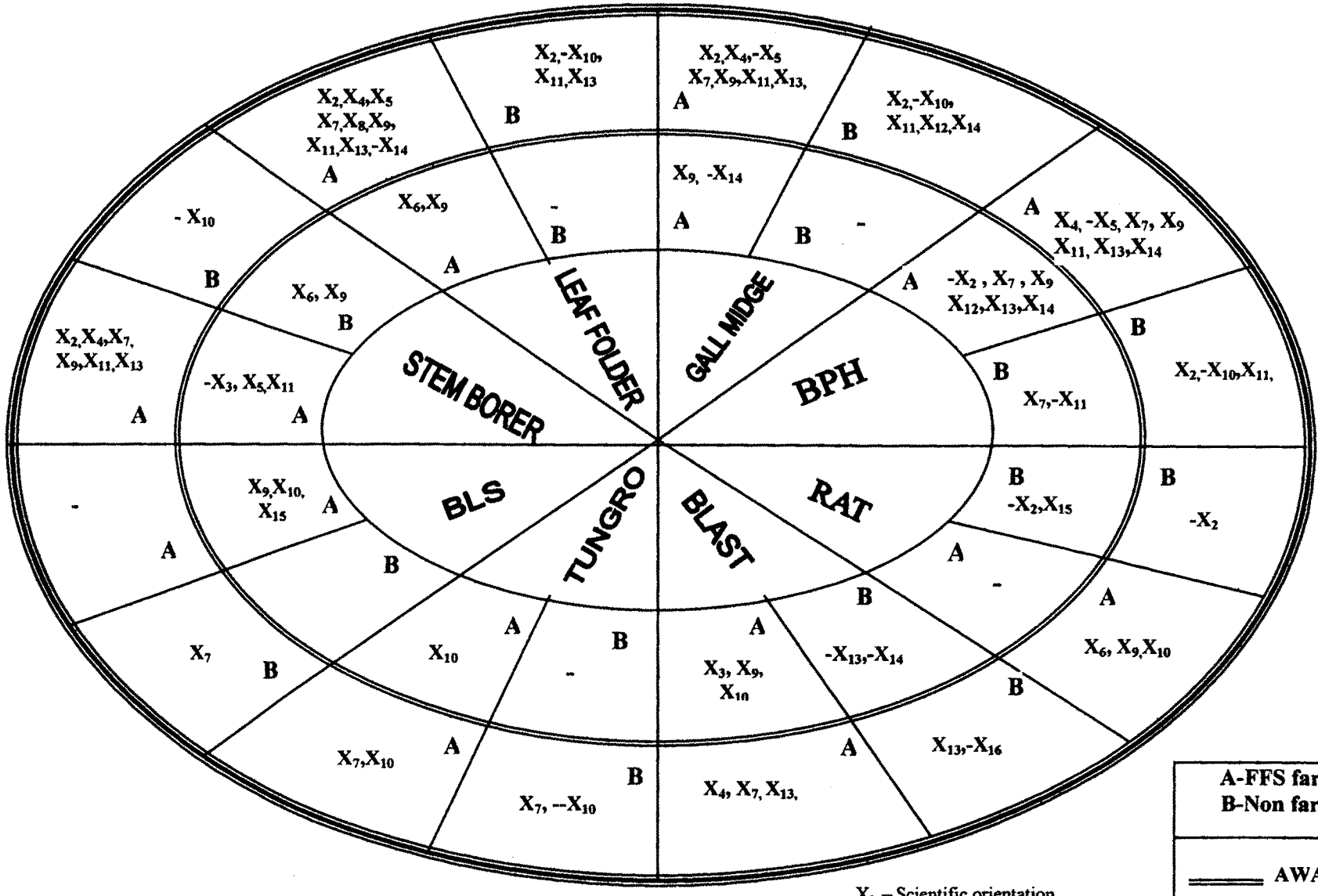
It could be seen from the table 42 that all the selected variables together contributed 29.81 per cent ($R^2 = 0.2981$) variation among the FFS farmers, with respect to their adoption of agronomic methods. In which, contact with extension agency were having positively significant influence towards their adoption. It means that a unit increase in contact with extension agency would increase the adoption by 0.8369 units *ceteris paribus*.

In the case of non-FFS farmers due to low level of variation in their adoption the variables could not contribute significantly towards their adoption.

Physical methods

It is evident from the table 42 that the R^2 value (0.2513 and 0.2362) for FFS and non-FFS farmers denoted, the existence of variation by 25.13 per cent and 23.62 per cent among them. The practice included under this component needed more labour to perform and hence, the majority of farmers did not follow the practice, which might have resulted in low level of variation in adoption.

FIG. 6 . EMPIRICAL MODEL SHOWING THE CONTRIBUTION OF INDEPENDENT VARIABLES TOWARDS THE AWARENESS AND ADOPTION (PEST-WISE)



X_1 – Age
X_{10}– Education
X_{10}– Farm size
X_{10}– Farming experience
X_{10}– Area under paddy

X_1 – Mass media exposure
X_{10}– Contact with extension agency
X_{10}– Social participation
X_{10}– Cosmopoliteness
X_{10}– Economic motivation

X_1 – Scientific orientation
X_{10}– Progressiveness
X_{10}– Innovativeness
X_{10}– Risk orientation
X_{10}– Trainings undergone
X_{10}– Possession of PPE

Table.43. Multiple regression of characteristics of FFS farmers with their awareness ,knowledge and adoption of IPM practices

INDEPENDENT VARIABLES	Awareness	Knowledge	Adoption
Intercept	9.3311	-0.9142	4.3686
1.Age	0.7126	0.9498	0.3309
2.Education	-1.5597	1.4927	2.7783 * *
3.Farm size	1.0026	-2.1693 *	-0.3904
4.Farming experience	-0.1446	2.4092 *	0.5434
5.Area under paddy	-1.1703	1.4925	-1.0507
6.Mass media exposure	0.7661	-0.7383	-0.2310
7.Contact with extension agency	1.0452	2.1308 *	2.1722 *
8.Social participation	-1.4584	-0.8709	0.1198
9.Cosmopoliteness	1.3631	0.6581	-0.5033
10.Economic motivation	0.0424	0.0142	-0.5264
11.Scientific orientation	0.6784	2.0923 *	1.3049
12.Progressiveness	0.4759	-0.7781	0.1158
13.Innovativeness	2.3137 *	0.9739	2.7890 * *
14.Risk orientation	-0.5261	1.0422	0.5799
15.Training Undergone	1.0153	0.7432	-0.6876
16.Possession of PPE	1.2840	3.0553 *	0.5079
R Square	0.3966	0.4946	0.5267
F-value	1.7668	2.6302	2.9910

* 5 Per cent level of significance

** 1 Per cent level of significance

Chemical methods

It was found that contact with extension agency alone had shown its significant contribution towards the adoption. A unit increase in contact with extension agency would increase the adoption by 0.0905 units *ceteris paribus* by FFS farmers.

4.4.17. Multiple regression of characteristics of FFS farmers with their awareness, knowledge and adoption of IPM practices

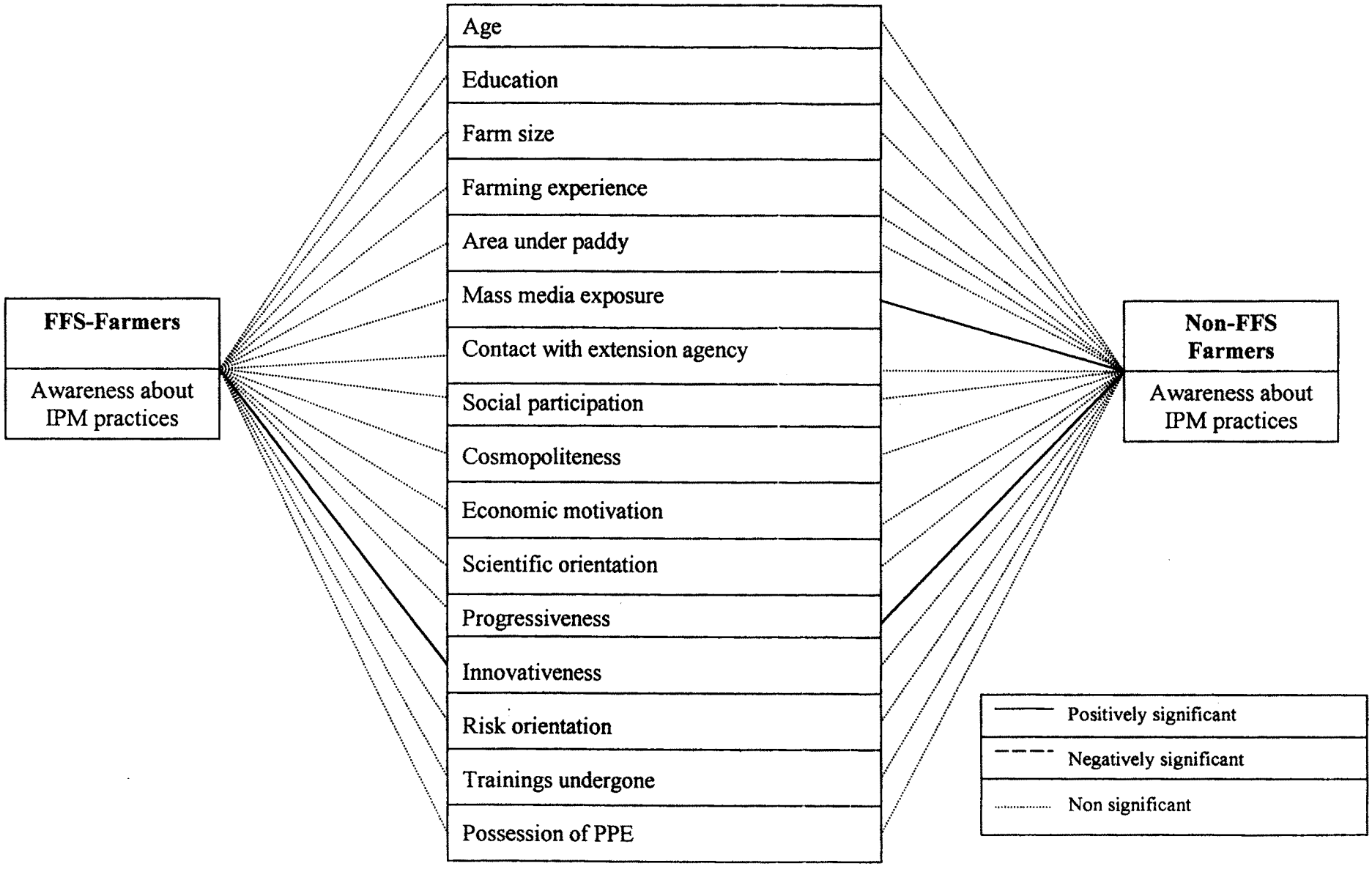
Awareness

It is clear from the table 43 that the R^2 value 0.3966 denoted the existence of variation among the FFS farmers with respect to their awareness. Among all the variables, innovativeness had positive and significant contribution towards awareness. A unit increase in innovativeness would increase the awareness by 3.012 units *ceteris paribus*.The farmer with the more innovative nature would be trying to collect, and follow any new recommendations. Hence the farmers with more innovativeness had more awareness about IPM than others (Fig.7).

Knowledge

Possession of plant protection equipments had exhibited positive and highly significant contribution towards the adoption of FFS practices and farming experience, contact with extension agency and scientific orientation had resulted in significant contribution towards the adoption (Table 43 and Fig.8).

FIG. 7 . EMPIRICAL MODEL SHOWING THE CONTRIBUTION OF INDEPENDENT VARIABLES TOWARDS THE AWARENESS



A unit increase in farming experience, contact with extension agency, scientific orientation and possession of plant protection equipments would increase the knowledge by 0.0857, 0.3328, 0.0844 and 1.5979 units *ceteris paribus* respectively.

The farmers with high farming experience might have got more enthusiasm to learn about new approaches. As the IPM was new, the farmers with more experience in farming would have obtained more knowledge due to their enthusiasm to learn more.

The farmers with more contact with extension agency also had more knowledge about the practices.

The scientific orientation also had resulted in significant contribution towards the knowledge, because those with high orientation towards science, would be very much eager to learn new effective ventures towards the pest control. Hence they had more knowledge on IPM, as it was a new venture in pest management.

Adoption

All the variables together contributed 52.67 per cent of variation in the adoption of IPM practices(Table 43 and Fig.9). Education and innovativeness had resulted in positive and highly significant relationship while the contact with extension agency was having significant contribution towards the adoption of IPM practices. A unit increase in education, contact with extension agency and innovativeness would increase the adoption by 0.648, 0.709 and 4.9557 units *ceteris paribus* respectively.

FIG.8 . EMPIRICAL MODEL SHOWING THE CONTRIBUTION OF INDEPENDENT VARIABLES TOWARDS THE KNOWLEDGE

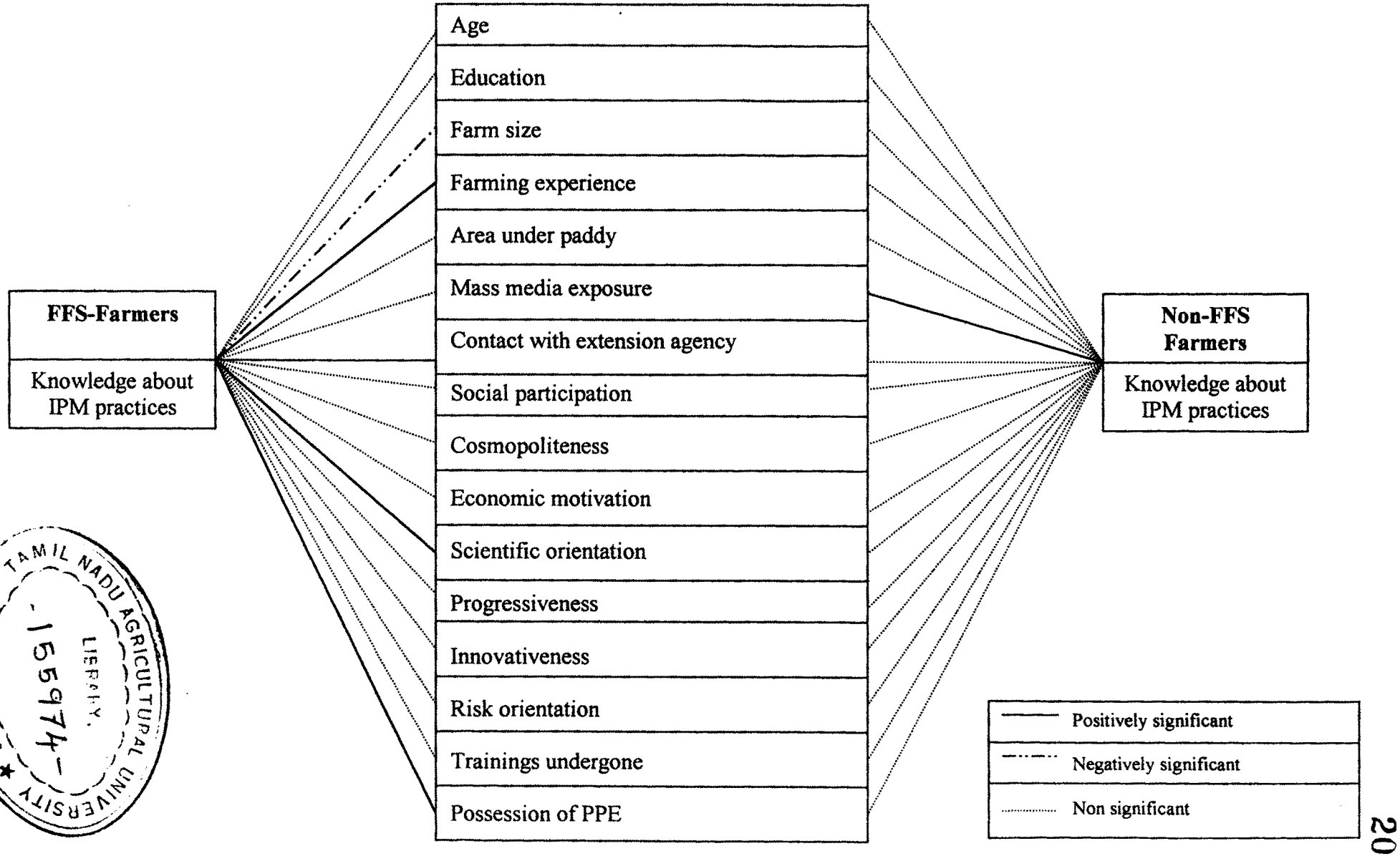


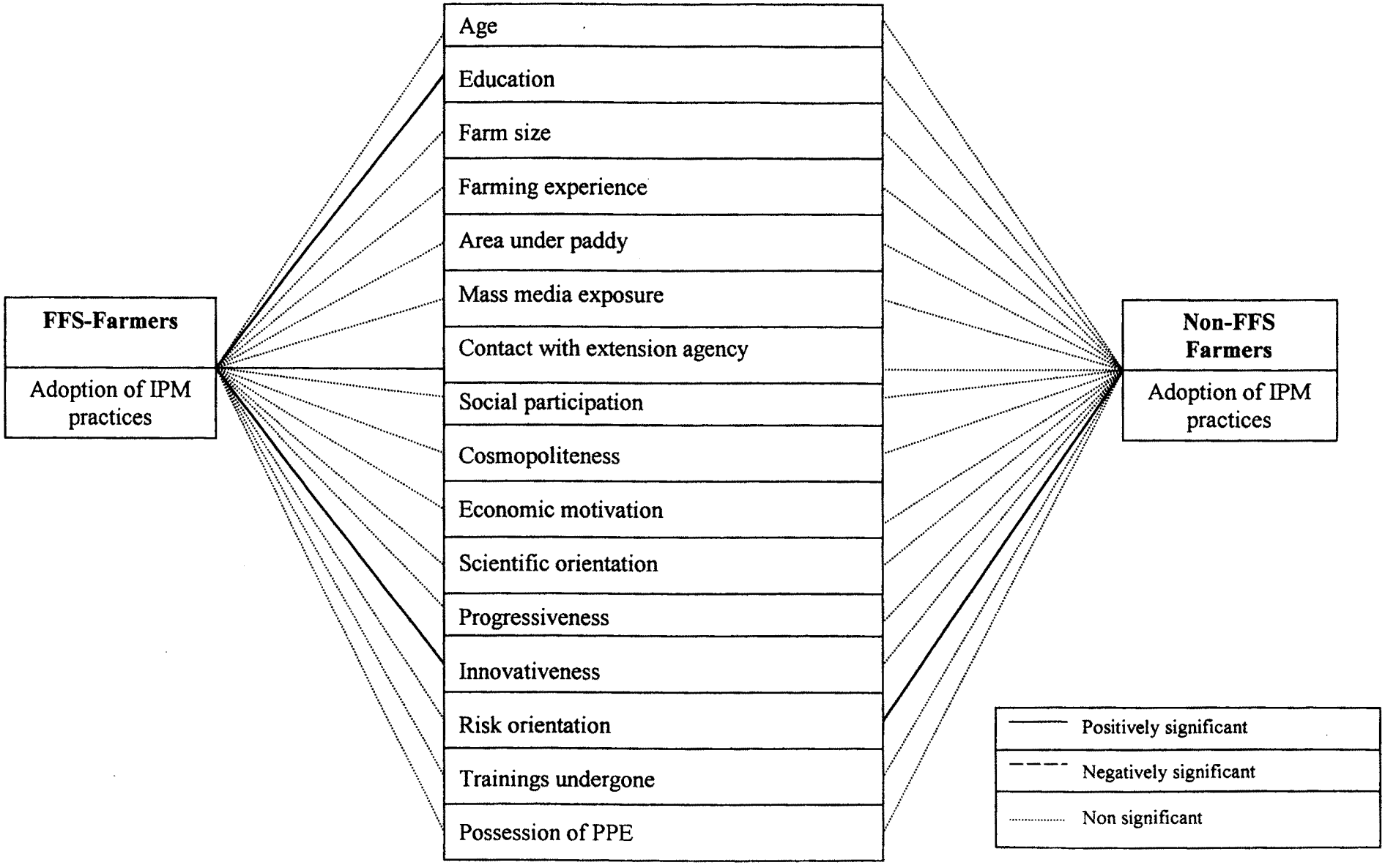
Table.44. Multiple regression of characteristics of Non-FFS farmers with their awareness, knowledge and adoption of IPM practices

INDEPENDENT VARIABLES	Awareness	Knowledge	Adoption
Intercept	10.4035	1.1256	12.1108
1.Age	-0.5156	0.0782	-1.4549
2.Education	0.2899	-0.7968	0.2163
3.Farm size	-0.0948	0.4814	-0.4995
4.Farming experience	0.1466	-0.1085	1.1708
5.Area under paddy	-0.2900	-0.1356	1.2927
6.Mass media exposure	2.2763 *	2.8148 * *	1.9799
7.Contact with extension agency	-0.1086	0.4850	0.6191
8.Social participation	0.1168	0.2892	0.8395
9.Cosmopoliteness	-0.4228	-0.2648	-0.0338
10.Economic motivation	-0.0067	0.4797	-1.4000
11.Scientific orientation	-1.4682	0.1605	-1.2984
12.Progressiveness	2.0317 *	0.1930	0.3812
13.Innovativeness	-0.4444	-0.1520	-0.0122
14.Risk orientation	0.9087	1.3075	2.8619 * *
15.Training Undergone	0.8406	0.4658	1.1073
16.Possession of PPE	1.0981	-0.3276	1.4133
R-square	0.4375	0.3712	0.5174
F-value	2.0902	1.5867	2.8808

* 5 Per cent level of significance

** 1 Per cent level of significance

FIG. 9 . EMPIRICAL MODEL SHOWING THE CONTRIBUTION OF INDEPENDENT VARIABLES TOWARDS THE ADOPTION



4.4.18. Multiple regression of characteristics of non-FFS farmers with their awareness knowledge and adoption of IPM practices

Awareness

The R^2 value (0.3712) denoted that all the variable together contributes 37.12 per cent variation with their awareness (Table 44 and Figs.7). Mass media exposure had resulted in highly significant contribution towards the awareness about IPM. A unit increase in mass media exposure would increase the awareness by 0.6183 units *ceteris paribus.*

Knowledge

All the variables together contributed 43.75 per cent of variation among the respondents with respect to their knowledge (Table 44 and Fig.8). Mass media exposure and progressiveness had positive and significant contribution towards their knowledge. A unit increase in mass media exposure and progressiveness would increase their knowledge by 0.9181 and 1.1332 units *ceteris paribus* respectively.

Adoption

The multiple determinant (R^2) value (0.5173) explained the existence of variation among non-FFS farmers with respect to adoption (Table 44 and Fig.9). Risk orientation and mass media exposure had exhibited highly significant contribution towards the adoption of IPM practices.

Table 45. Constraints faced by FFS and non-FFS farmers

Sl. No.	Constraints	FFS (%)	Non-FFS (%)
1.	Lack of awareness	(21) 35.00	(32) 56.67
2.	Non co-operation of neighbours	(33) 36.67	(29) 51.67
3.	Difficulties in arriving the exact dose of chemical product	(22) 36.67	(29) 48.33
4.	Difficulties in remembering ETL and chemical name	(23) 38.33	(18) 30.00
5.	Less conviction on some practices	(19) 53.33	(26) 43.33
6.	High cost of chemicals	(25) 41.67	(23) 38.33
7.	Lack of electricity facilities	(24) 40.00	(22) 36.67
8.	Rat menace	(43) 71.67	(45) 75.00
9.	Lack of availability of seeds in right time	(27) 45.00	(31) 51.67
10.	Labour scarcity	(37) 61.67	(38) 63.33
11.	Susceptible nature of certain paddy varieties	(32) 53.33	(36) 60.00
12.	Lack of timely technical guidance	(7) 11.67	(17) 28.35

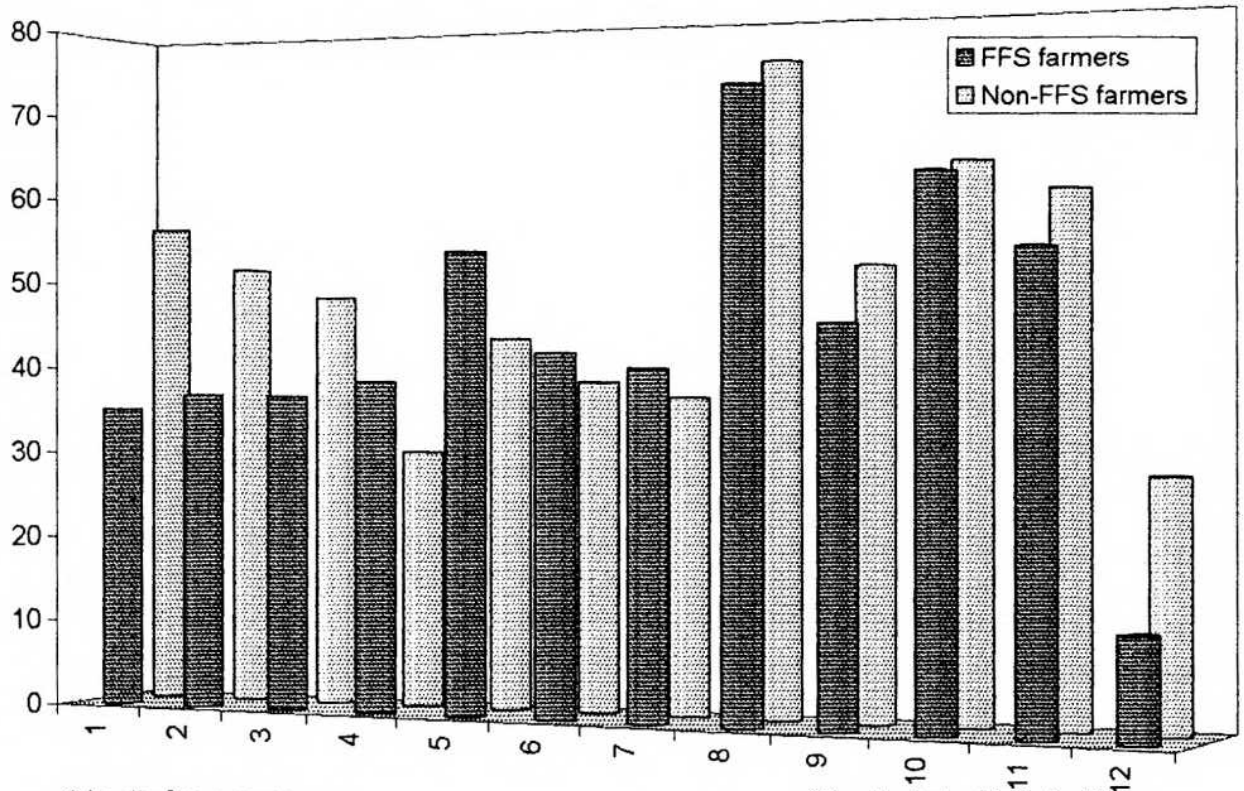
4.5. Constraints faced by the respondents

Rat menace occupied first position (71.67% and 75.00% by FFS and non-FFS farmers respectively), followed by labour scarcity (61.67% and 63.33% by both of them). Even though they were using the poison baits, and rat traps for rat control, majority of both the category of farmers had experienced the rat menace. Due to the seasonal nature of work, majority of the agricultural labourers migrated towards nearby towns for works, which had created labour scarcity and also the demand for them in peak time had created labour dearth (Table 45 and Fig.10).

Non-co-operation of neighbours was expressed by 55.00 per cent and 51.67 per cent of FFS and non-FFS farmers. Non-co-operation was expressed which hindered collective plant protection. For the practices such as synchronised sowing, use of narrow bunds to control rat, alternate flooding and draining and for the peripheral planting of pulses.

Susceptible nature of certain paddy varieties was also expressed by majority of them (53.33% and 60.00%). This was due to the perception that continuous use of the same variety (Ponni and ADT.39), lead these varieties to become susceptible for the Brown plant hopper and smut. Lack of availability of seeds in right time was expressed by the respondents (45.00% and 51.67% of FFS and non-FFS farmers respectively). This might be due to reason that at the time of study due to receiving of rainfall, all of them had sufficient water to go for next crop with rice.

FIG.10. CONSTRAINTS FACED BY THE FFS AND NON-FFS FARMERS



1.Lack of awareness
2.Non-co-operation of neighbours
3.Difficult to arrive at exact dose of chemical dosage
4.Difficult to remember ETL and chemical name
5.Less conviction on some practices
6.High cost of chemicals
7.Lack of elactricity facilities
8.Rat menace
9.Lack of availability of seeds in right time
10.Labour scarce
11.Susceptible nature of certain paddy varieties
12.Lack of timely technical guidance

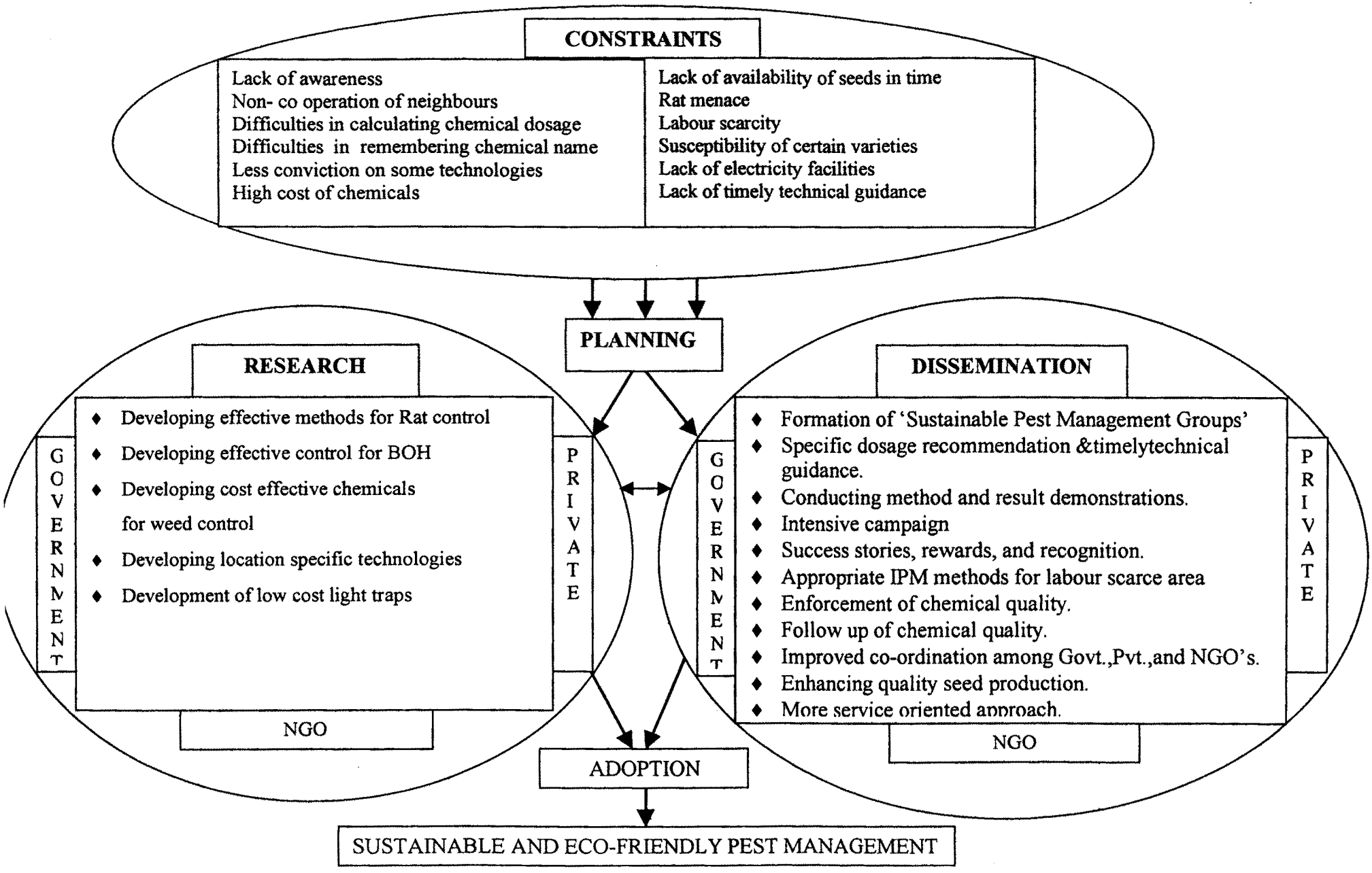
High cost of chemicals was expressed by 41.67 per cent and 38.33 per cent of FFS and non-FFS farmers. Lack of electricity facilities (40.00% and 26.67%) was also expressed by both the categories for the use of light traps.

Lack of awareness (35.00%) was expressed for the use of pheromone traps, clipping tip of seedlings, use of rat tablets etc., by the FFS farmers. In the case of non-FFS farmers the lack of awareness was expressed on use of light traps, pheromone traps, rat tablets, monitoring for ETL-level, conservation of natural enemies, selection of variety etc. by 56.67 per cent of respondents, as these happened to be specific technical information passed on through FFS.

Difficulties to arrive at the exact dose of the chemical product was expressed by 36.67 per cent of FFS and non-FFS farmers and 48.33 per cent of non-FFS farmers. Similarly difficulties were also expressed In the case of remembering ETL-level and chemical name. Less conviction on some practices was expressed by 53.33 per cent and 43.33 per cent of FFS and non-FFS farmers. The FFS and non-FFS farmers had expressed less conviction over the ETL-based spray. In the case of herbicide spray, there existed misperception, that the soil becomes hardened due to the application of herbicides. Lack of observability with regard to the effect of seed treatment lead the FFS and non-FFS farmers to express less conviction over the practice seed treatment.

Lack of technical guidance was also reported by 11.67 per cent and 28.35 per cent of FFS and non-FFS farmers respectively.

FIG.11. SUGGESTIVE MODEL FOR EFFECTIVE ADOPTION OF IPM



4.6. Suggestive model for effective adoption of IPM

For an effective adoption of IPM it needs a problem-oriented research and dissemination towards the pest management. The constraints experienced by the farmers needs thorough analysis to develop respective and disseminate the IPM practices. A model has been proposed by considering the constraints expressed by the respondents, possibilities for planning in research and dissemination(Fig 11).

Planning to be done by research and dissemination systems to develop effective methods of controlling pests and for dissemination. In the case of dissemination Government, non-governmental organisations and private agencies can be involved for having effective dissemination of IPM practices. Formation of 'Sustainable Pest Management Groups (SPMGs) and involvement of local leaders may help to enhance the co-operation among the farmers with regard to the pest management. This can also be used to increase the awareness about the need for sustainable and eco-friendly pest management. Timely technical guidance, conducting method and result demonstrations, supply of printed materials, effective utilisation of mass media, individual contact and specific dosage recommendation, would help to enhance the awareness about IPM practices, to simplify the calculation of chemical dosage and for remembering specific chemicals for specific pests. Method and result demonstrations, mass media exposure and individual contact can also be used to enhance the conviction on some practices. Intensive campaigns could help to manage the rat menace problem, which was experienced by majority of the farmers.

Lack of availability of seeds in time can be overcome by increasing the quality seed production by Government, private agencies and by farmers themselves. Enforcement of the chemical quality and follow up of Government policies may help to avoid the production of harmful chemicals. More service oriented approach among the employees of Government, NGOs and private agencies would help for effective dissemination of IPM practices. Improved co-ordination among Government, private and NGO would facilitate the effective coverage. Success stories, rewards and recognition may also be used to motivate the farmers to adopt the IPM practices. Provision of subsidies and incentives also can be used to manage the economic constraints and to motivate the farmers for effective adoption of IPM.

SUMMARY AND CONCLUSION

CHAPTER V

SUMMARY AND CONCLUSION

The Indian Agricultural scenario has changed tremendously with the adoption of modern agricultural technologies comprising high yielding varieties, chemical fertilizers, assured irrigation and improved agronomic practices. Under the intensive cropping system certain pests have emerged as the major threat to crop production. However, Indiscriminate use of pesticides intensively cropped areas have led to destruction of beneficial organisms, resistance against pesticides, resurgence of pests, pesticide residue in food chain, environmental pollution and pesticide associated health hazards.

In order to overcome several ill effects of pesticides on human health, the Integrated Pest Management (IPM) approach has been introduced. IPM is a programme by farmers not for farmers. It seeks to empower farmers to become managers and decision-makers, so that they can handle available control measures to maximise profits while optimizing inputs and resources.

Impact of IPM is one of the important areas of research at present. If the IPM technologies practiced by the Rice growers, the sociological issues involved integrated pest management with their adoption are ascertained, these would serve as a ready reckoner for a meaningful and an effective Integrated pest management in rice. Hence this study was proposed with the following objectives.

Objectives

1. To assess the extent of awareness and knowledge about the Integrated Pest Management (IPM) technology among the FFS and Non-FFS farmers.
2. To compare the FFS and Non-FFS farmers with regard to the adoption of IPM practices.
3. To enlist the constraints experienced by the farmers in IPM.
4. To propose an action model for effective IPM in paddy.

The study was conducted in Pudukottai district in which the two blocks viz., Annavasal and Ponnamaravathy were selected. From each block, three villages were selected randomly and from each village twenty farmers were selected randomly. As the study has been designed to compare the FFS and non-FFS farmers, the farmers who attended the FFS from three villages of Annavasal block were considered as FFS farmers, while those who have not attended the FFS and belonged to the three villages of Ponnamaravathy block were taken as non-FFS farmers.Totally 120 farmers were selected from the six villages.

A comparison of the characteristics of FFS and non-FFS farmers

The significant differences were found between the FFS and non-FFS farmers for the variables such as contact with extension agency, scientific orientation, progressiveness, innovativeness, training undergone and possession of plant protection equipments. It meant that the FFS farmers were having high contact with extension

agency, high scientific orientation, progressiveness, innovativeness, trainings undergone and possession of plant protection equipments than the non-FFS farmers.

Awareness and adoption of IPM practices among FFS and non-FFS farmers

All the managerial practices revealed that monitoring pests for ETL in nursery and main field, use of light traps, conservation of natural enemies, ETL-based chemical spray, selection of variety, use of aluminium phosphide tablets for rat control, intensity based chemical spray and adjustment of planting time had exhibited difference with respect to the awareness among FFS and non-FFS farmers. The FFS farmers were having more awareness than the non-FFS farmers for those practices.

Both the FFS and non-FFS farmers had high level of awareness for the practices such as summer ploughing, optimum spacing, removal of weeds, use of neem products, optimum dose of fertilizer application, trimming and plastering of bunds and crop rotation.

There was difference in adoption for conservation of natural enemies, intensity based correct amount of chemical spray, removal of infected plant debris, optimum spacing, optimum fertilizer application, monitoring pests in nursery and main field for ETL-level among both the categories. The FFS farmers had more adoption than the non-FFS farmers.

Very meagre amount of adoption was observed for some of the practices such as synchronised sowing, selection of variety, clipping the tips of seedling, use of pheromone trap, use of narrow bunds, use of disease free seeds, avoiding the cultivation of

susceptible varieties, burning the stubbles and infected plant debris, and use of aluminium phosphide tablets, among both the FFS and non-FFS farmers.

Distribution of respondents according to their awareness, knowledge and adoption

More of FFS farmers had medium level of awareness followed by high and low level, while in case of non-FFS somewhat equal distribution of awareness was observed.

With regard to their knowledge level more FFS farmers had high level of knowledge, while the non-FFS, farmers had medium level only.

Both the FFS and non-FFS farmers had low and medium level of adoption of IPM practices followed by high.

Zero order correlation co-efficient of characteristics of FFS and non-FFS farmers with their awareness, knowledge and adoption of IPM practices.

Progressiveness and innovativeness had resulted in highly significant relationship with respect to their awareness. The mass media exposure and progressiveness had exhibited highly significant relationship with the awareness among non-FFS farmers, while the education, cosmopoliteness, innovativeness, risk orientation and training undergone had significant relationship towards the awareness about the IPM practices.

Education, contact with extension agency and possession of plant protection equipments had resulted in highly significant relationship with the knowledge among FFS farmers. In case of non-FFS farmers, progressiveness and risk orientation had highly

significant relationship with their knowledge, while innovativeness and trainings undergone had a significant relationship with the knowledge about IPM.

Education, contact with extension agency and innovativeness had resulted in highly significant relationship, while the mass media exposure and progressiveness had significant relationship with regard to their adoption of IPM practices by FFS farmers. Social participation, progressiveness, risk orientation and trainings undergone had exhibited highly significant relationship with regard to the adoption of IPM practices by the non-FFS farmers, while education, area under paddy, cosmopoliteness, innovativeness and possession of plant protection equipments had resulted in the significant relationship with their adoption of IPM practices.

Multiple regression analysis of characteristics of FFS farmers with their awareness, knowledge and adoption of IPM practices

Innovativeness had shown significant contribution towards the awareness among FFS farmers and mass media exposure had resulted in highly significant contribution towards the awareness about IPM among non-FFS farmers.

Possession of plant protection equipments had shown a positive and highly significant contribution towards the knowledge, while farming experience, contact with extension agency and scientific orientation had resulted in significant contribution towards the adoption among the FFS farmers. The farm size exhibited negative contribution towards the knowledge of FFS farmers about IPM. Mass media exposure

and progressiveness had shown significant contribution towards the knowledge among non-FFS farmers.

Education and innovativeness had resulted in positive and highly significant relationship with the adoption, while the contact with extension agency had shown significant contribution towards the adoption of IPM practices among the FFS farmers. The risk orientation had shown highly significant contribution, while the mass media exposure resulted in significant contribution towards the adoption of IPM practices.

Constraints faced by the FFS and non-FFS farmers

Rat menace and labour scarcity were experienced by nearly two-third of the FFS and non-FFS farmers. Non co-operation of neighbours and less conviction were observed in half of the respondents of both the categories. Lack of timely technical guidance was experienced by majority of the non-FFS farmers. Susceptible nature of the paddy variety was also expressed by more than half of the FFS and non-FFS farmers. Difficulties in calculating the chemical dosage and remembering the ETL-level were also experienced by both the categories of farmers. Lack of awareness, high cost of herbicides, lack of electricity facilities were the other constraints experienced by the respondents.

Implications of the study

Even though the FFS farmers were having more awareness about the IPM practices, only a few had adopted to the maximum extent. Necessary follow up visits coupled with supportive services will enhance the adoption of IPM practices.

Low awareness was expressed by the non-FFS farmers for some of the IPM practices such as the selection of variety, monitoring for pests in nursery and main field at ETL-level, use of light traps and pheromone traps, adjusting the planting time, ETL-based spray and use of aluminium phosphide tablets. The FFS trainings may be extended to the non-FFS villages also and the knowledge and adoption also can be enhanced. Even though, the FFS farmers had attended the trainings, they were also lacking awareness of the practices such as the clipping of seedlings, use of pheromone trap and use of aluminium phosphide tablets for rat control. Hence to enhance the awareness about all the practices of IPM, various extension methods such as individual contact, group meetings, farm publications, supply of leaflets, folders and pamphlets can also be used.

Majority of the non-FFS farmers had low and medium levels of knowledge. Since the knowledge is one of the crucial factors to motivate the farmers for the adoption of IPM, the extension workers may take much effort to improve the knowledge of farmers through trainings, method demonstrations and organising campaigns to all the farmers in general.

The success of any developed technology can be experienced only when it is received and adopted by the farmers. In this study, both the category of farmers were found to have low level of adoption. Hence starting from their awareness and knowledge, which have to be enhanced by the intensive extension methods, to motivate the farmers. The extension workers should design appropriate extension strategy so as to enable the farmers to acquire required knowledge on IPM, which in turn will increase the adoption.

The knowledge gained by FFS farmers needs to be made use of in the ensuing seasons as the time that was available for the knowledge gain and knowledge utilization was less.

Social participation is one of the important factors that has to be considered by the extension workers to disseminate a technology. It was found that the FFS farmers who underwent the trainings had only low level of social participation. Hence to improve the spread of the IPM through FFS farmers, extension workers may try to motivate them, to enhance the social participation. Formal meetings coupled with informal discussions of FFS farmers with neighbouring villages may be arranged by the change agency to exchange their views and gains.

The multiple regression analysis revealed that the innovativeness for FFS farmers, mass media exposure and progressiveness for non-FFS farmers had exhibited significant contribution with their awareness. With regard to the knowledge, the possession of PPE, farming experience, contact with extension agency and scientific orientation had resulted in significant relationship with FFS farmers, while the mass media exposure alone had shown significant contribution with the knowledge of non-FFS farmers. Education, innovativeness and contact with extension agency had exhibited significance with the FFS farmers, while for non-FFS farmer, the risk orientation and mass media exposure had resulted significantly with adoption.

Rat menace was expressed by a majority of the FFS and non-FFS farmers. Hence the research and extension system may make intensive efforts for the control of rat menace. Less conviction, difficulties in remembering the ETL, and calculation of

chemical dosage were experienced by the respondents. To overcome these constraints, skill trainings may be provided. A model farm with regard to the IPM, similar to the satellite farm approach can be developed to make the farmers convinced with IPM. Non-cooperation of neighbours was also experienced by both the categories of farmers. Hence the extension workers may educate on the advantages of the IPM for co-operation among them. Timely technical guidance be provided by the change agency system. The knowledge about the use of resistant varieties needs to be enhanced amongst the respondents.

Strategies for future research

i) The comparative studies among the small, marginal and big farmers with regard to IPM may be conducted for varied field crops.

ii) Similar studies may be conducted in other areas also, to facilitate the generalisation.

iii) Experimental research may be designed so as to provide a much more realistic picture on IPM.

iv) Technological gap at various levels starting from the research system to the ultimate clientele may also be taken up, to bring out the efficiency of technology transfer at various levels.

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APPENDICES

DEPARTMENT OF AGRICULTURAL EXTENSION AND RURAL SOCIOLOGY
TAMIL NADU AGRICULTURAL UNIVERSITY
COIMBATORE-3.

From

Dr.I.Mohamed Iqbal
Associate Professor of Agricultural Extension
and Rural Sociology,
Tamil Nadu Agricultural University,
Coimbatore-3.

Sir/Madam,

Sub:-Education – Post Graduate Course – Thesis work by M.Lawrance, M.Sc.(Ag.) Scholar – Variables relative Importance – Scoring – Requested – Regarding.

I am pleased to inform you that one of my M.Sc.(Ag.) students **Mr.M.Lawrance** of the Department of Agricultural Extension and Rural Sociology has taken up a research programme entitled, **"Integrated Pest Management in Tankfed Rice Cultivation – A Critical Analysis"** for his M.Sc.(Ag.) programme.

I request you to please examine the variables identified for this study.

If in your opinion any of the variables are missing, please, feel free to add the new variables considered by you. Further, I request you to kindly rate all the variables for its relevancy by making a tick (✓) mark on the three point continuum of relevances viz., More relevant, Relevant and Irrelevant and send the same to the student researcher utilizing the self addressed, stamped envelope enclosed, as early as possible.

Thanking you,

Yours Sincerely,

(Dr.I.MOHAMED IQBAL)

Integrated Pest Management in Tankfed Rice Cultivation – A Critical Analysis

LIST OF VARIABLES

Kindly put a tick (✓) mark in the appropriate column

No.	Variables	More relevant	Relevant	Irrelevant
1.	Age			
2.	Educational status			
3.	Occupational status			
4.	Annual income			
5.	Farm size			
6.	Farming experience			
7.	Nature of family			
8.	Communication status			
9.	Mass media exposure			
10.	Contact with extension agency			
11.	Cropping pattern			
12.	Economic motivation			
13.	Value orientation			
14.	Information source use behaviour			
15.	Urban contact			
16.	Progressiveness			
17.	Social participation			
18.	Use of infrastructural facilities			
19.	Innovativeness			
20.	Risk orientation			
21.	Training need			
22.	Training undergone			
23.	Possession of plant protection appliances			
24.	Availability of plant protection appliances			
25.	Irrigation potential			
26.	Material possession			
27.	Area under paddy			
28.	Constraints			
29.	Knowledge			
30.	Awareness			
31.	Adoption			
32.	Others if any please specify			

Signature

Name and Address

Frequency distribution of respondents according to their characteristics

Sl. No.	VARIABLES	CATEGORY	FFS		Non-FFS	
			No	%	No	%
1.	Age	Young	19	31.67	9	15.00
		Middle	23	38.33	18	30.00
		Old	18	30.00	33	55.00
		Total	60	100.00	60	100.00
2	Education	Illiterate	14	23.33	10	16.67
		Primary	24	40.00	29	48.33
		Middle	13	21.67	8	13.33
		High school	9	15.00	9	15.00
		Collegiate	0	0	4	6.67
		Total	60	100.00	60	100.00
3	Farm size	Marginal farmer	36	60.00	25	41.67
		Small farmer	7	11.67	14	23.33
		Large farmer	17	28.33	21	35.00
		Total	60	100.00	60	100.00
4	Farming experience	Low	23	38.33	19	31.67
		Medium	23	38.33	24	40.00
		High	14	23.34	17	28.33
		Total	60	100.00	60	100.00
5	Area under paddy	Low	40	66.67	29	48.33
		Medium	7	11.67	14	23.33
		High	13	21.67	17	28.34
		Total	60	100.00	60	100.00
6	Mass media exposure	Low	30	50.00	26	43.33
		Medium	11	18.33	10	16.67
		High	19	31.67	24	40.00
		Total	60	100.00	60	100.00
7	Contact with extension agency	Low	25	41.67	27	45.00
		Medium	17	28.33	19	31.67
		High	18	30.00	14	23.33
		Total	60	100.00	60	100.00
8	Social participation	No membership	39	65.00	36	60.00
		Member in 1 organisation	16	26.67	17	28.33
		Member in more than1 organisation	2	3.33	0	0
		Office bearer in 1 organisation	1	1.67	5	8.34
		Office bearer in more than1 organisation	2	3.33	2	3.33
		Total	60	100.00	60	100.00

9	Cosmopoliteness	Low	22	36.67	26	43.33
		Medium	24	40.00	15	25.00
		High	14	23.33	19	31.67
		Total	60	100.00	60	100.00
10	Economic motivation	Low	17	28.33	9	15.00
		Medium	24	40.00	27	45.00
		High	19	31.67	24	40.00
		Total	60	100.00	60	100.00
11	Scientific orientation	Low	13	21.67	15	25
		Medium	24	40.00	26	43.33
		High	23	38.33	19	31.67
		Total	60	100.00	60	100.00
12	Progressiveness	Low	16	26.67	21	35.00
		Medium	18	30.00	18	30.00
		High	26	43.33	21	35.00
		Total	60	100.00	60	100.00
13	Innovativeness	Low	1	1.67	9	15
		Medium	29	48.33	36	60.00
		High	30	50.00	15	25.00
		Total	60	100.00	60	100.00
14	Risk orientation	Low	22	36.66	18	30.00
		Medium	16	26.67	16	26.67
		High	22	36.66	26	43.33
		Total	60	100.00	60	100.00
15	Training undergone	No training	0	0	47	78.33
		Training undergone	60	100	13	21.67
		Total	60	100.00	60	100.00
16	Possession of PPE	a) No possession	39	65.00	47	78.33
		Possession of PPE	21	35.00	13	21.67
		Total	60	100.00	60	100.00
		b) No observation during spray	13	21.67	12	20.00
		Observing during spray	47	78.33	48	80.00
		Total	60	100.00	60	100.00

Sex Wise Distribution Of Respondents

VILLAGES	FFS-Farmers(no.)	
	Male	Female
FFS-Farmers		
Kiliyur	20	0
Madhiya nallur	17	3
Veeraperumampatti	6	14
TOTAL(out of 60)	43	17
Non-FFS Farmers		
Arasamalai	20	0
Idayathur	19	1
Melathaniam	20	0
TOTAL(out of 60)	59	1

INTERVIEW SCHEDULE

INTEGRATED PEST MANAGEMENT IN TANKFED RICE CULTIVATION- A CRITICAL ANALYSIS.

Village:
R.No.

1.Name of the farmer:

2.Age (completed yrs.) :

3.Farmer belong to the category : FFS / Non FFS.

4.Educational status : Illiterate / primary / Middle / Secondary / Collegiate.

5.Farm size (Acres) :

TYPE OF OWNERSHIP	WET LAND		DRYLAND		GARDEN LAND		TOTAL
	Tankfed	Others	Tankfed	Others	Tankfed	Others	
OWNED							
LEASED IN							
LEASED OUT							
TOTAL							

7.Farming experience : **Yrs.**

8.Area under paddy :

CROPS	VARIETY	AREA(Acres)	PERIOD OF GROWING
Paddy 1.			
2.			
3.			
Other crops1.			
2.			
3.			

9.Mass media exposure:

PARTICULARS	FREQUENCY		
	Regularly	Occasionally	Never
1.listening to farm program's on Radio Uzhavar uzhagam Vezhan arangam Others(specify):			

2.watching farm program on TV Vayazhum vazhvum Others :			
3.Reading farm magazines Vazharum vezhanmai Navina vighanum Uzhavar uzhagam Others			
4.Reading farm news articles in news papers;			
5.Seeing agricultural films : Name of the film:			
6.Participation in extension activities			

10.Contact with extension agency:

EXTENSION AGENTS	FEQUENCY			PURPOSE	
	Regular	Some times	Never	Agrl	Non Agrl
Agricultural scientists					
Assistant Director of Agriculture					
Agricultural Development Officer					
Agricultural Officer					
Assistant Agricultural Officer					
Fertilizer Dealers					
Rep. of Private Companies					
Others 1. 2.					

11.Social Participation

Organisation	Office bearer		Member	
	past	present	Past	present
1.Panchayat				
2. Panchayat Union				
3. Cooperative Credit Society				
4. Cooperative Banks				

5. Cooperative Marketing Society				
6. Cooperative Milk Society				
7. Youth Club				
8. Distinct features –MLA, MP, etc.				
9. Social service club				
10. Others (Specify) a) b)				

12. Cosmopoliteness

a) Have you ever visited the neighbouring towns / cities Yes / No
If yes, name of the city visited

b) How often do you visit Often / Occasionally/ Rarely

c) When did you visit last

d) Purpose of your visit Personal / Agrl. / Non .Agrl

13. Economic motivation

Sl. No.	STATEMENTS	SA	A	UD	DA	SDA
1	A farmer should work towards larger yield for larger economic profits .					
2	The most successful farmer is one who makes the most profit.					
3	A farmer should try new farming idea which may earn him more money.					
4	A farmer should try to grow ~~flower crops~~ Cash crops in addition to growing of food crops for home consumption.					
5	Its difficult to the farmers children to make a good start unless he provides them with economic assistance .					
6	A farmer must learn his living but the most important thing in life cannot be defined in economic terms.					

SA-Strongly agree, A-Agree, UD-Undecided, DA-Disagree, SDA-Strongly disagree.

14.Progressiveness

1.A progressive farmer should be upto date in knowledge of latest technology. Do you keep yourself upto date knowledge of latest technology **Yes/No**

2. A progressive farmer should be receptive to change resulting in better income .Are you changing to new varieties as and when they are recommended **Yes/No**

3. A progressive farmer should be helpful to other farmer in adopting improvement . Did you tell others about the benefit of adoption of improved technology. **Yes/No**

4. A progressive farmer should be an innovator (or) atleast an early adopter Are you the first to adopt any improved practices. **Yes/No**

5. A progressive farmer should have more contact with extension agency. Do you meet extension worker (AAO, AO, etc.) for advice. **Yes/No**

6. A progressive farmer should use improved (or) high yielding varieties. Did you grow any improved (or) high yielding variety last year. **Yes/No**

7. A progressive farmer should be an adopter of plant protection measures in full. Did you use plant protection measures full. **Yes/No**

15. Risk Orientation

Statements	SA	A	UD	DA	SDA
1. New methods of farming give better results to a farmer than old methods.					
2. The ways of conventional farming is still the best way to farm today					
3. Even a farmer with lots of 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 its worth of efforts					
6. Traditional methods of farming have to be changed in order to raise the level of living of a farmer					

SA- Strongly agree, A- Agree, UD- Undecided, DA- Disagree, SDA- Strongly Disagree

16. Innovativeness

1. When would you prefer to adopt an improved agricultural practice
   - As soon as it brought to my knowledge ( )
   - After I have seen other farmers using it successfully ( )
   - I prefer to wait and take my own time ( )

17. Training's Undergone

Name of the training	Venue	Duration	Conducted by whom	Sufficiency of training
1. 2. 3. 4. 5.				

18.Possession of plant protection equipment:

Name	No.	Year of purchase	Condition of equipment
1. 2. 3. 4.			

A. Do you hire any plant protection equipment
Cost of hiring :
Choice of hiring:
Opinion on hired equipment.

B. Who actually sprays

C. Do you supervise mixing of plant protection chemical -YES / NO

D. Do you supervise spraying of plant protection chemicals -YES / NO

19. what are all the constraints that you are facing while following integrated pest management.

Part –II

Extent of knowledge of farmers on IPM

1. In IPM summer ploughing helps to
a) to identify pests b) exposes eggs & pests to sun
c) No use Correct/ Incorrect

2. The variety suitable for kuruvai season is
a) White Ponni b) ADT-36 c) Ponmani Correct/Incorrect

3. The chemical used for seed treatment is

a) Capton b) Monocrotophos c) Endopsulphon Correct/Incorrect

4.Does synchronous planting reduce pest and disease incidence Yes/ No

5.What pest gets increased due to excess nitrogen
a) Stem borer b)BPH C)Thrips Correct/Incorrect

6.Does use of light traps help to monitor all the pests Yes/No

7.One of the important principle of IPM is to apply chemicals
a)When Economic Threshold level crosses (ETL)
b)Before the ETL crosses
c)On observing pests Correct/Incorrect

8.The chemical used to control green leaf hopper is
a)Monocrotophos b) Carbofuron c)Quinalphos Correct/Incorrect

9.The resistant variety for brown plant hopper
a) Co-42 b)IR-50 c)Ponni Correct/Incorrect

10.Quantity of Monocrotophos recommended to control BPH
A)500ml/ac b)250ml/ac c)1000ml/ac Correct/Incorrect

11.Does collection and destruction of egg masses reduce the incidence of Stem borer Yes /No

12.Pheromone trap is used for the detection of
a)Thrips b)Stem borer c)Gall midge Correct/Incorrect

13.The following are the predator on rice pests
a) Case worm b)Whorl maggot c)Lady bird beetle Correct/Incorrect

14.Lady bird beetle preys on
a)Thrips b)Army worm c)Gall midge Correct/Incorrect

15.NSKE- formulations can be used against
a)Earhead bug b)Rat c)Thrips Correct/Incorrect

16.Does the spider belong to pest Yes/No

17.Recommended number of Aluminum phosphide tablets for rat burrow Correct/Incorrect
a)1 b)2 c)3

18.spread of rice tungro virus can be controlled by spraying
a)Capton b)Mancozeb c)Carbofuron Correct/Incorrect

19.The chemical used to control Blast is
a)Carbendazim b)Captafol c)Monocrotophos Correct/Incorrect

20.The dosage of Carbendazim required to control Brown leaf spot is(per acre)
a)200g b)500g c)750g Correct/Incorrect

21.IR-50 is highly susceptible to
a)Blast b)Bacterial leaf spot c)Tungro Correct/Incorrect

22.Pre emergence herbicide recommended for paddy is
a)Basalin b)Butachlor c)Lasso Correct/Incorrect

23.The dosage of Butachlor recommended for paddy is
a) 1 lit/acre b) 2 lit/acre c) 5 lit/acre Correct/Incorrect

PART-III Extent of awareness and adoption

YELLOW STEM BORER	Aw	Ad	LEAF FOLDER	Aw	Ad	GALL MIDGE	Aw	Ad	BPH	Aw	Ad	RAT	Aw	Ad
I.Agronomic method			**I.Agronomic method**			**I.Agronomic method**			**I.Agronomic method**			**I.Agronomic method**		
1.Selection of variety			1. Summer ploughing			1.Trimming and plastering of bunds			1.Selection of variety			1.plan to have narrow bunds		
2.Summer ploughing			2.Synchronised sowing			2.Synchronised sowing			2.Sequential cropping			2.Avoid keeping hay stacks near by fields		
3.Synchronised sowing			3.Optimum spacing			3.Optimum spacing			3.Alternsate flooding and draining					
4.Optimum spacing			4.Removal of alternate hosts			4.Removal of alternate hosts			4.Removal of alternate hosts					
5.Clipping the tips of seedling			5.Fertilizer management			5.Fertilizer management			5.Fertilizer management					
6.Fertilizeer management			6. .monitoring pests in nursery & mainfield for ETL											
7.monitoring pests in nursery & mainfield for ETL														
II. Physical methods			**II. Physical methods**			**II. Physical methods**			**II. Physical methods**			**II. Physical methods**		
1.Pest surveillance by light traps			1.Use of pheromone traps			-			1.Pest surveillance by light traps			1.Dig burrows and kill rats		
2.Use of pheromone traps												2.Setup indigenous rat traps		

5x2

YELLOW STEM BORER	Aw	Ad	LEAF FOLDER	Aw	Ad	GALL MIDGE	Aw	Ad	BPH	Aw	Ad	RAT	Aw	Ad
III.Biological methods			**III.Biological methods**			**III.Biological methods**			**III.Biological methods**			**III.Biological methods**		
1.Conservation of natural enemies			1.Conservation of natural enemies			1.Conservation of natural enemies			1.Conservation of natural enemies					
2.Use of neem products			2.Use of neem products						2.Use of neem products					
IV.Chemical methods			**IV.Chemical methods**			**IV.Chemical methods**			**IV.Chemical methods**			**IV.Chemical methods**		
1.Seed treatment			1.Herbicide application			1.Herbicide application			1.Herbicide application			1.placing two aluminium phosphide tablets		
2.ETL based chemical spray			2.ETL based chemical spray			2.ETL based chemical spray			2.Soaking seeds in insecticide solution					

Aw-awareness Ad-adoption
ETL-Economic threshhold level
BPH-Brown plant hopper

BLAST	Aw	Ad	TUNGRO	Aw	Ad	BROWN LEAF SPOT	Aw	Ad
I.Agronomic method			**I.Agronomic method**			**I.Agronomic method**		
1.Optimum spacing			1.Summer ploughing			1.Use disease free seeds		
2.Remove and destroy weeds			2.Destroy weed hosts			2.adjust planting time		
						3.Removal of collateral hosts and weeds		
						4.Use slow releasing N-fertilizer		
II.Physical methods			**II.Physical methods**			**II.Physical methods**		
1.Avoid cultivation of susceptible varieties			1.Burn the stubbles			1.Remove infected plant debris		
III.Biological methods			**III.Biological methods**			**III.Biological methods**		
			1.Spray neem oil to control vector					
IV.Chemical methods			**IV.Chemical methods**			**IV.Chemical methods**		
1.Seed treatment			1. Intensity based chemical spray-Nursery			1.Seed treatment		
2.Intensity based chemical spray			2. Intensity based chemical spray-mainfield			2. Intensity based chemical spray		

Aw-awareness Ad-adoption