# STUDY ON FARMERS' AWARENESS AND ADOPTION OF FUNGICIDES (KAVACH) IN MAJOR BANANA GROWING AREAS OF TAMIL NADU

**A study for Sandoz (India) Limited.**

THESIS SUBMITTED IN PART FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE (AGRICULTURE) IN AGRICULTURAL MARKETING MANAGEMENT TO THE TAMIL NADU AGRICULTURAL UNIVERSITY,

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CERTIFICATE

This is to certify that the thesis entitled **"STUDY OF FARMERS' AWARENESS AND ADOPTION OF FUNGICIDES (KAVACH) IN MAJAR BANANA GROWING AREAS OF TAMIL NADU"** submitted in part fulfilment of the requirement for the degree of **MASTER OF SCIENCE** (AGRICULTURE) in **AGRICULTURAL MARKETING MANAGEMENT** to the Tamil Nadu Agricultural University, Coimbatore is a record of bonafide research work carried out by **Ms. R. TAMILSELVAM** under my supervision and guidance and that no part of this thesis has been submitted for the award of any 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 journals or magazine.

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MY BELOVED

PARENTS

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*Many, O Lord my god, are the wonders you have done. The things you planned for us no can recount to you, were I to speak and tell of there, they would be too many to declare.*

*Psalms 40:5*

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By

1.8.95

(TAMIL SELVAM.R)

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# INTRODUCTION

# CHAPTER I

## INTRODUCTION

Varied agro climatic conditions prevailing in India make it suitable, for growing a wide range of fruits and vegetables. India is the third largest fruit producing country, producing over 28 million tonnes of fruits as against a world production of 300 million tonnes. Its production is next only to Brazil and U.S. It produces 65 per cent of the world's mangoes. Mango is predominant with largest acreage comprising of 42 per cent of fruit area and 40 per cent of total fruit production in India. India produces 11 per cent of the world's bananas[1]. But the daily per capita consumption of fruits in India is 40 g as against 120 g recommended by the diet advisory committee of the Indian Council of Medical Research.

Banana is an important nutritious fruit. This is not seasonal in nature and available in large quantities throughout the year. Considering the nutritive value and fruit value of bananas, it could be considered as "poor man's apple". In respect of area and production, India is the second largest producer of banana after Brazil.

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1. Chada, K.L., " **The Hindu Survey of Indian Agriculture**" (Madras: Kasturi and Sons Ltd., 1994), pp. 111-118.

**Area and Production**

Table 1 depicts the area, production and productivity of banana in different states of India, which would reveal that maximum areas are in Kerala (58173 ha) followed by Maharashtra (53,800 ha), Tamil Nadu (45,962 ha) and Assam (34,472 ha). However, in terms of production, Tamil Nadu ranks first (15,62,026 tonnes) followed by Maharashtra (14,18,700 tonnes). The total banana production in the country is 60.56 lakh tonnes, of which Tamil Nadu contributes 25.79 per cent.

From Table 2, the important banana growing districts in Tamil Nadu are Tiruchirapalli, (16092 ha) closely followed by V.O.Chidambaranar (7064 ha), Thanjavur (4510 ha) and Tirunelveli (3989 ha). The study area contemplated for the present study is Tiruchirapalli, Chidambaranar, Tirunelveli and Madurai districts which occupy an area of about 50.48 per cent of the total banana area in Tamil Nadu state.

TABLE 1

AREA, PRODUCTION AND PRODUCTIVITY OF BANANA IN INDIA DURING 1990-91

| State | Area (ha) | % | Production (tonnes) | % | Productivity (t/ha) |
|---|---|---|---|---|---|
| Kerala | 58,173 | 17.86 | 4,38,380 | 7.23 | 7.53 |
| Tamil Nadu | 45,962 | 14.11 | 1,562,026 | 25.79 | 33.98 |
| Maharastra | 53,800 | 16.52 | 1,418,700 | 23.42 | 26.36 |
| Assam | 34,472 | 10.58 | 444,010 | 7.33 | 12.88 |
| Karnataka | 18,857 | 5.79 | 176,021 | 2.90 | 9.33 |
| Bihar | 13,229 | 4.06 | 76,181 | 1.25 | 5.75 |
| Gujarat | 14,300 | 4.39 | 777,400 | 12.83 | 54.36 |
| Andhra Pradesh | 27,500 | 8.44 | 481,000 | 7.94 | 17.49 |
| Orissa | 22,250 | 6.83 | 220,000 | 3.63 | 9.88 |
| Madhya Pradesh | 19,311 | 5.93 | 292,792 | 4.83 | 15.16 |
| Tripura | 3,528 | 1.08 | 23,900 | 0.39 | 6.77 |
| Manipur | 3,010 | 0.92 | 38,250 | 0.63 | 12.70 |
| Meghalaya | 4,682 | 1.43 | 57,155 | 0.97 | 12.63 |
| Uttar Pradesh | 1,093 | 0.33 | 19,415 | 0.32 | 17.76 |
| Andaman and Nicobar Islands | 1,400 | 0.42 | 4,343 | 0.07 | 3.10 |
| Lakshadweep | 135 | 0.04 | 288 | 0.004 | 2.13 |
| Arunachal Pradesh | 1,000 | 0.30 | 6,200 | 0.10 | 6.20 |
| Mizoram | 2,707 | 0.83 | 14,965 | 0.24 | 5.52 |
| Pondicherry | 177 | 0.05 | 3,285 | 0.05 | 18.55 |
| | 3,25,586 | 100.00 | 60,56,311 | 100.00 | |

Source : Agricultural Situation in India, 1992.

**TABLE 2**

**AREA UNDER BANANA BY DISTRICTS - 1990-91**

| District | Area (ha) | Percentage share |
|---|---|---|
| Madras | - | - |
| Chengalpattu MGR | 1329 | 2.20 |
| South Arcot | 3265 | 5.41 |
| North Arcot Ambedkar | 2661 | 4.41 |
| Tiruvannamalai Sambuvarayar | 1086 | 1.80 |
| Salem | 1738 | 2.88 |
| Dharmapuri | 1099 | 1.82 |
| Periyar | 3075 | 5.09 |
| Coimbatore | 2061 | 3.41 |
| The Nilgiris | 390 | 0.64 |
| Thanjavur | 4510 | 7.47 |
| Tiruchirapalli | 16092 | 26.67 |
| Pudukkottai | 660 | 1.09 |
| Madurai | 3313 | 5.49 |
| Dindigul Anna | 3604 | 5.97 |
| Ramanathapuram | 87 | 0.14 |
| Kamarajar | 936 | 1.55 |
| Pasumpon Muthuramalingathevar | 502 | 0.83 |
| Tirunelveli Kattabomman | 3989 | 6.61 |
| Chidambaranar | 7064 | 11.71 |
| Kanniyakumari | 2856 | 4.73 |

Source : Quarterly Statistical Abstract of Tamil Nadu, 1992, p. 62.

**Export**

Table 3 reveals that during 1991-92, 98,783.2 tonnes of fresh and processed fruit valued at Rs.12035.7 lakhs were exported. Mango alone accounted for 23,104 tonnes of fresh fruits valued at Rs.3546 lakhs and 11147 tonnes of mango pulp valued at Rs.1862 lakhs. Among exported fruits, fresh grapes constituted 23213 tonnes valued at Rs.3795 lakhs, but banana is exported only to a very negligible extent. Only 655.7 tonnes of fresh and dried fruit of banana worth Rs.27

TABLE 3

EXPORTS OF FRUITS

| Name of the fruits | 1990-91 | | 1991-92 | |
|---|---|---|---|---|
| | Quantity (in tonnes) | Value (in Lakh Rs.) | Quantity (in tonnes) | Value (in Lakh Rs.) |
| Fresh mangoes | 19,380.0 | 3,122.0 | 23,104.0 | 3,546.0 |
| Mango pulp | 5,348 | 855.0 | 11,147.0 | 1,862.0 |
| Fresh grapes | 19,496.0 | 2,708.0 | 23,213.0 | 3,795.0 |
| Apple | 3,007.1 | 184.0 | 10,455.0 | 860.0 |
| Apricot, Cherries, peach and plums | 17.3 | 2.8 | 12.9 | 2.6 |
| Banana (Fresh and dried) | 290.2 | 6.3 | 655.7 | 27.0 |
| Citrus (Fresh and dried) | 7,002.1 | 252.4 | 8,266.4 | 405.1 |
| Custard apple | - | - | 21.2 | 3.2 |
| Dates | 17.0 | 1.3 | 4.9 | 1.6 |
| Guava | 760.6 | 63.9 | 479.9 | 47.2 |
| Mango (dried) | 272.5 | 28.5 | 300.6 | 36.9 |
| Papaya | 228.9 | 4.7 | 827.9 | 11.0 |
| Pear and Quince | 197.2 | 13.8 | 137.9 | 7.9 |
| Pine apple | 795.9 | 98.4 | 1,790.3 | 215.6 |
| Pomegranate | 1,299.4 | 102.3 | 1,573.6 | 131.2 |
| Sapota | - | - | 572.8 | 71.9 |
| Sitaphal | 670.3 | 57.3 | 1,754.2 | 153.3 |
| Tamarind | 5,512.1 | 220.8 | 11,477.3 | 566.6 |
| Watermelon | 1,855.3 | 196.8 | 2,988.6 | 291.6 |
| Other fresh fruits | | | | |
| Total | 66,219.9 | 7,918.3 | 98,783.2 | 12,035.7 |

Source : The Hindu Survey of Indian Agriculture, 1994, p. 115.

lakhs were exported. The average yield of banana in India is 20 tonnes per hectare which is far below the average yield of banana in say country like Honduras. The common contributing factors for the low productivity are high water requirement, wide spacing adopted, continuous ratooning, incidence of bunchy top and fusarium wilt and nematode attacks. Major impediments to the export of banana fruits and fruit products are, inadequate volume of fruit of good quality confirming to international standards, inadequacy of packaging technology and materials, improper transportation and improper handling of the fruit after harvesting causing blemishes.

India is predominantly an agricultural country where more than 70 per cent of the population depend on agriculture. It contributes to 46 per cent of national income. Indian agriculture is today, faced with major challenges of increasing agricultural production and productivity to ensure food security for the rising population. The only way to achieve higher agricultural yield is to ensure timely and increased availability of inputs, such as fertilizers, pesticides, and hybrid seeds. Among all inputs, use of plant protection chemicals were essential to reduce the crop losses due to pests and diseases.

**Pesticide consumption**

The pesticide usage began to gain popularity from the nineteen forties and over a span of four decades it has emerged as one of the essential agro-inputs contributing for enhancing and sustaining crop yields. Some 90,000 tonnes of technical grade material pesticides are now used in India, of which nearly 70 per cent goes for agriculture. Totally 134 pesticides were registered. Out of this, only 78 are being manufactured in India amounting to 66400 tonnes of technical grade materials. Of these, the pesticides that have already been banned in the developed countries both for manufacture and usage, such as, DDT, BHC and Mancozeb account for about 46,000 tonnes[2] but even with this tonnage, our consumption is insignificant. When compared with some developed countries our consumption is only 327 g/ha as against 1600 g of USA, 2000 g of UK and 10,000 g of Japan[3].

Table 4 shows that about 33.6 per cent of the total consumption of pesticides in India is concentrated only in Andhra Pradesh. The share of Karnataka, Gujarat and Punjab in the total consumption of pesticides is about

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2. Nagarajan,S.,"The Hindu-Survey of Indian Agriculture", (Madras :Kasturi and Sons Ltd., 1992), pp. 139-141.

3. Randhawa,D.N.S., "Pesticides Information", XV (2): 1989, p. 15.

16.2 per cent, 15.2 per cent and 11.4 per cent respectively. Tamil Nadu accounts for only 3.6 per cent.

Table 5 shows the distribution of pesticide consumption among various crops in India. Cotton and paddy accounted for 67.3 per cent of the total consumption of pesticides and remaining crops accounted for 36.7 per cent of it. Less than eight million hectares of cotton takes practically half of (44.5 per cent) total pesticide consumption in agriculture. But the share of fruits and vegetables is only seven per cent. If adequate protection is to be ensured to all crops, pesticide production in the country should be increased at least four times.

**TABLE 4**

**STATEWISE CONSUMPTION OF PESTICIDES FOR 1985**

| States | Estimated pesticides consumption in million (Rs.) | % to total pesticides consumption |
|---|---|---|
| Uttar Pradesh | 96.28 | 1.7 |
| Bihar | 46.67 | 0.8 |
| Assam | 15.28 | 0.3 |
| West Bengal | 163.58 | 2.9 |
| Madhya Pradesh | 56.24 | 1.0 |
| Orissa | 108.23 | 2.0 |
| Karnataka | 879.73 | 16.2 |
| Tamil Nadu | 197.45 | 3.6 |
| Punjab | 633.91 | 11.4 |
| Andhra Pradesh | 1865.03 | 33.6 |
| Haryana | 257.82 | 4.7 |
| Himachal Pradesh | 7.10 | 0.1 |
| Rajasthan | 7.13 | 0.1 |
| Maharashtra | 283.24 | 5.1 |
| Gujarat | 842.71 | 15.2 |
| Kerala | 73.97 | 1.3 |
| Total | 5556.37 | 100.0 |

Source : Pesticides Information Vol.XIII(4):1988.

**TABLE 5**

**CROPWISE CONSUMPTION OF PESTICIDES FOR 1985**

| Crops | Estimated pesticide consumption in million (Rs.) | % to total pesticides consumption |
|---|---|---|
| Paddy | 1272.05 | 22.8 |
| Wheat | 354.18 | 6.4 |
| Jowar | 495.40 | 8.9 |
| Bajra | 99.05 | 1.8 |
| Maize | 63.62 | 1.1 |
| Gram | 12.20 | 0.2 |
| Jute | 15.38 | 0.3 |
| Cotton | 2472.13 | 44.5 |
| Sugarcane | 38.41 | 0.7 |
| Groundnut | 136.84 | 2.5 |
| Sunflower | 3.04 | 0.1 |
| Onion | 10.92 | 0.2 |
| Potato | 2.45 | 0.0 |
| Tobacco | 3.93 | 0.1 |
| Fruits and vegetables (Excluding onion and potato) | 387.38 | 7.0 |

Source : Pesticides Information Vol. XIII(4):1988.

Twenty years back, Pesticides Association of India (PAI) had conducted a study and concluded that the annual loss of agricultural production was Rs.6000 crores due to crop pests and diseases. At present, this loss would be more than Rs.20000 crores. It is inflicted by an array of these organisms. It is reported that weeds account for 33 per cent of crop production losses, diseases 28 per cent, insects 20 per cent, rats 6 per cent, birds and others rest[4]. In India, the consumption of insecticides (75 per cent) were more than fungicide (8 per cent). The fungicide usage in India is 30 g/ha. When compared to consumption of developed countries,

India's usage is poor. USA consumes 140 g of fungicide/ha and Japan consumes 200 g/ha.

Table 6 reveals the production of insecticides and fungicides in India during 1989-1990. Production of insecticide is much more than fungicides. This shows a preferential attitude of farmers for controlling insectpests assuming that insects are more damaging than diseases. Secondly the insect control is considered more effective and cheaper than control of diseases. But the losses due to diseases are higher than insects[4]. According to Table 6, the usage of fungicides are very poor when compared to insecticides. The major reason for poor fungicide consumption might be poor awareness about diseases, yield losses and control measures of diseases among the farming community.

**Problem Setting**

Of all, the major banana growing areas in India, Tamil Nadu occupies the third position with respect to area under banana cultivation, and the first position with respect to production and productivity. In banana the incidence of disease is more than the pest attack. The most important

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4. Mathur, S.C., "Pesticides Information" XX (4): 1990, pp. 1-9.

## TABLE 6

## PRODUCTION OF TECHNICAL GRADE PESTICIDES IN INDIA

('000 tonnes)

| Items Technical pesticides | 1989-90 | |
|---|---|---|
| | Capacity | Production |
| **INSECTICIDES** | | |
| BHC | 45.2 | 28.4 |
| DDT | 9.0 | 7.5 |
| Malathion | 12.3 | 2.8 |
| Metasystax | 0.2 | 0.2 |
| Methyl parathion | 2.7 | 1.5 |
| Fenitrothion | 1.4 | - |
| Fenthion | 0.3 | 0.1 |
| Dimethoate | 2.0 | 1.3 |
| Phosphomidon | 1.3 | 1.4 |
| D.D.V.P | 0.7 | 0.9 |
| Quinalphos | 1.4 | 1.4 |
| Ethion | 0.6 | 0.3 |
| Carbaryl | 2.0 | - |
| Monocrotophos | 4.4 | 3.1 |
| Endosulfan | 4.0 | 4.5 |
| Phorate | 2.3 | 1.9 |
| Phosalone | 1.0 | 0.2 |
| Fenvalerate | 0.7 | 1.0 |
| Orthane | 0.1 | - |
| Cypermethrin | 0.3 | 0.4 |
| Phenthoate | 0.6 | - |
| **FUNGICIDES** | | |
| Copperoxychloride | 2.4 | 0.8 |
| Captafol | 0.1 | - |
| Dithane | 3.4 | 2.6 |
| Captan | 0.1 | 0.4 |
| Nickel chloride | 0.3 | - |
| Thiocarbomate | 3.4 | 2.6 |
| Organo-Mercurials | 0.1 | - |
| Sulfur | 2.0 | - |
| Ziram | 0.1 | - |
| Copper sulphate | 3.0 | - |
| Manøcozeb | 3.0 | - |
| Kitazin | 0.2 | - |
| Atrazine | 0.1 | - |
| Carbendazim | 0.4 | 0.2 |

Source : Pesticides Information, XVI (2) : 1991, pp. 30-31.

diseases are Panama wilt, Bunchy top, Sigatoka leaf spot, Cucumber mosaic, Anthracnose and Moko (Bacterial wilt). Of all these diseases, the average yield loss due to Sigatoka constitutes 10-15 per cent. In certain cases yield loss has been reported to be as high as 30-50 per cent[5].

The control measures adopted for control of Sigatoka are fungicide sprays of Bavistin, Indofil M.45, Calixin and Blue copper. Recently Sandoz (India) Limited has introduced a new fungicide namely Kavach. It is one of the important broad spectrum contact fungicide and an effective controller of Sigatoka leaf spot disease of banana and also it helps in increasing the bunch weight of banana as investigated by Research and Development Department of Sandoz (India) Limited. But no clear evidence is available about awareness, acceptance and impact of this chemical at the field level.

In the above background, the present study was taken up. This study is imperative to analyse what the banana growers think of Sigatoka leaf spot and its yield loss, what is their awareness and adoption level of kavach and its competing chemicals, for control of Sigatoka leaf spot disease, what factor influences them to purchase kavach and

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5. College of Horticulture, Tamil Nadu Agricultural University, Coimbatore-3.

its competing chemicals and what is their perception level on kavach and its competing fungicides. An answer to these questions will help the case firm to adopt proper promotional strategies and also increase their sales volume of kavach. With these facts in mind, the following objectives were determined,

* to analyse the awareness and adoption of fungicide usage in cultivation of banana in selected districts of Tamil Nadu;
* to analyse the farmers' perception about fungicides and dealers' perception on companies; and
* to suggest suitable marketing strategies to improve the sale of kavach in Tamil Nadu.

**Hypothesis**

$H_0$: there is no significant difference between characteristics of farmers with their awareness and adoption levels of fungicides.

$H_1$: there is significant difference between characteristics of farmers with their awareness and adoption levels of fungicides.

**Scope of the study**

In view of the liberalised economic policy, there is tremendous scope for increasing the export of banana. For this, the production of banana should be increased by way of

evolving high yielding varieties. For producing such varieties,application of increased amount of fertilizers, fungicides and insecticides are required. This offers tremendous scope to capitalise on the pesticide market. The results of this study would help the company to understand farmers' level of awareness to design its future plan, identify the market opportunity for kavach and also help to plan for removing the constraints in the adoption of kavach for banana.

# CONCEPTS AND REVIEW

## CHAPTER II

## CONCEPTS AND REVIEW

Exact definitions of the concepts and critical review of the previous research studies pave the way for future research endeavours. A thorough review of literature is an important step in any successful research.

The literature collected in the light of the objectives set forth are presented under the following sub-headings.

2.1. Market

2.2. Marketing

2.3. Pesticides

2.4. Awareness

2.5. Socio-personal Factors in Relation to Awareness

2.6. Adoption

2.7. Socio-personal Characteristics Influencing Adoption

2.8. Brand

2.9. Brand Preference and Relating Previous Research Studies

2.10. Perceptions and Past Studies Relating to it.

### 2.1. Market

Narain indicated that the term market had no reference to a place, where the goods were bought and sold; but to a single commodity and the buyer and seller of that commodity who were in free competition with one another[1].

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1. Brij Narain, **Principles of Economics**, (Delhi : S.Chand & Co., 1941), p. 126.

According to Clark and Clark, a market was found at every point at which a specific commodity was concentrated for sale. A market was a centre about which or an area in which the forces leading to exchange of title to a particular product operated towards which and from which the actual goods travel[2].

Cundiff and Still defined market as the aggregate of forces and conditions within which buyers and sellers made decisions, that resulted in the transfer of goods and services and determination of prices namely, value, in exchange[3].

Lipsey defined market as an area over which buyers and sellers negotiated the exchange of a well defined commodity[4].

Nair, John and George defined market as people with needs to satisfy, money to spend and willingness to spend it[5].

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2. Touseley Clark and E.Clark, **Principles of Marketing** (London : The MacMillan Company, 1962), p. 10.

3. Cundiff, E.N. and R.Still, **Basic Marketing : Concepts, Environment and Decision** (New Delhi : Prentice Hall of India Pvt. Ltd., 1968), p. 21.

4. Richard Lipsey, G., **An Introduction to Positive Economics**, (London : English Language Book Society, 1971), p. 69.

5. Nair, K.N., Paul John and W.George, **Marketing and Sales Promotion**, (Delhi : Himalaya Publishing House, 1986), p. 5.

A market was defined by Kotler, as which consists of all the potential customers sharing a particular need (or) want who might be willing and able to engage in exchange to satisfy that need (or) want. Originally the term market stood for the place where buyers and sellers gathered to exchange their goods. Economists use the term market to refer to a collection of buyers and sellers who transact over a particular product (or) product class. Business people use the term market coloquially to cover various grouping of customers[6].

**2.2. Marketing**

Marketing may be thought of as that phase of business activity through which human wants are satisfied by the exchange of goods and services on the one hand and for some valuable consideration, usually money or its equivalent on the other[7].

The performance of business activities that direct the flow of goods and services from the primary producer to the

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6. Phillip Kotler, **Marketing Management - Analysis, Planning, Implementation and Control** (Prentice Hall of India Private Limited, New Delhi, 1994), p. 11.

7. Pyle, C., **Marketing Principles**, (New York : McGraw Hill Book Co., 1956), pp. 24-25.

ultimate consumer was referred to as marketing by the American Marketing Association[8].

The term "Marketing" means a set of business activities. Marketing is seen as the task of finding and stimulating buyers to consume the firms' output. Some of the marketing activities are products development, pricing, distribution and communication. The average person might even recognize that the more progressive firms continuously monitor customers' changing needs and develop new products and services, or modify existing ones, to meet these needs[9].

Marketing was merely regarded as an instrument (or) technique to stimulate demand and accelerate production processes, at profit[10].

Subramanyam et al., inferred marketing as the process of defining, anticipating and creating customer needs and wants and organising all the resources of the company to satisfy them[11].

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8. Bugell Mathew, **Marketing : An Introductory Analysis** (New York : McGraw Hill Book Co., 1954), p. 13.

9. Rom Mortin, **Marketing Strategy and Management**, (New York : John Wiley and Sons, 1982), p. 2.

10. Padolecchia, S.P., "Marketing and the challenges of the future", **Marketology, 16** (2), 1984, p. 26.

11. Subramanyam, G., B.Ramakrishna and S.K.Prasad, "Handloom Marketing : A study of Consumer Behaviour", **Indian Journal of Marketing, 15** (6), 1985, pp. 15-20.

Kotler defined marketing as a social and managerial process by which individual and groups obtain what they need and want through creating, offering, and exchanging products of value with others ie., marketing means human activity taking place in relation to markets and working with markets to actualize potential exchanges for the purpose of satisfying human needs and wants[12].

## 2.3. Pesticides

According to Singh et al., pesticide was a term used in general for the products, synthetic or natural, utilised for control of insect pests, fungi, bacteria, weeds, nematodes and rodents, growth regulators and defoliants[13].

Bhat defined pesticides as the chemical or mixture of chemicals used for killing, repelling, integrating, phasing or even regulating with a view to minimise the damage by pests to the crops[14].

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12. Phillip Kotler, **Marketing Management - Analysis Planning, Information and Control** (New Delhi, Prentice Hall of India Private Limited, 1994), pp. 12-13.

13. Balder Singh, D.Bhushan and R.C.Adalukha, "Indian Pesticide Industry Review", **Pesticide**, 8 (4), 1974, p. 9.

14. Bhat, M.V., "Introduction to pesticides", **Pesticides Information**, 11 (3), 1985, pp. 20-31.

Chattopadhyay defined pesticides as substances used to control pests and they include insecticides, fungicides, weedicides, nematicides and rodenticides[15].

**Fungicides**

Fungicides were the substances that prevented, inhibited or destroyed growth of fungi, diseases of plants and crops.

**2.4. Awareness**

In this section past studies relating to awareness are reviewed.

The consumer becomes aware of the innovation but lacks information about it. Srinivasan revealed that 60 per cent of the farmers were aware about supply of implements, 55 per cent of them were aware about distribution of fruit seedlings at concessional rates and 15 per cent of them were aware of vegetable seeds and green manure seeds given at subsidised rates[16].

Murali and Kulkarni reported that majority of the house wives (83.5 per cent) were aware about food stuffs that were

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15. Chattopadhyay, S.B., "Principles and Procedures of Plant Protection", 1991, p. 4.

16. Srinivasan, "Impact of Agrl. Programmes in Relation to Panchayat Raj Institution and Extension Agencies in Perur Block of Coimbatore District - Tamil Nadu", Unpub. M.Sc. (Ag.) Thesis, TNAU, Coimbatore, 1970.

adultered but only 20 per cent of the housewives were aware about the harmful effect of adulteration on health[17].

Bentley studied about traditional peasant farmers in Honduras and concluded that Honduras knew more about some aspects of the local agroecosystem knew more about plants, less about insects, and less still about plant pathology. Certain local belief may fail to observe insect multiplication[18].

Kalugasalamurthy found that farmers' awareness about fungal diseases, yield loss due to fungal diseases and awareness about pesticides companies were very poor. Awareness about fungicides of Sandoz was very poor among sample farmers in Thanjavur and South Arcot districts[19].

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17. Murali, D. and M.S.Kulkarni, "Awareness of Housewives Regarding Food Adulteration", **Indian Journal of Marketing**, 1979, pp. 27-30.

18. Bentley, J.W., "What farmers don't know can't help them : the strengths and weakness of indigenous technical knowledge in Hondúras", Agricultural and Human Values (1986), 6 (3), pp. 25-31.

19. Kalugasalamurthy, S., "Fungicides Marketing in Tamil Nadu", (Unpub. M.Sc. (Ag.) Thesis, TNAU, Coimbatore, 1991).

Rajasekaran concluded that the awareness about herbicide and herbicide technology among the sample farmers were very high[20].

Senthilkumar found that the Economic Threshold Level (ETL) concepts were known to 71 per cent of the farmers. But only very limited number of farmers (12 per cent) had actually adopted the Economic Threshold Level[21].

Hayat et al., generalized on farmers' knowledge and perceptions on new varieties of wheat and concluded that 50 per cent of farmers were growing banned varieties of wheat, which were highly susceptible to rust because they were not aware about new rust resistant varieties[22].

**2.5. Socio-personal Factors in Relation to Awareness**

Subramanyam reported that age and educational level of farmers were found to influence significantly the retention

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20. Rajasekaran, R., "An Analysis of Market Potential for New Herbicide of Indofil Chemicals Company", (Unpub. MBM Thesis, Tamil Nadu Agricultural University, Coimbatore, 1991).

21. Senthilkumar, S., "Identification of Pesticides for Manufacturing in Tamil Nadu", (Unpub, MBM Thesis, Tamil Nadu Agricultural University, Coimbatore, 1991).

22. Hayat, S., N.Kaan, M.Iqbal and J.Zeb, "Farmers Use Knowledge and Perception about Wheat Varieties in the Mardan District", **Journal of Rural Development and Administration**, 25 (3), pp. 122-129, 1993.

of knowledge. In general, young farmers retained more as compared to middle and old aged farmers[23].

Mani reported that there was positive association between gain in knowledge, mass media exposure and contact with extension agency[24].

Duraisamy stated that there was no positive correlation between the variables like age, education, farming experience, and retention of knowledge[25].

Vijayaraghavan stated that the age of participants and non participants of Integrated Dryland Agricultural Development Project had a negative and significant association with awareness. While education, social-

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23. Subramanyan, V.S., "The Retentive Knowledge Gained Through Selected Extension Methods and Their Combinations", **Indian Journal of Extension Education, Vol. XII**, No. 122, Jan-June, 1976, pp. 29-33, 1975.

24. Mani, K., "An Experimental Study on the Relative Effectiveness of Three Selected Combinations of Extension Methods in Educating Farmers", Unpub. M.Sc. (Ag.) Thesis, Tamil Nadu Agricultural University, Coimbatore.

25. Duraisamy, V., "Psycholinquistic Analysis of Farm Broadcast", (Unpub. M.Sc. (Ag.) Thesis, Tamil Nadu Agricultural University, Coimbatore, 1977).

participation, farming experience, farm size and economic status are positively correlated with awareness[26] and Balu[27], Ashok[28] and Duraisamy[29] were in agreement with the above.

Reddy and Reddy emphasised that the variables such as farm power, farm size, contact with extension agency, achievement motivation, scientific orientation and risk preference had positive and significant association with knowledge of the contact farmers about paddy cultivation[30].

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26. Vijayaraghavan, R., "Critical Analysis of the Functioning of Integrated Dryland Agricultural Development Project", (Unpub. M.Sc. (Ag.) Thesis, Tamil Nadu Agricultural University, Coimbatore, 1979.

27. Balu, S.R.,"A Study on the Functioning of Integrated Dryland Agricultural Development Project", (Unpub. M.Sc. (Ag.) Thesis, Tamil Nadu Agricultural University, Coimbatore, 1980.

28. Ashok, K.S., "A multi-Dimensional Study of a Co-Operative Marketing Society", (Unpub, M.Sc. (Ag.) Thesis, Tamil Nadu Agricultural University, Coimbatore, 1981).

29. Duraisamy, K.,"Integrated Rural Development Programme - A Beneficiary Analysis", (Unpub. M.Sc. (Ag.) Thesis, Tamil Nadu Agricultural University, Coimbatore, 1981).

30. M.Veeraraghava Reddy and S.Venku Reddy, "Relationship Between Selected Characteristics of Contact Farmers and Their Knowledge and Adoption of Improved Paddy Cultivation", **Indian Journal of Extension Education, Vol. XXIV**, 3 & 4, pp. 39-42, 1988.

## 2.6. Adoption

In this section, past studies relating to adoption are discussed.

Kunnal et al., investigated the adoption of new technologies in dryland sorghum crop production and concluded that 48 per cent of sample farmers adopted the soil and water conservation practices, 56 per cent used improved varieties, 2.44 per cent of sample farmers applied fertilizers and 2.44 per cent of sample farmers sprayed plant protection chemicals[31].

Sagar and Pal studied that the adoption of plant protection in major field crops was related to some selected characteristics of farmers and they found that supply of pesticides, knowledge about plant protection, attitude of farmers' towards plant protection and local source of information were significantly correlated with the adoption of plant protection measures[32].

Srinivasalu et al., emphasised that 30 per cent of farmers adopted the recommended fertilizer schedule, 15 per

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31. Kunnal, L.B., C.J.Itnal and M.K.Krishnaswami, "Adoption of New Technologies in Dryland Sorghum Crop Production", **Indian Journal of Extension Education, Vol. XX**, No. 3 & 4, pp. 60-62, 1984.

32. Sagar, R.L. and M.K.Pal, "Adoption of Plant Protection in Major Field Crops as Related to Some Selected Characteristics of Farmers", **Indian Journal of Extension Education**, 19 (6), pp. 68-69, 1985.

cent of farmers took gypsum, 88 per cent of farmers sprayed insecticides and 27 per cent of farmers sprayed fungicides. Only one per cent of farmers adopted the recommended volume of spray solution in insecticide usage and only 2 per cent of the farmers adopted the recommended volume of spray solution of fungicide sprays. He concluded that this tendency was due to lack of knowledge among respondents followed by non availability of inputs, their high cost, lack of credit facilities, lack of interest, lack of resources and inadequate agricultural extension work[33].

Verma reported that 20.5 per cent of sample farmers used insecticides, 13.6 per cent of farmers used fungicides and none had used any herbicides[34].

Changmai et al., studied the factors affecting the fertilizer adoption behaviour of farmers and found out that 63.51 per cent of sample farmers were adopters of fertilizers and 36.48 per cent of sample farmers were non adopters of fertilizers. It was reported that the

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33. B.Srinivasulu, P.N.Reddy, T.O.Reddy, A.N.Rao and M.N.Reddy, "Adoption Behaviour of Groundnut Cultivators" **Indian Journal of Extension Education, Vol. XXIV**, No.1 & 2, pp. 58-60, 1988.

34. Verma, R.C., "Marketing Decision - A Quantitative Approach", **Indian Journal of Marketing, 12** (4), pp. 19-22, 1971.

probability of adopting fertilizer technology depends on such factors as percentage area under high yielding varieties, percentage area irrigated, total farm income, level of literacy, infrastructural facilities, access to input markets and non farm income[35].

**2.7. Socio-personal Characteristics Influencing Adoption**

Singh revealed in his study that income of the farm had greater influence on the adoption of new farm practices[36].

Hussain observed that there was no correlation between age and income of the farmers with adoption of improved animal husbandry practices[37].

Sohal and Singh reported that social participation had no relationship with farmers' aspirations in improving their level of farming[38].

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35. Changmai, H.K., Satya, K.J.S., Manimala, T., "Adoption of Fertilizer Technology by Farmers-An Application of Logit Model", **Indian Journal of Agrl. Marketing, 6** (2), pp. 25-28, 1992

36. Singh, A., "Study of Farmers' Characteristics Associated with the Adoption and Diffusion of Improved Farm Practices in C.D. Block Charthwal, District, Muzffarnagar", (Unpub, M.Sc. (Ag.) Thesis, Govt. Agrl. College, Kanpur, Typewritten, 1963).

37. Hussain, M.Ahmed, "Adoption of Improved Animal Husbandry Practices in Hyderabad District (A.P)", (Unpub. M.Sc. Thesis, Hyderabad, Andhra Pradesh Agricultural University, 1968).

38. Sohal, T.S. and Ranjit Singh. "Association Between the Personal Characteristics of Farmers and Their Level of Farming Operations", **Indian Journal of Extension Education, 4** (1 & 2), pp. 65-70, 1968.

Subramanyam reported that there was a close relationship between the farm income and the packages of practices adopted by the farmers[39].

Jothiraj concluded that the age was not a differentiating factor between adopters and non adopters of the selected individual practices[40].

Reddy and Reddy reported that the six independent variables such as caste, material possession, farm size, contact with extension agency, achievement motivation and scientific orientation were positively and significantly associated with adoption of improved practices of paddy cultivation. Education was found to be negatively and significantly related with adoption[41].

Saeeo generalised that adoption of innovations was more closely related to individual and farm related factors than with community and family level variables and he

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39. Subramanyam, V.S.,"Causes for the Success or Failure of Recommended Package of Practices for Rice in Madras", (Unpub. M.Sc. (Ag.) Thesis, Andhra Pradesh Agricultural University, Typewritten, 1960).

40. Jothiraj, S.,"An Ex-post-Facto Study on the Extent of Adoption of Selected Husbandry Practices by the Dairy Man", (Unpub. M.Sc. (Ag.) Thesis, Tamil Nadu Agricultural University,Coimbatore, 1974).

41. Veeraraghava Reddy, V. and S.Venku Reddy, Op.cit., 1988.

suggested that the expansion of local extension services, supply of technical inputs, credit and marketing facilities could increase the profitability of modern practices and create incentives for innovation[42].

Quzi and Iqbal reported that education was an important determinant of innovation and adoption. Age was observed to be inversely related to it. Older farmers tend to be more enterprising in some respects, but generally owners of large farms were more prepared to undertake and risk modern technology than the small farmers[43].

Siardos generalised that the farmer's personal characteristics such as the age and education did not seem to exert any significant influence on adoption behaviour and socioeconomic characteristics such as the scale of farming and social activities affect the farmers' adoption indirectly[44].

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42. Saeeo, A.M., "Socioeconomic Models of Adoption of Agricultural Innovations in the Sudan and Their Implications for Agricultural Development Programs", Dissertation Abstracts International (A Humanities and Social Science), 50 (3), p. 754, 1989.

43. Quzi, A.R. and Iqbal, M., "The Relationship Between Personal Characteristics and Adoption of Recommended Farm Practices", **Journal of Rural development and Administration**, 23 (1), pp. 126-129, 1991.

44. Siardos, G.C., "The Structure of Farmer's Characteristics and Their Influence on the Adoption of Farm Practices - A Case Study in Northern Greece", **Agriculture Mediterranea**, 121 (2), pp. 144-153, 1991.

Jananadevan and Prakash concluded that the extent of fertiliser use was significantly related to the level of knowledge obtained by farmers regarding fertilizer application through extension contact and information sources[45].

Hossain and Croach observed that the innovativeness of the opinion leaders and factors were important in influencing the behaviour of other farmers[46].

**2.8. Brand**

Giles opined that brand name refers strictly to letters, words (or) group of words which could be spoken. But trade mark however is a legal term covering words and symbols which can be registered and protected. He further stated that it may begin with a name but extends to other visual features like topography, colour, package, design and slogans which are the features which should assist in creating stimulating and maintaining demand[47].

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45. Jananadevan, R. and Prakash, R., "Extent of Adoption of Fertilizers in Coconut Gardens of Kollam District", **Indian Coconut Journal**, 22 (12), pp. 8-10, 1992.

46. Hossain, S.M.A. and Croach, B.R., "Patterns and Determinants of Adoption of Farm Practices. Some Evidence from Bangladesh", **Agricultural Systems**, 38 (1), pp. 1-15, 1992.

47. Giles, G.B., **"Marketing"**, (London : The English Language Book Society and Mac Donald and Evans Limited, pp. 119-120, 1974 ).

Stantan referred brand to a name, term, symbol or special design or some combination of these elements, that was intended to identify the goods or services of one seller or a group of sellers. A brand differentiated one seller's product or services or a group of sellers from those of its competitors[48].

## 2.9. Brand Preferences and Relating Previous Research Studies

Markin stated that consumer favour a brand over most others, although if it is out of stock, they will accept a substitute[49].

Singh and Prabhakar defined consumer preference as an attempt to create a unique image for products-an image that enables them to achieve an advantage over their competitors' product[50].

Verma reported that in many marketing situations an individual brand preference changes over time because of

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48. William J.Stanton, **Fundamentals of Marketing**, (New Delhi : McGraw Hill International Book Company, p. 210, 1984.

49. Rom Mortin, **Marketing, Strategy and Management**, (New York : John Wiley and Sons, p. 635, 1982.

50. Manmohan Singh, B.K. and B.C.Prabhakar, "Consumer Perceptions of Certain Product Features of Steel Almirah", **Indian Journal of Marketing, 19** (5), p. 18, 1989.

advertising, dissatisfaction with service, quality and other reasons[51].

Sharma and Desai concluded that the farmers' preference of a particular fertilizer played an important role in affecting the marketing price, because a great discrepancy of market price between the different fertilizers was observed[52].

Aggarwal studied the consumer's purchase and use pattern of blade. He observed that almost one fourth of the persons have bought only one brand and more than half of them used only one brand (or) two brands throughout the year. He concluded that there was no significant relationship between the purchase quality and brand loyalty or between the age of a consumer and his brand loyalty status[53].

Rao and Siddarth emphasised that a feature of advertising policy helps the consumer to easily identify the

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51. Verma, R.C., "Marketing Decisions - A Quantitative Approach", **Indian Journal of Marketing**, 12 (4), pp. 19-22, 1971.

52. Sharma, D.P. and Desai, "Efficiency of Fertilizers Supply System - A Case Study in Kundulur Village", **Indian Journal of Agrl. Economics**, 28 (4), pp. 104-109, 1973.

53. Aggarwal, A.K., "Brand loyalty in Blade", **Indian Journal of Marketing, XIV** (4), pp. 15-20, 1983.

brand. Branding is actually used to distinguish one organisation's goods (or) services from another[54].

Tauseef and Inderjeet analysed the factors which influenced the preference of a particular brand of fertilizer and they found out that the farmers were not influenced by the price of fertilizer. The farmer's purchase preference was based on easy availability of fertilizer, good quality of fertilizer, good packing of the fertilizer and its good effect on soil structure[55].

Sivakumar studied the farmers' buying behaviour of pesticides and factors contributing to the buying behaviour. He concluded that the quality of the preferred brand, advertisement, and price of the brand had significant relationship with farmer's buying preference[56].

Namasivayam generalized about advertising media, preference of customer and he concluded that the socio

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54. Subba Rao and V.R.Siddarth, "Interaction of Marketing Variables with Advertising Decision - An Analysis", **Indian Journal of Marketing**, 15 (11), pp. 9-10, 1985.

55. Tauseef Ahmad and Inderjeet Singh, "Fertilizers Brand Preference, A Case Study of Meerut Division", **Indian Journal of Marketing, XV** (10 & 12), pp. 28-29, 1985.

56. Sivakumar, S.D., "Study on the Market Structure and Buying Behaviour of Farmers with Reference to Pesticides" (Unpub. M.Sc. (Ag.) Thesis, Submitted to Tamil Nadu Agricultural University, Coimbatore), 1987.

economic factors such as age, education, and income influenced their preference[57].

Ramasamy and Chandrasekharan identified the factors influencing the purchase of cotton seed and the buying behaviour of farmer. The purchasing decision of farmers were, influenced by the distance travelled by the farmer to purchase cotton seed, source of purchase, varietal preference, seed quality, source of information about supply of cotton by different agencies and brand preference. Dealers with a credit sale facility, availability of seed at lower price and premises located nearer to the farmers' locality attracted farmers[58].

Sivakumar reported that advertisement has a positive effect of stimulating the potential buyer to purchase a particular brand and non availability, low quality and high prices were major factors in switching over to other brands[59].

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57. Namasivayam, "Advertising Media Preference", **Indian Journal of Marketing, XVIII** (5-7), pp. 23-28, 1988.

58. Ramasamy, C., Chandrasekharan, M. "Buying Behaviour of Farmers - The Case of Cotton Seed", **Indian Journal of Agricultural Marketing, 4** (2), pp. 166-172, 1990.

59. Sivakumar, A., "Marketing Strategy Analysis - A Case Study" (Unpub. M.Sc. (Ag.) Thesis, Agricultural Economics, Tamil Nadu Agricultural University, Coimbatore, 1992).

Nyemba studied the factors affecting farmers' continuous purchase of fertilizer and found that purchase of fertilizer was positively determined by interactions with the extension agent[60].

**2.10. Perception and Past Studies Relating to it**

Singh and Prabhakar defined perception as "the process by which an individual selects, organises and interprets stimuli into a meaningful and coherent picture of the world". A stimulus is any unit of input (ie) products, packages, brand name, advertisement, and commercials. It is based on these perceptions that the consumer in all probability will ultimately decide to buy. This brings to sharp focus the importance of thorough understanding of consumer perceptions by the marketing personnel[61].

According to Kotler, perception is "the process by which an individual selects, organizes, and interprets information inputs to create a meaningful picture of the

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60. Nyemba, J.A., "A Study of Factors Affecting Farmers' Continuous Purchase and Use of Chemical Fertilizers in the West Province of Cameroon". Discovery and Innovation, 6 (1), pp. 110-115, 1994.

61. Manmohan, B.K., Singh and B.V.Prabhakar, "Consumer Perception of Certain Product Features of Steel Almirah", Indian Journal of Marketing, 19 (5), pp. 17-26, 1989.

62. Phillip kotler., op. cit., 1994.

world". Perception depends not only on the physical stimuli but also on the stimuli's relation to the surrounding field and on conditions within the individual[62].

Apodaca found the reason of hybrid corn rejection by Mexicans and American farmers, indicated that change agents perceived the corn seed mainly in terms of its higher yield, while farmers perceived it as a poor food[63].

Bible and Brown studied the role consensus and satisfaction of extension advisory committee members. They said that consensus on role definitions and role performance was relatively low among committee members who perceived more responsibility for themselves than agents did. Both committee members and extension agents had higher consensus on perception of role expectations than on perception of role performance. Consensus on role definition and on expected versus perceived role behaviour was associated with satisfaction among both sets of role definers[64].

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63. Apodaca, Anacleto, "**Corn and Custom Introduction of Hybrid Corn to Spanish American Farmers in New Mexico,** in Edward H.Spicer (Ed.) Human Problems in Technical Change, New York, Russell Sage Fdn. A., 1952.

64. Bible, B.L. and Brown, "Role Consensus and Satisfaction of Extension Advisory Committee Members", **Rural Sociology, 28** (1), pp. 81-90, 1963.

Roy and Jaiswal concluded that three groups of respondents namely, research workers, extension workers, and farmers, perceived the characteristics of innovations based upon their background experience and selectivity of perception[65].

Terblanche conducted a study in South Africa and showed that 20 years ago, differential perceptions existed between extension officers and stock farmers, concerning veld conditions. They are still the same in extent and intensity. So he suggested that it will be a difficult task to convince 71 per cent of Angora goat rearing farmers, who perceive their veld conditions as good advantages which they already perceive as exist[66].

Kalugasalamurthy found that the sample farmers perceived Kavach and Blue copper as high priced products, but they were highly satisfied with the efficacy of sandoz product[67].

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65. Roy, N.K. and N.K.Jaiswal, "Characteristics of Agrl. Innovation as Perceived by Farmers, Extension Workers and Research Workers", Manas :**The Journal of Scientific Psychology Delhi** (Paper in Press), 1969.

66. Terblanche, E.Lef, "Perceptions on the Adoption of Grazing Control Systems", **South African Journal of Agricultural Extension**, 17, pp. 45-52, 1990.

67. Kalugasalamurthy, S., **Op.cit.**, 1991.

Motavalli et al., studied about farmers' perception and management practices of `farm yard manure in relation to the use of manufactured fertilizers and they indicated that farmers perceived farm yard manure to be a complement to fertilizer rather than a substitute[68].

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68. Motavalli, P.P., Singh, R.P. and Anders, M.M. "Perception and Management of Farm Yard Manure in the Semi-arid Tropics of India", **Agricultural Systems, 46** (2), pp. 189-204, 1994.

# DESIGN OF THE STUDY

# CHAPTER III

# DESIGN OF THE STUDY

This chapter deals with the design of the study, research methods and procedures used, which are dealt under the following sub-headings.

3.1 Selection of Study Area and Sampling Procedure

3.2 Period of Study

3.3 Operationalisation and Measurement of Variables

3.4 Tools of Analysis

## 3.1 Selection of Study Area and Sampling Procedure

Tirunelveli Nellai Kattabomman, Madurai, Tiruchirapalli and V.O.Chidambaranar districts are the predominant banana growing districts of Tamil Nadu. These four districts cover more than 50 per cent of banana growing areas of Tamil nadu (ie., 30458 ha). It would be an appropriate unit for analysing the factors responsible for the awareness and adoption of fungicides among banana growers. Hence these districts were selected for the study purposively. There were 28 blocks in Tiruchirapalli district, 21 blocks in Madurai district, 19 blocks in Tirunelveli district and 12 blocks in V.O.Chidambaranar district. One block in each district was selected, using random sampling method. Only blocks with a minimum of 300 ha of banana were considered for the selection of ensure banana farmers. In each block

TABLE 7

SELECTION OF RESPONDENTS

| Districts | Block | Villages | Number of Banana growers | |
|---|---|---|---|---|
| | | | Total | Sample size |
| Tiruchirapalli | Kulithalai | Thimmachipuram | 271 | 15 |
| | | Nachalur | 378 | 21 |
| | | Marudhur | 256 | 14 |
| Madurai | Chinnamanur | Seebalakottai | 438 | 24 |
| | | Margayankottai | 161 | 9 |
| | | Erasaka Nayaganur | 306 | 17 |
| Tirunelveli | Cheranmaha-devi | Veeravanallur | 288 | 16 |
| | | Gobalasamudram | 400 | 22 |
| | | Karkurichi | 220 | 12 |
| V.O.Chidambaranar | Srivaikundum | Eral | 316 | 17 |
| | | Perur | 362 | 20 |
| | | Padmanabamangalam | 232 | 13 |
| Total | 4 | 12 | 3628 | 200 |

three villages were selected through random sampling method. Fifty farmers were selected in each block in the three villages using random sampling method and probability proportion technique. Thus a three tier random sampling was followed in the selection of 200 farmers spread over four blocks in the selected four districts of Tamil Nadu. Also 10 pesticide dealers were selected in each block using random sampling method.

### 3.2 Period of Study

The study was undertaken during the months of October 1994 to December 1994. The secondary data pertaining to the year 1992-93 was made use for the study.

The required information relevant to the socio-economic characteristics, varietal selection of banana, cropping pattern, usage of fungicides, fungicide brand awareness and opinion about fungicides, were collected from farmers through personal interview. The secondary data like rainfall, soil types, irrigation facilities, land use pattern, pesticide use were collected from the offices of the Assistant Director of Agriculture, Joint Director of Agriculture and Statistical officers. The details on the marketing of pesticides and opinion about fungicides were collected from the various dealers by personal interview method.

## 3.3 Operationalisation and Measurement of Variables

The variables used in this study were classified as independent variables and dependent variables. The independent variables used in this study were age, education, farm size, farming experience, occupational status, annual income, social participation and extension agency contact.

### 3.3.1 Independent variables

#### 3.3.1.1 Age

The number of years completed by the respondents at the time of enquiry was considered as his age for this study. The respondents were classified into age groups of young, middle and old with the following ranges as adopted in the census of India (1987) report.

| Classification | Score |
|---|---|
| Young | Upto 35 |
| Middle | 35-45 |
| Old | Above 45 |

#### 3.3.1.2 Education

Educational status was operationalised as the nature of education acquired for which the following scoring procedure was used as followed by Trivedi (1963).

| Classification | Score |
|---|---|
| Illiterate | 0 |
| Primary school | 1 |
| Secondary school/High school | 2 |
| Collegiate | 3 |

### 3.3.1.3. Farm Experience

Farm experience refers to the association of an individual to his farming profession. Based on their farm experience the selected farmers were classified into three groups.

| Farming experience | Category |
|---|---|
| Upto 10 years | Low |
| 10 to 20 years | Medium |
| Above 20 years | High |

### 3.3.1.4 Farm size

This referred to the total extent of land possessed and cultivated by the individual farmer. The conversion procedure as specified by the Tamil Nadu Government Notification on Guidelines of New Project (1974) of equating two acres of dry land to one acre of irrigated land was followed to arrive at the total extent of land. They were classified into four categories as follows.

| Farm sized | Category |
|---|---|
| Upto 2.5 acres (1 ha) | Marginal farmer |
| From 2.51 to 5.00 acres (1-2 ha) | Small farmer |
| From 5.01 to 10.00 acres (2-4 ha) | Medium farmer |
| Above 10.00 acres (above 4 ha) | Big farmer |

### 3.3.1.5 Occupational status

The occupational status of the respondents was operationalised taking into consideration of agricultural and other subsidiary occupations. A farmer without any subsidiary occupation was given the maximum score. The scoring procedure followed by Allauddin (1983) was adopted here.

| Occupation | Score |
|---|---|
| Farming alone | 4 |
| Farming + Farming labour | 3 |
| Farming + Business | 2 |
| Farming + Service (Govt./Private) | 1 |

### 3.3.1.6. Annual Income

Annual income was defined as the total/net income of the respondent obtained from both agricultural and other subsidiary occupations for a period of one year. This variable was classified as low, medium and high based on their average income.

| Income group | Category |
|---|---|
| Upto Rs. 60,000 | Low |
| Rs. 60,000-1,20,000 | Medium |
| Above Rs. 1,20,000 | High |

### 3.3.1.7. Social participation

It referred to the degree of involvement of an individual in a formal organisation as a member (or) as an office bearer.

| Member | Score |
|---|---|
| Non-participation in any organisation | 0 |
| Member in one organisation | 1 |
| Member in more than one organisation | 2 |
| Office bearer in one organisation | 3 |
| Office bearer in more than one organisation | 4 |

The scoring procedure used by Trivedi (1963) was adopted for this study.

### 3.3.1.8. Extension agency contact

This referred to the degree to which an individual maintained contact with various extension agencies for farm information. This variable was measured in terms of frequency and purpose of meeting the change agents by the farmers. The scoring procedure followed by Ponnappan (1982) was adopted for this study.

| Frequency | Score | Purpose | Score |
|---|---|---|---|
| Frequently | 3 | Agricultural related | 2 |
| Occasionally | 2 | Non-agricultural related | 1 |
| Rarely | 1 | | |

### 3.3.2. Dependent variables

The dependent variables used in the study were awareness and adoption.

#### 3.3.2.1. Awareness

In the present investigation, awareness denoted the farmer's casual knowing of the sigatoka leaf spot disease of banana, yield loss of the disease, its control measures, awareness about fungicides and resistant power of banana varieties. Each item of awareness was tested by 'Yes' and 'No' response and for every 'Yes' response a score of one and for every 'No' response, a score of zero was given.

#### 3.3.2.2 Adoption index

Adoption has been operationalised as the correct usage of package of recommendations as recommended by the particular company/extension agents. The term adoption in this study means the use of fungicides by the respondents either fully or in part. The practices listed in the interview schedule were given scores and the adoption index was calculated by using the formula as suggested by Bhaskaran and Praveena (1982).

$$AI = a/p \times 100$$

Where,

AI = Adoption index

a = No.of practices adopted by the respondents
p = Total No.of practices recommended by company/ Extension agent

## 3.4 Tools of Analysis

### 3.4.1 Conventional Analysis

Average and percentage analysis were used to study the farmers' educational status, age level, income, farming experience, size of land holding, occupation, social participation and extension agency contact. Awareness about sigatoka leaf spot disease, control measures, fungicide awareness, opinion about fungicides were also measured by percentage analysis. In the case of dealers characteristics like, education, social participation, credit period perception about different fungicide companies and their products were measured again by percentage analysis, which aided in making comparisons.

### 3.4.2 Mean and standard deviation

Based on the mean and standard deviation, the farmers' perception about fungicides and dealers' perception about fungicide companies were classified into 3 categories ie., low, medium and high. The procedure adopted was as follows.

Mean - 1 standard deviation = low

Mean + 1 standard deviation = High

Mean $\pm$ 1 standard deviation = Medium

### 3.4.3 Garett's Ranking

This method was suggested by Garett for converting the ranks into scores when number of items ranked, differed from

respondent to respondent. A set of factors contributing to the preference of banana growers, suggestions and reasons towards fungicides had been listed out and respondents were asked to rank them in the order of their importance and then it was converted into ranks by using the formula,

$$\text{Per cent position} = \frac{100\ (R_{ij} - 0.5)}{N_j}$$

Where,

$R_{ij}$ = Rank given for ith factor by $j$th individual

$N_j$ = Number of factors ranked by jth individual

By referring the table given by Garett, the per cent position estimated were converted into scores, then for each factor, the scores of various respondents were added and mean was calculated and the mean scores were arranged in a descending order. The reason with the highest mean score was considered to be most important.

### 3.4.4. Multiple regression analysis

The following multiple regression equation was used to study the relationship envisaged in this study.

$$Y=a + b_1x_1+b_2x_2+b_3x_3+b_4x_4+b_5x_5+b_6x_6+b_7x_7+b_8x_8+e$$

Where

Y = Awareness/adoption

a = Intercept

$x_1$ to $x_8$ are the independent variables

(ie.,) $x_1$ => Age

$x_2$ => Education

$x_3$ => Annual income

$x_4$ => Social participation

$x_5$ => Farm size

$x_6$ => Farming experience

$x_7$ => Occupational status

$x_8$ => Extension agency contact

e => Error term

$b_1$ to $b_8$ are the partial regression coefficients

In case of awareness, the total scores for the previous said variables (under the caption awareness) were calculated for each farmer to represent the variable 'Y'. In the case of adoption, adoption index for the four practices was estimated for each adopter-farmer to represent 'Y'.

# STUDY AREA DESCRIPTION

# CHAPTER IV

# STUDY AREA DESCRIPTION

The usefulness of any research study can be fully appreciated only when the results are studied with the background information such as physical, social and economic conditions of the region. The present study was undertaken with the aim of highlighting the awareness and adoption of fungicides in the selected area. Hence details on characteristics of agriculture with specific reference to agro-climatic factors, irrigation and cropping pattern and availability of input marketing facilities relating to the study region are presented in this chapter.

Four districts namely, Tiruchirapalli, Madurai, Tirunelveli and V.O.Chidambaranar constituted the study region. The above details for these districts are furnished in this chapter.

## Location

Tiruchirapalli is the central district of Tamil Nadu located between 10° and 10°-30' of the Northern Latitude and $77^{o}$-45' of the Eastern longitude. South to Tiruchirapalli lies Madurai and Tirunelveli districts and in the South and South East of Tirunelveli, the V.O.Chidambaranar district is located.

**Rainfall**

Normal rainfall is minimum in V.O.Chidambaranar district while it is maximum in Tirunelveli district. The normal rainfall of Tiruchirapalli, Madurai, Tirunelveli and V.O.Chidambaranar districts are 826.6 mm, 827.1 mm, 888.7 mm and 662.2 mm respectively.

**Soil types**

The predominant soil type is red loam in Tiruchirapalli and Madurai districts. While in other districts, redloam and black soils are seen.

**Land utilisation pattern**

Tiruchirapalli district is the largest district followed by Tirunelveli, Madurai and V.O.Chidambaranar districts with their total geographical area were constituted by 1099011 ha, 681629 ha 676685 ha and 459054 ha respectively. Madurai district has a larger share of forests 23.7 per cent followed by Tirunelveli with 18.4 per cent of the total geographical area contributed by forest as shown in Table 8 .

Net area sown is nearly 50 per cent in Tiruchirapalli while it is more than 50 per cent in V.O.Chidambaranar district. The net area sown is minimum in Tirunelveli (24.4 per cent) of the total area is sown under crops during 1991-92. The area sown more than once was maximum in Madurai

[illegible]

[illegible]

| Name of the districts | Total geogra-phical area | Forests (%) | Barren and un-cultiv-able land (%) | Land put to non-Agri use (%) | Cultiv-able waste (%) | Permanent pastures other graning (%) | Miscell-aneous trees groves (%) | Current fallow (%) | Other fallow | Net area sown (%) | Area sown more than once (%) | Total cropped area (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Tiruchirapalli | 1099011 | 67722 (6.2) | 32790 (3.0) | 160275 (14.6) | 34910 (3.2) | 17025 (1.5) | 16411 (1.5) | 10290 (0.9) | 214010 (19.5) | 545570 (49.6) | 29333 (2.7) | 574911 (52.3) |
| Madurai | 676605 | 160653 (23.7) | 34952 (5.2) | 75423 (11.2) | 9017 (1.3) | 578 (0.1) | 1469 (0.2) | 66340 (9.8) | 27149 (4.0) | 301104 (44.5) | 50536 (8.7) | 359640 (53.2) |
| Tirunelveli | 601629 | 125500 (18.4) | 25165 (3.7) | 94818 (13.9) | 39901 (5.8) | 10919 (1.6) | 9231 (4.1) | 80385 (11.8) | 129581 (19.0) | 166125 (24.4) | 51593 (7.6) | 217718 (32.0) |
| V.O.Chidambaranar | 459054 | 11002 (2.4) | 19944 (4.3) | 68593 (19.9) | 20137 (4.4) | 5052 (1.2) | 24852 (5.4) | 38150 (8.3) | 40406 (8.8) | 230038 (50.3) | 14058 (3.1) | 244096 (53.4) |

followed by Tirunelveli, V.O.Chidambaranar and Tiruchirapalli districts. The total cropped area is minimum in Tirunelveli district (32.0 per cent) while it is the maximum in V.O.Chidambaranar district (53.4 per cent), even though V.O.Chidambaranar district has a minimum total area, this district had the maximum share occupied by total cropped area.

**Irrigation pattern**

The details on different sources of water supply, net and gross area irrigated for districts selected are furnished in Table9 . With respect to Tiruchirapalli the net area irrigated and gross area irrigated was the maximum (170736 and 199135 ha) when compared to other three districts in view of its lengthy canals and maximum number of wells.

Madurai occupies the second position in this category followed by Tirunelveli and V.O.Chidambaranar district in order. A different picture could be seen when the share of net irrigated area to net area sown as well as gross irrigated area to total cropped area are analysed. While nearly 70 per cent of the net sown area and total cropped area is irrigated in Tirunelveli district,it was the minimum in V.O.Chidambaranar district which has only 19 per cent of net area sown and 22.56 per cent of total cropped area under

TABLE 9

SOURCES OF WATER SUPPLY (1991-92)

| Name of the districts | Canals | | Tube wells (No.) | Wells used for irrigation purpose only (No.) | Reservoirs (No.) | Tanks (No.) | Net area irrigated (ha) | Gross area irrigated (ha) | Share of net irrigated to net area sown | Share of gross irrigated to total cropped area |
|---|---|---|---|---|---|---|---|---|---|---|
| | No. | Length (km) | | | | | | | | |
| Tiruchirapalli | 163 | 767 | 9457 | 150011 | 3 | 2562 | 170736 | 199135 | 31.29 | 34.64 |
| Madurai | 164 | 279 | 534 | 86869 | 6 | 2423 | 144989 | 179084 | 48.15 | 49.80 |
| Tirunelveli | 197 | 532 | - | 29295 | - | 620 | 114083 | 152285 | 68.67 | 69.91 |
| V.O.Chidambaranar | 4 | 78 | 72 | 1800 | 5 | 2593 | 45149 | 55253 | 19.56 | 22.56 |

irrigation. As far as Madurai district is concerned nearly 50 per cent of the cropped area is irrigated, but in Tiruchirapalli district inspite of the lengthy canals and large number of wells more or less one-third of the cultivated area alone was irrigated. It may be remembered in this juncture that Tiruchirapalli district is benefitted by the Cauvery river, Madurai by river Vaigai and Tirunelveli and V.O.Chidambaranar districts by river Thamiraparani.

**Cropping pattern**

Paddy is the major crop in Tirunelveli and Madurai districts which occupied 46.6 per cent & 33.1 per cent of the gross cropped area of these districts respectively. In Tiruchirapalli, paddy occupies a second place after sorghum. While in V.O.Chidambaranar district, cotton and pulses occupied the major share, as shown in Table 10 . Cereals totally occupied more than 50 per cent of the total cropped area in the study region except V.O.Chidambaranar district where it was grown only in 29 per cent of the area.

The selected crop banana was grown only in 3313 ha in Madurai district and to a maximum of 16092 ha in Tiruchirapalli district. The share of banana was 2.7 per cent, 0.92 per cent, 1.83 per cent and 2.88 per cent in Tiruchirapalli, Madurai, Tirunelveli and V.O.Chidambaranar districts respectively.

TABLE 10

AREA UNDER DIFFERENT CROPS IN STUDY DISTRICTS OF TAMIL NADU DURING THE YEAR (1990-91) (AREA IN HECTARES)

| Name of the districts | Paddy | Sorghum | Cumbu | Ragi | Total cereals | Green gram | Black gram | Total pulses | Cotton | Sugar-cane | Banana | Ground-nut | Coconut | Gingelly |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Tiruchirapalli | 92682 | 129013 | 61012 | 1199 | 303546 | 3584 | 13972 | 39476 | 15188 | 21371 | 16092 | 71727 | 5937 | 26446 |
| | (16.1) | (22.4) | (10.6) | (0.2) | (52.8) | (0.6) | (2.4) | (6.9) | (2.6) | (3.7) | (2.7) | (12.5) | (1.0) | (3.6) |
| Madurai | 119149 | 26274 | 12048 | 1619 | 184751 | 11284 | 5925 | 36760 | 33727 | 13385 | 3313 | 31026 | 11977 | 4760 |
| | (33.1) | (7.3) | (3.4) | (0.5) | (51.4) | (3.1) | (1.9) | (10.2) | (9.4) | (3.7) | (0.92) | (8.6) | (3.6) | (1.3) |
| Tirunelveli | 101402 | 5238 | 1229 | 1467 | 110587 | 3307 | 21816 | 33762 | 20183 | 5444 | 3989 | 11656 | 7288 | 4525 |
| | (46.6) | (2.4) | (0.6) | (0.7) | (50.8) | (1.5) | (12.3) | (15.5) | (9.2) | (1.5) | (1.83) | (5.4) | (3.3) | (2.1) |
| V.O.Chidambaranar | 28789 | 10035 | 28900 | 28900 | 71088 | 12694 | 21205 | 35666 | 45900 | 9015 | 7064 | 5571 | 3276 | 5050 |
| | (11.7) | (4.1) | (11.8) | (0.5) | (29.0) | (5.2) | (8.7) | (14.6) | (18.7) | (0.1) | (2.88) | (2.3) | (1.3) | (2.2) |

**Consumption of chemical fertilisers and pesticides**

In the study region as a whole, the pesticide use was maximum in Tiruchirapalli district as shown in Table11. It accounted for the maximum consumption of fertilisers due to the largest area and maximum cropped area. In this district, 73000 tonnes of NPK was used, which was reduced to 57000 tonnes, 44000 tonnes and 10000 tonnes in Madurai, Tirunelveli and V.O.Chidambaranar district respectively. Inspite of a lower total cropped area, Tirunelveli and V.O.Chidambaranar districts had used 33000 tonnes and 39000 tonnes of pesticides in dust form, which might be due to larger area under cotton in these districts.

**Season of Planting**

The season of planting of banana varieties varies between the various districts. Planting is done all the year round in order to secure better prices during the off season. Normally, planting, is done from September to November, when irrigation facilities, are available. In some other areas planting is done during South West monsoon in May-June.

**Marketing of Banana**

The marketing system for banana is not well organised and hence, the produce suffers losses in quality and quantity before it reaches the consumers. As the production

TABLE 11

CONSUMPTION OF CHEMICAL FERTILIZERS AND PESTICIDES (1992-93) (IN '000' TONNES)

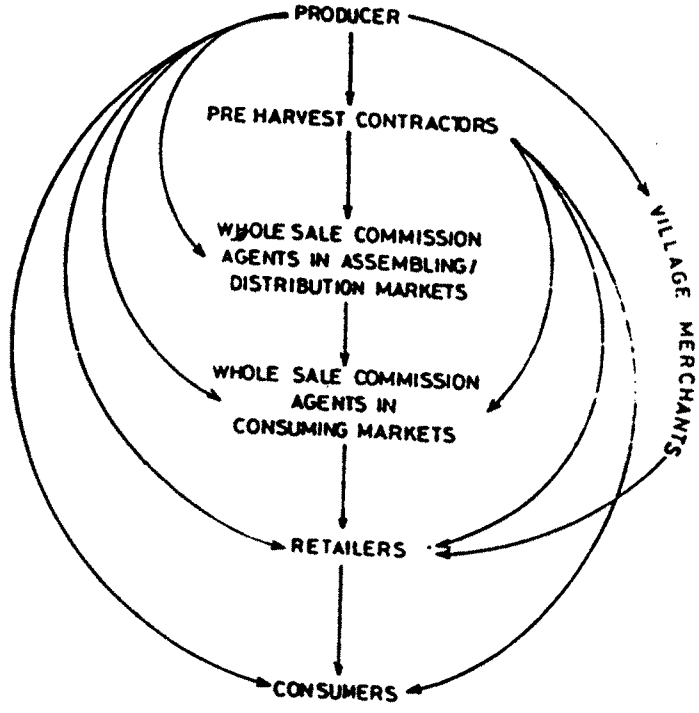
| Name of the districts | Fertilizers | | | Total NPK | Pesticides | |
|---|---|---|---|---|---|---|
| | Nitrogen N | Phosphatic $P_2O_5$ | Potassic $K_2O$ | | Dust (tonnes) | Liquid (litre) |
| Tiruchirapalli | 39 | 15 | 19 | 73 | 48 | 28116 |
| Madurai | 30 | 11 | 16 | 57 | 12 | 11437 |
| Tirunelveli | 27 | 8 | 9 | 44 | 33 | 7529 |
| V.O.Chidambaranar | 6 | 2 | 2 | 10 | 39 | 19019 |

centres are situated in the remote villages, with less transport facilities, majority of cultivators sell their produce to preharvest contractors in advance and the harvesting and preparation for market is done by preharvest contractors only. They conduct periodical visits to the banana gardens. They are the main financing agents for the farmers. Farmers get the advance money from them at the time of entering in to contract. Even before all the bunches emerge in the garden, these contractors enter in to contract with the farmers for the purchase of their produce and an advance will also be paid. The contractors fix the contract money on the basis of bunches. Suppose there are about 1000 plants in the garden, contract is fixed only for 900 bunches, as only that number of good bunches alone are expected, some times they take extra bunches ie., if they purchase 100 bunches they harvest 105-110 bunches but pay only for 100 bunches. The contractors will not allow to cut the leaves till bunches are harvested.

Sometimes the banana growers sell their produce to village merchants, who operate in the village shandies as commission agents. They collect the produce and sell it at the shandies.

Fig.1

CHANNELS OF BANANA MARKETING




Source : Shanmugavelu, K.G., et al., Banana - Taxonomy, Breeding and Production Technology (New Delhi : Metropolitan Book Co. Pvt. Ltd., 1992), p. 404.

Figure 1 shows the different distribution systems. The most common banana market channels seen in banana trade

1. producer-wholesaler-retailer-consumer
2. Producer-village merchant-wholesaler-retailer-consumer
3. Producer-village merchant-retailer-consumer
4. Producer-retailer-consumer
5. Producer-consumer

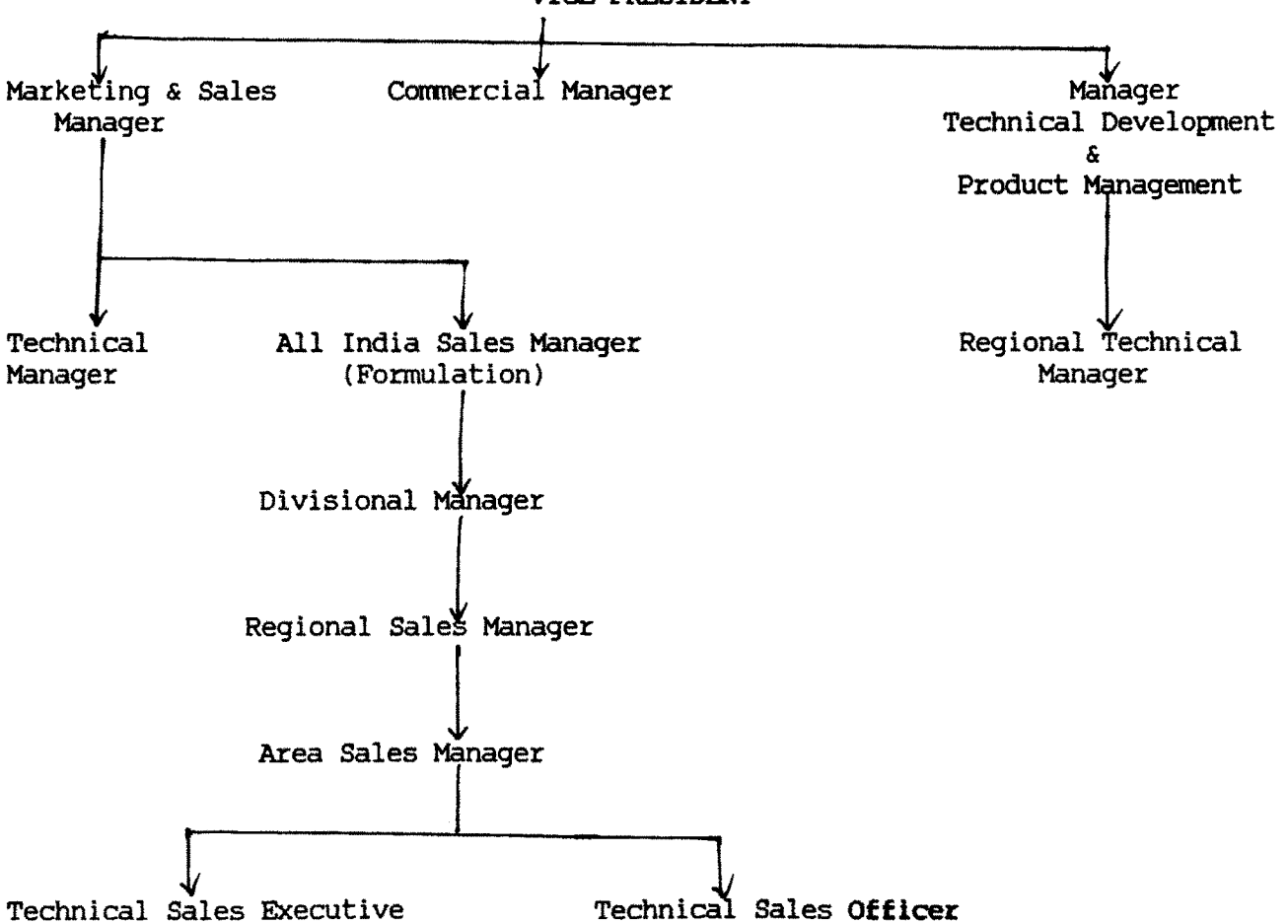
## COMPANY PROFILE

Sandoz (India) Limited is ranked among the top notch agricultural input suppliers and business oriented companies in the country, today, having multicrore turnover and widely diversified nature of products which includes pesticides, seeds, pharmaceuticals, dye stuffs, optical brightners, textile auxillaries and leather chemicals. It is one of the leading concern in the field of pesticide production and marketing. It is manufacturing large diversified pesticide conglomerate with an annual turnover of more than 100 crores which includes exports to the tune of 20 crores.

The head office of agrochemicals is situated in Bombay and the company has several regional offices in major cities of India. The lower most cadre in the marketing set up comprises of the sales representatives and commercial executives, who popularise the company's products among farmers and dealers and also educate the farmers through field works and demonstrations. The target achievement and future requirement are predicted at head office level as per SWOT analysis (strength, weakness,opportunity and threat). The dealer meetings, campaigns, trainings, and demonstrations are conducted under the control of the Regional sales manager. Frequent demonstrations and farmers meetings were conducted to launch a new product. The

FIGURE. No.2

ORGANISATIONAL SET UP



department of marketing is manned by experienced, dynamic and well qualified personnel at all levels to form an effective team with a touch of professionalism to guide, control and coordinate the functions of selling agents. The main aim is to achieve more volume of sales, quality assurance, satisfy consumer needs, incessant flow of availability, finest technical assistance and also they are maintaining close relationship between the company and the consumers they also know the real needs of the actual users.

This company continues to hold the market leadership position in this highly competitive market of pesticides because it built up with an extensive distribution system and effective advertising campaigns. Every year the company allots higher amount for advertising and promotional activities. The company has to distribute their product only through distributors and not directly to the dealers. They select their distribution channel by statewise agency houses. The distribution of products can be carried out only through a well organised net-work service point, which can reach the remotest areas of villages.

**Research and development**

Sandoz (India) Limited has a well equipped Research and development division for agro-chemicals. In India, it is

situated in Coimbatore, Nasik and Karnal. The specific objectives of this research units are,

* to find the suitability of Sandoz's products for our climatic conditions, that is to find whether it is superior to the existing product (or) not.
* to help the marketing people on technical aspects.
* screening of new molecules and development of the existing molecules.

The regional technical managers are to collaborate with scientists of agricultural universities and government agricultural extension officers. The main aim of the executives and technical officers who work under the control of regional technical managers are,

* to identify the new market opportunities and also to help the company to increase its sales volume.
* to give technical guidance to sales representatives and solve their problems.

**Company's products**

Sandoz (India) Limited is the first company in India which marketed biological pesticide, Delfin. Last year it launched EkaluxR 20 AF, a new water based formulation of quinalphos with a reduced solvent load. Two year before Sandoz got ISO 9002 certificate for its best quality of products. Not only it manufactures EkaluxR 20 AF but also it markets the following pesticides.

**Fungicides**

1. KAVACH [R] 75 WP (chlorothalonil) - A broad spectrum organic contact fungicide.
2. THIOVIT[R] 80 WP (Wettable sulphur) - A contact fungicide and acaricide.
3. BLUE COPPER[R] 50 (copper oxychloride) - A contact fungicide containing 80 per cent (W/w) copper oxychloride.

**Insecticides**

1. EKALUX[R] 20 AF (Quinalphos) - An organo phosphorus contact and stomach insecticide. It is a new water base formulation of quinalphos.
2. EKALUX[R] Ec25 (Quinalphos) - An organo phosphorus contact and stomach poison. It contains 25 per cent (w/w) quinalphos.
3. EKALUX[R] G-5. A stomach and contact insecticide. It contains 5% (w/w) quinalphos
4. MAVRIK[R] 25 EC (Fluvalinate) - A selective contact and stomach insecticide.
5. CYPERMETHRIN SANDOZ[R] (cypermethrin 25% w/w) - a synthetic pyrethroid, which acts as a stomach and contact poison.

**New products**

1. DELFIN[R] WG - A biological insecticide
2. ATEMI[R] 50 SL - (Cyproconazole) - A systemic triazole fungicide with protectant, curative and eradicative action.
3. KAVACH[R] 40 SC (Chlorothalonil) - A flowable formulation of chlorothalonil
4. SAFROTIN[R] 20 EC - (Propetamphos) - An organo phosphorus insecticide with contact and stomach poison.
5. SANDOVIT[R] - (Dodecyl benzene sulfanate) - An anionic wetting agent.

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Source : Dr. G.Krishnamohan, **Diagnostic Symptoms of Crop Diseases**. pp. 78-92, 1994.

# RESULTS AND DISCUSSION

# CHAPTER V

# RESULTS AND DISCUSSION

This chapter highlights the findings of the investigation along with the discussion in relation to the objectives of the present study. The results and discussion are presented under the following headings.

5.1. Socio-personal characteristics of banana growers

5.2. Awareness level of banana growers

5.3. Extent of adoption of Kavach and its competing fungicides among sample farmers

5.4. Relationship between awareness and adoption of fungicides among banana growers and their socio-personal characteristics

5.5. Factors associated with farmers' perception of Kavach and its competing fungicides

5.6. Factors associated with fungicides buying preferences of farmers

5.7. Constraints in adoption of Kavach

5.8. Profile characteristics of sample dealers

5.9. Market share of different fungicides

5.10. Dealers' perception about fungicide companies

5.11. Suggestions to improve sale of Kavach

## 5.1. Socio-personal Characteristics of Banana Growers

An understanding of socio-personal characteristics of sample farmers is necessary, because it gives a clear picture and relevant information about the farmers' awareness and adoption level of fungicides.

### 5.1.1. Age level of sample farmers

The banana growers were classified into three groups. The distribution of banana growers according to their chronological age is set out in Table 12.

A perusal of Table 12 revealed that 44.5 per cent of farmers belonged to the group of above 45 years of age, followed by 33.5 per cent of farmers who fell under the category of 35-45 years of age and 22 per cent who belonged to the below 35 years of age.

Among the four districts, Tiruchirapalli had higher number of respondents above 45 years of age (50 per cent) followed by V.O.Chidambaranar (48 per cent), Tirunelveli (44 per cent) and Madurai (36 per cent).

### 5.1.2. Educational status of sample farmers

It could be seen from Table 13 that a larger section of the growers, viz., 46 per cent were illiterates. The percentage share of the sample decreased with improvement in education as 24.0 per cent, 23.5 per cent and 6.5 per cent

TABLE 12

DISTRIBUTION OF BANANA GROWERS ACCORDING TO THEIR CHRONOLOGICAL AGE

(n = 200)

| Particulars | Tirunelveli | | V.O.Chidambaranar | | Tiruchirapalli | | Madurai | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % | No. | % | No. | % |
| Up to 35 | 6 | 12 | 12 | 24 | 10 | 20 | 16 | 32 | 44 | 22.0 |
| 35 to 45 | 22 | 44 | 14 | 28 | 15 | 30 | 16 | 32 | 67 | 33.5 |
| Above 45 | 22 | 44 | 24 | 48 | 25 | 50 | 18 | 36 | 89 | 44.5 |
| Total | 50 | 100 | 50 | 100 | 50 | 100 | 50 | 100 | 200 | 100.0 |

TABLE 13

EDUCATIONAL STATUS OF SAMPLE FARMERS

(n = 200)

| Particulars | Tirunelveli | | V.O.Chidambaranar | | Tiruchirapalli | | Madurai | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % | No. | % | No. | % |
| Illiterate | 25 | 50 | 25 | 50 | 22 | 44 | 20 | 40 | 92 | 46.0 |
| Primary | 8 | 16 | 8 | 16 | 15 | 30 | 17 | 34 | 48 | 24.0 |
| High school | 14 | 28 | 14 | 28 | 11 | 22 | 8 | 16 | 47 | 23.5 |
| Collegiate | 3 | 6 | 3 | 6 | 2 | 4 | 5 | 10 | 13 | 6.5 |
| Total | 50 | 100 | 50 | 100 | 50 | 100 | 50 | 100 | 200 | 100.0 |

with regard to primary, high school and collegiate level educations respectively. Out of four districts, V.O.Chidambaranar and Tirunelveli had the highest percentage of illiterates viz., 50 per cent. Farmers having primary level of education constituted about 34 per cent in Madurai and 30 per cent in Tiruchirapalli.

### 5.1.3. Farming experience of sample farmers

From Table 14, it could be seen that 45.5 per cent of banana growers had more than 20 years of banana growing experience, followed by 34.5 per cent which fell in between 20 years and less than 20 years of experience and 20 per cent having less than 10 years of experience. Among the study districts, 64 per cent of Tiruchirapalli banana growers got more than 20 years of farming experience followed by Madurai and Tirunelveli (40 per cent each) who came under the category of more than 20 years of experience.

### 5.1.4. Size of holding

The banana growers were categorised into marginal, small, medium and large farmers based on their size of land holding and the details are furnished in Table 15.

In the sample, a larger proportion of the farmers, viz., 46 per cent were marginal farmers and the proportion decreased with increase in size of the farm as 31.0 per cent, 15.5 per cent and 7.5 per cent respectively by small,

TABLE 14

DISTRIBUTION OF BANANA GROWERS ACCORDING TO THEIR FARMING EXPERIENCE

(n = 200)

| Experience in years | Name of the districts | | | | | | | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Tirunelveli | | V.O.Chidambaranar | | Tiruchirapalli | | Madurai | | | |
| | No. | % | No. | % | No. | % | No. | % | No. | % |
| Up to 10 Yrs. | 11 | 22 | 11 | 22 | 5 | 10 | 13 | 26 | 40 | 20 |
| 10 to 20 Yrs. | 19 | 38 | 20 | 40 | 13 | 26 | 17 | 34 | 69 | 34.5 |
| Above 20 Yrs. | 20 | 40 | 19 | 38 | 32 | 64 | 20 | 40 | 91 | 45.5 |
| Total | 50 | 100 | 50 | 100 | 50 | 100 | 50 | 100 | 200 | 100.0 |

TABLE 15

SIZE OF LAND HOLDING OF SAMPLE FARMERS

(n = 200)

| Particulars | Name of the districts | | | | | | | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Tirunelveli | | V.O.Chidambaranar | | Tiruchirapalli | | Madurai | | | |
| | No. | % | No. | % | No. | % | No. | % | No. | % |
| Marginal | 27 | 54 | 29 | 58 | 20 | 40 | 16 | 32 | 92 | 46.0 |
| Small | 14 | 28 | 13 | 26 | 16 | 32 | 19 | 38 | 62 | 31.0 |
| Medium | 9 | 18 | 5 | 10 | 9 | 18 | 8 | 16 | 31 | 15.5 |
| Large | 0 | 0 | 3 | 6 | 5 | 10 | 7 | 14 | 15 | 7.5 |
| Total | 50 | 100 | 50 | 100 | 50 | 100 | 50 | 100 | 200 | 100.0 |

medium and large farmers. All the selected districts had the same distribution pattern except to Madurai, in which small farmers occupied a higher share comparing to marginal farmers. And in case of Tirunelveli, large farmers were not at all seen in the sample studied.

### 5.1.5. Occupational status of sample farmers

The banana growers were classified into different categories as shown in Table 16.

It could be observed that 48.5 per cent of banana growers concentrated on farming alone, 36 per cent came under the category of farming and labour while 11.5 per cent of the respondents were engaged in farming plus business and 4 per cent of sample farmers were working in service sector besides farming. Out of the four selected districts, Madurai possessed 56 per cent of banana growers who were doing farming alone, followed by V.O.Chidambaranar with 54 per cent, Tirunelveli with 44 per cent and Tiruchirapalli with 40 per cent.

### 5.1.6. Income level of sample farmers

Income level is one of the important factors which is supposed to influence the adoption of fungicides.

Table 17 shows that less than half of banana growers (45 per cent) belonged to the income group of upto

TABLE 16

OCCUPATIONAL STATUS OF SAMPLE FARMERS

(n = 200)

| Particulars | Name of the districts | | | | | | | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Tirunelveli | | V.O.Chidambaranar | | Tiruchirapalli | | Madurai | | | |
| | No. | % | No. | % | No. | % | No. | % | No. | % |
| Farming alone | 22 | 44 | 27 | 54 | 20 | 40 | 28 | 56 | 97 | 48.5 |
| Farming and labour | 14 | 28 | 21 | 42 | 21 | 42 | 16 | 32 | 72 | 36.0 |
| Farming and Business | 13 | 26 | 2 | 4 | 5 | 10 | 3 | 6 | 23 | 11.5 |
| Farming and Service | 1 | 2 | 0 | 0 | 4 | 8 | 3 | 6 | 8 | 4.0 |
| Total | 50 | 100 | 50 | 100 | 50 | 100 | 50 | 100 | 200 | 100.0 |

TABLE 17

DISTRIBUTION OF FARMER GROWERS ACCORDING TO THEIR STATUS OF ANNUAL INCOME

(n = 200)

| Particulars | Name of the districts | | | | | | | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Tirunelveli | | V.O.Chidambaranar | | Tiruchirapalli | | Madurai | | | |
| | No. | % | No. | % | No. | % | No. | % | No. | % |
| Up to Rs. 60,000 | 18 | 36 | 24 | 48 | 26 | 52 | 22 | 44 | 90 | 45 |
| Rs. 60,000 to Rs.1,20,000 | 20 | 40 | 21 | 42 | 12 | 24 | 11 | 22 | 64 | 32 |
| Above Rs. 1,20,000 | 12 | 24 | 5 | 10 | 12 | 24 | 17 | 34 | 46 | 23 |
| Total | 50 | 100 | 50 | 100 | 50 | 100 | 50 | 100 | 200 | 100 |

Rs.60,000. The 32 per cent of banana growers came in between the income group of 60,001 and 1,20,000 and 23 per cent earned more than Rs.1,20,000. Among the study districts, Madurai district had (34 per cent) of growers who earned above Rs.1,20,000 followed by Tiruchirapalli and Tirunelveli (24 per cent each) and V.O.Chidambaranar with 10 per cent.

**5.1.7. Social participation of sample farmers**

The particulars on social participation by the sample farmers are furnished in Table 18. It could be seen from the table that 50 per cent of the farmers were members of atleast any one organisation while 33.5 per cent were members in more than one organisation. Non participation in any organisation was seen among 15 per cent of the selected farmers. At the same time 1.5 per cent of the farmers were holding positions as office bearers. Thus, in general,the social participation of the sample farmers might be considered as satisfactory.

In the study districts, both non participation and office bearership were minimum in Madurai and Tirunelveli districts and membership in more than one organisation was minimum in the other two districts.

### 5.1.8. Contact with extension agency

It could be seen from Table 19 that more than half of the sample farmers (61 per cent) were having medium level of contact with extension agency, while 26.5 per cent had low level of contact and only 12.5 per cent of banana growers had high level of contact with extension agency. Out of the four districts, Madurai had higher number of sample farmers (24 per cent) had high level of contact with extension agency followed by Tiruchirapalli (18 per cent), V.O.Chidambaranar (6 per cent) and Tirunelveli (2 per cent). The high level of contact with extension agency in Madurai and Tiruchirapalli districts might lead to higher level of awareness about banana diseases and adoption of control measures.

## 5.2. Level of Awareness Among Sample Farmers

In the present study an attempt is made to analyse the level of awareness of farmers relating to 'Sigatoka' leaf spot disease of banana, and also their knowledge on various fungicides available in the market.

### 5.2.1. Awareness about the Sigatoka leaf spot

The level of awareness about the symptoms of Sigatoka, yield loss due to it and control measures were analysed and the results are presented in Table 20 and Fig. 3. Nearly two third of the sample farmers, ie., 64 per cent were aware of Sigatoka leaf spot disease. In Madurai, disease awareness

TABLE 18

DISTRIBUTION OF BANANA GROWERS ACCORDING TO THEIR SOCIAL PARTICIPATION

(n = 200)

| Particulars | Name of the districts | | | | | | | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Tirunelveli | | V.O.Chidambaranar | | Tiruchirapalli | | Madurai | | | |
| | No. | % | No. | % | No. | % | No. | % | No. | % |
| Non participation in any organisation | 14 | 28 | 14 | 28 | 2 | 4 | 0 | 0 | 30 | 15.0 |
| Member in one organisation | 27 | 54 | 26 | 52 | 26 | 52 | 21 | 42 | 100 | 50.0 |
| Member in more than one organisation | 7 | 14 | 9 | 18 | 22 | 44 | 29 | 58 | 67 | 33.5 |
| Office bearer in one organisation | 2 | 4 | 1 | 2 | 0 | 0 | 0 | 0 | 3 | 1.5 |
| Office bearer in more than one organisation | - | - | - | - | - | - | - | - | - | - |
| Total | 50 | 100 | 50 | 100 | 50 | 100 | 50 | 100 | 200 | 100.0 |

TABLE 19

CONTACT WITH EXTENSION AGENCIES

(n=200)

| Particulars | Name of the districts | | | | | | | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Tirunelveli | | V.O.Chidambaranar | | Tiruchirapalli | | Madurai | | | |
| | No. | % | No. | % | No. | % | No. | % | No. | % |
| High | 1 | 2 | 3 | 6 | 9 | 18 | 12 | 24 | 25 | 12.5 |
| Medium | 28 | 56 | 32 | 64 | 30 | 60 | 32 | 64 | 122 | 61.0 |
| Low | 21 | 42 | 15 | 30 | 11 | 22 | 6 | 12 | 53 | 26.5 |
| Total | 50 | 100 | 50 | 100 | 50 | 100 | 50 | 100 | 200 | 100.0 |

was seen among 70 per cent of the farmers. The yield loss due to the disease was known to all farmers who were aware of the symptoms. But only 36 farmers or 18 per cent of the sample farmers were aware of the yield loss properly or exactly.

At the same time its control measures were known to 52.5 per cent of the selected farmers .It could be inferred from Table 20 that the farmers were more educated about the control measures then the loss occurring due to the disease.

Perfect level of awareness about the yield loss due to the disease and its control measures were seen among the larger section of the farmers in Madurai district followed by Tirunelveli, Tiruchirapalli and V.O.Chidambaranar districts in order.

**5.2.2. Awareness about fungicides**

The findings of this section deals with the extent of fungicide awareness of banana growers. Out of 200 sample farmers, Bavistin was known to highest number of farmers (70 per cent) followed by Indofil M 45 (49 per cent) Calixin (25.5 per cent), Blue copper (13.5 per cent). Kavach (7 per cent) and Redomil (5.5 per cent).

In the study districts, it was found that, banana growers in Madurai had higher awareness on Bavistin

TABLE 20

DISTRIBUTION OF BANANA GROWERS ACCORDING TO AWARENESS LEVEL

| Name of the districts | Farmers aware about Sigatoka leaf spot | | Farmers aware about its yield loss | | Farmers aware about its control measures | |
|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % |
| Tirunelveli | 30 | 60 | 23(7) | 46(14) | 26 | 52.0 |
| V.O.Chidambaranar | 32 | 64 | 20(12) | 40(24) | 24 | 48.0 |
| Tiruchirapalli | 31 | 62 | 25(6) | 50(12) | 25 | 50.0 |
| Madurai | 35 | 70 | 24(11) | 48(22) | 30 | 60.0 |
| Total | 128 | 64 | 92(36) | 46(18) | 105 | 52.5 |

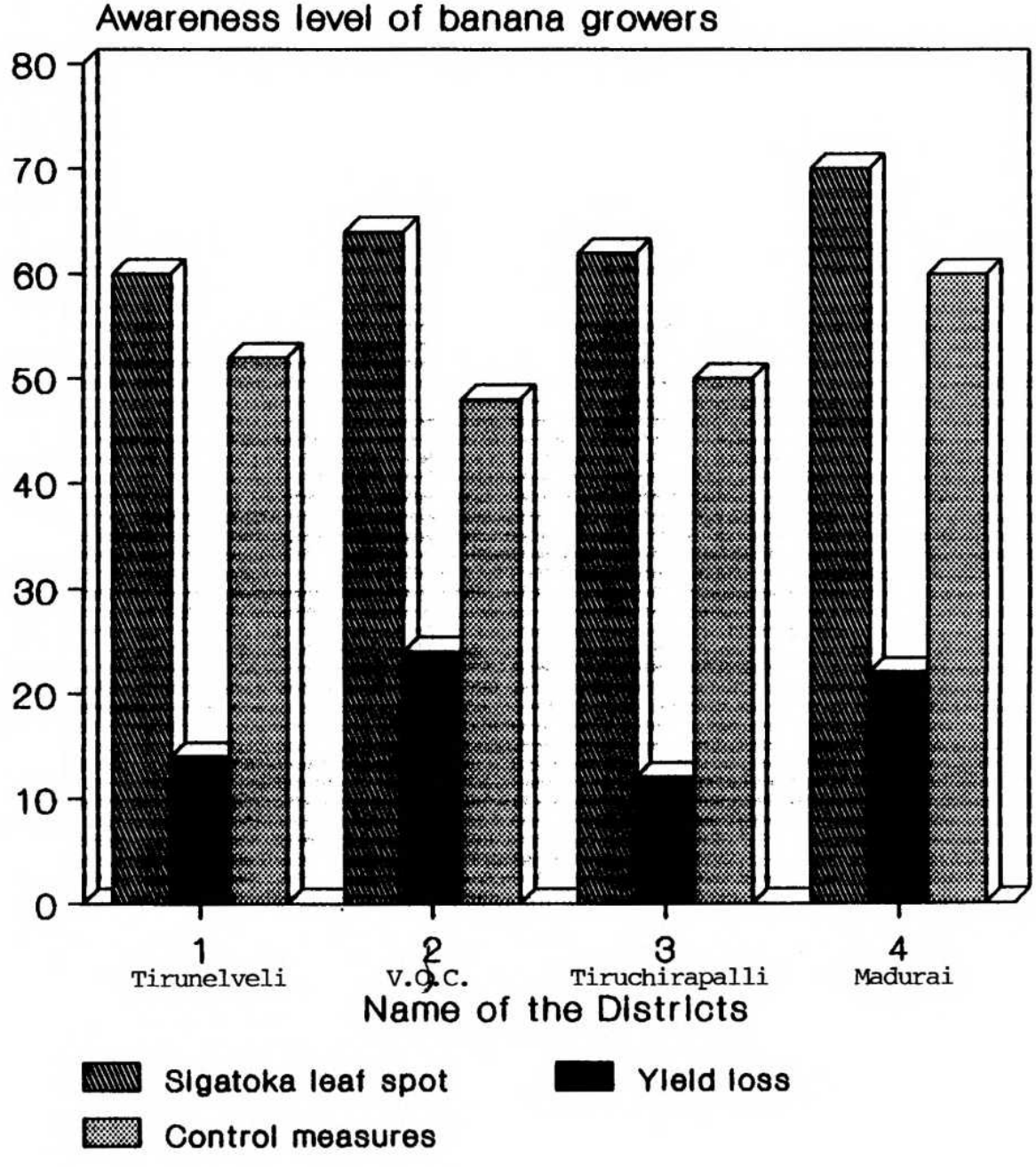
Value in the parentheses indicates the number and percentage who were exactly aware about the yield loss of Sigatoka leaf spot.

TABLE 21

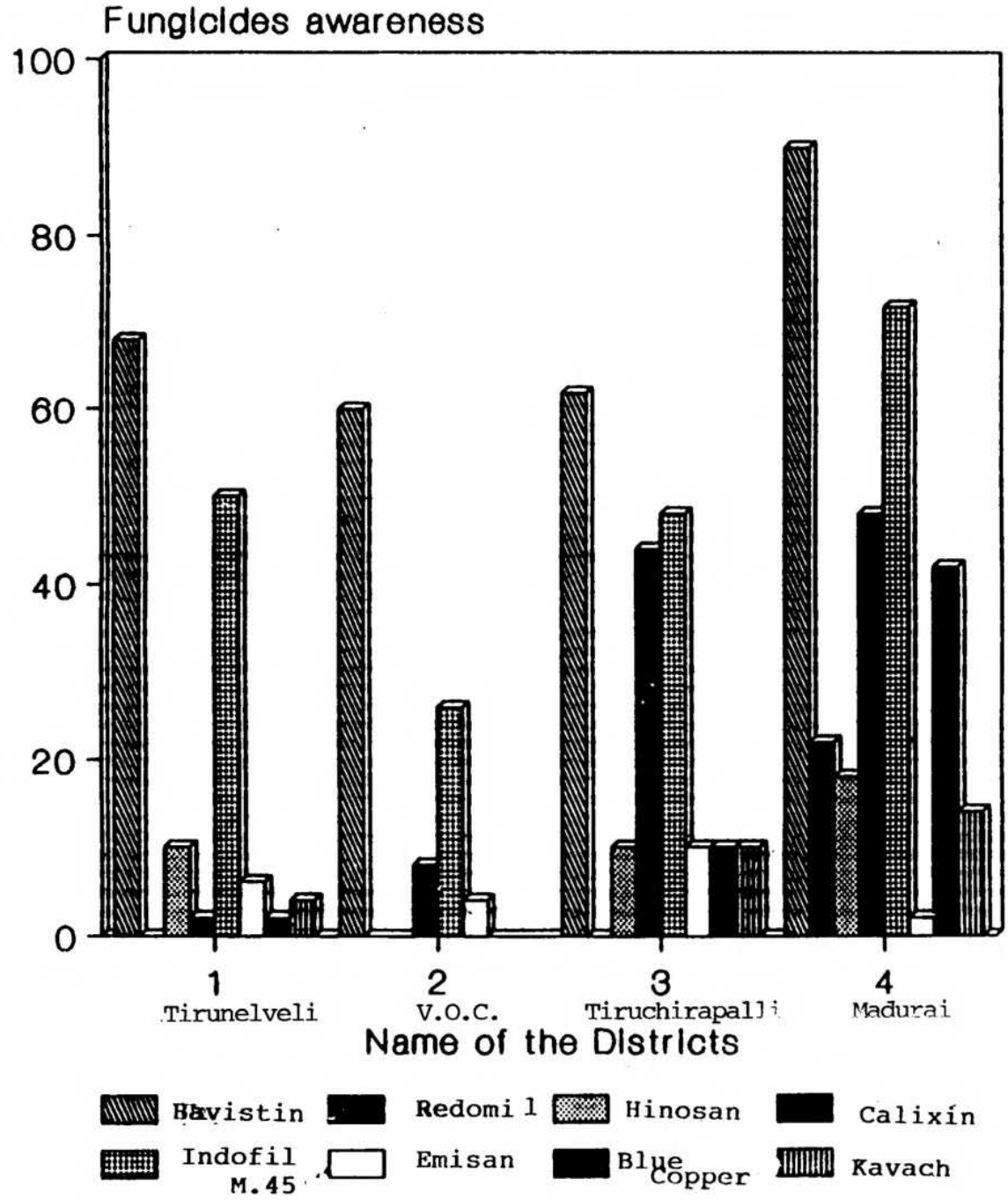
FARMERS AWARENESS ABOUT FUNGICIDES

| Name of the districts | Farmers fungicides awareness | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Bavistin | | Bedomil | | Hinosan | | Calixin | | Indofil M.45 | | Bmisan | | Blue copper | | Kavach | |
| | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % |
| Tirunelveli | 34 | 68 | - | - | 5 | 10 | 1 | 2 | 25 | 50 | 3 | 6 | 1 | 2 | 2 | 4 |
| V.O.Chidambaranar | 30 | 60 | - | - | - | - | 4 | 8 | 13 | 26 | 2 | 4 | - | - | - | - |
| Tiruchirapalli | 31 | 62 | - | - | 5 | 10 | 22 | 44 | 24 | 48 | 5 | 10 | 5 | 10 | 5 | 10 |
| Madurai | 45 | 90 | 11 | 22 | 9 | 18 | 24 | 48 | 36 | 72 | 1 | 2 | 21 | 42 | 7 | 14 |
| Total | 140 | 70 | 11 | 5.5 | 19 | 9.5 | 51 | 25.5 | 98 | 49 | 11 | 5.5 | 27 | 13.5 | 14 | 7 |

**Fig. 3. DISTRIBUTION OF BANANA GROWERS ACCORDING TO THEIR AWARENESS LEVEL**



## Fig. 4. AWARENESS LEVEL OF FUNGICIDES



(90 per cent) followed by Tirunelveli (68 per cent), Tiruchirapalli (62 per cent) and V.O.Chidambaranar (60 per cent).

Again Madurai ranks first in awareness about Indofil M.45 (72 per cent) and second position was held by Tirunelveli (50 per cent), third by Tiruchirapalli (48 per cent) and the last by V.O.Chidambaranar (26 per cent).

The awareness of calixin in Madurai, Tiruchirapalli, V.O.Chidambaranar and Tirunelveli districts were 48 per cent, 44 per cent, 8 per cent and 2 per cent respectively. In case of Blue copper, the awareness was high in Madurai district (42 per cent) followed by Tiruchirapalli (10 per cent).

It could be seen from Table 21 and Fig. 4. that out of 200 sample banana growers, kavach was known to seven per cent of respondents. Among the four districts, Madurai farmers had highest level of awareness about kavach (14 per cent) followed by Tiruchirapalli (10 per cent) and Tirunelveli (4 per cent).

### 5.2.3. Varieties of Banana Grown by Sample Farmers

The details on the different varieties grown by the selected respondents are presented in Table 22. It could be inferred from Table 22 that Nendran is the variety grown by

a larger section of the farmers followed by Poovan and Robusta which occupied respectively 28.22 per cent, 27.01 per cent and 21.77 per cent of the total banana area of the sample. Anyhow inter district variations were seen to a greater extent in the sample. Nendran, Poovan, Karpooravalli and Sakkai were not at all grown in Madurai district while Nendran and Poovan combined together occupied 71.86 per cent,67.64 per cent and 70.35 per cent of the total banana area of Tirunelveli, V.O.Chidambaranar and Tiruchiravalli districts respectively. Similarly Robusta and Sakkai in Tiruchirapalli and Karpooravalli in Tirunelveli and V.O.Chidambaranar districts were not grown. Thus the sample presented wide variations in the varieties of banana grown.

The farmers in Tiruchirapalli, Tirunelveli and V.O.Chidambaranar districts were aware that Karupuravalli, Nendran and Kathali were resistant to Sigatoka leaf spot and decided to increase the area under these varieties in future, which would reflect on the area under Rasthali and Robusta as could be seen from Table 23 On the other hand Madurai farmers were interested in increasing the area under Robusta due to its better price available at Bangalore markets.

Nendran was grown by majority of Tiruchirapalli farmers. In future nearly three per cent of Rasthali growers

## TABLE 22

## VARIETIES OF BANANA GROWN BY SAMPLE FARMERS

| Name of the varieties | Name of the districts | | | | | | | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Tirunelveli | | V.O.Chidambaranar | | Tiruchirapalli | | Madurai | | | |
| | No. | % | No. | % | No. | % | No. | % | No. | % |
| Robusta | 11 | 15.62 | 2 | 2.94 | - | - | 42 | 70.00 | 59 | 21.77 |
| Dwarf Cavendish | - | - | - | - | - | - | 14 | 23.33 | 14 | 5.64 |
| Rasthali | 6 | 9.37 | 14 | 20.58 | 6 | 10.71 | 4 | 6.66 | 30 | 12.09 |
| Karpuravalli | - | - | - | - | 5 | 8.92 | - | - | 5 | 2.01 |
| Nendran | 31 | 48.93 | 5 | 7.35 | 34 | 60.71 | - | - | 70 | 28.22 |
| Poovan* | 15 | 23.43 | 41 | 60.29 | 11 | 19.64 | - | - | 67 | 27.01 |
| Sakkai | 2 | 3.12 | 6 | 8.82 | - | - | - | - | 8 | 3.22 |
| Total | 69 | 100.00 | 68 | 100.00 | 56 | 100.00 | 60 | 100.00 | 248 | 100.00 |

* Includes Kathali also

Multiple responses hence number may exceed 50.

**TABLE 23**

**ALLOCATION OF AREA UNDER DIFFERENT BANANA VARIETIES**

| Name of the Banana varieties | Present area | | Future Plan | |
|---|---|---|---|---|
| | Area (ha) | % | Area (ha) | % |
| **Madurai** | | | | |
| Robusta | 57.70 | 75.06 | 59.38 | 75.39 |
| Dwarf cavendish | 17.50 | 22.76 | 16.87 | 21.42 |
| Rasthali (Kolikudu) | 1.66 | 2.16 | 2.50 | 3.17 |
| **Tiruchirapalli** | | | | |
| Karpuravalli | 14.58 | 22.58 | 18.33 | 27.16 |
| Nendran | 29.16 | 45.16 | 29.16 | 43.20 |
| Rasthali | 3.75 | 5.80 | 2.08 | 3.08 |
| Poovan | 17.08 | 26.95 | 17.91 | 26.54 |
| **Tirunelveli** | | | | |
| Nendran | 23.12 | 51.86 | 25.00 | 54.79 |
| Kathali | 12.50 | 28.03 | 15.41 | 33.78 |
| Rasthali | 2.08 | 4.67 | 1.25 | 2.73 |
| Robusta | 6.04 | 13.56 | 3.12 | 6.89 |
| Sakkai | 0.83 | 1.86 | 0.83 | 1.82 |
| **V.O.Chidambaranar** | | | | |
| Rasthali | 10.80 | 16.42 | 9.58 | 14.55 |
| Robusta | 2.29 | 3.47 | 2.70 | 5.11 |
| Kathali | 44.89 | 68.08 | 46.04 | 69.93 |
| Sakkai | 4.79 | 7.26 | 4.16 | 6.32 |
| Nendran | 3.12 | 4.73 | 3.33 | 5.06 |

Multiple responses hence percentage may exceed 100

will switch over to other variety, because they were aware about Rasthali as a susceptible variety to panama wilt disease and also nearly five per cent of banana growers who dwell in Tirunelveli district, are willing to grow kathali. The major reason was that it has some of resistant power to sigatoka leaf spot and panama wilt. Another major reason for preferring the kathali was lesser risk, lack of problem even after its fifth ratooning. In case of Rasthali used as ratoon, even a second ratoon was highly susceptible to panama wilt and sigatoka leaf spot.

## 5.3. Extent of adoption of Kavach and its competing fungicides among sample farmers

### 5.3.1. Use of fungicides for sigatoka leaf spot

It could be noted from Table 24 that, out of 200 sample farmers, 135 (67.5 per cent) farmers used different fungicides for control of different diseases of banana including Sigatoka leaf spot. But, less than half of banana growers (45.5 per cent) applied fungicide against Sigatoka leaf spot. The adoption with regard to fungicide for sigatoka leaf spot was found to be maximum in Madurai district (58 per cent) followed by Tiruchirapalli (50 per cent), Tirunelveli (38 per cent) and V.O.Chidambaranar (36 per cent) districts.

Out of 200 respondents it could be seen that 16.5 per cent of the farmers applied Bavistin, 10 per cent used Indofil M.45, seven per cent took to Calixin, six per cent used kavach and only four per cent of the sample farmers used Blue copper against Sigatoka leaf spot.

While Bavistin and Indofil M.45 were used in all the districts Kavach and Calixin were used only in Tiruchirapalli and Madurai districts. Similarly Blue copper found to a place in Madurai districts alone.

**5.3.2. Method and frequency of application of fungicides**

Table 25 shows that, out of 45.5 per cent of banana grown farmers who were sprayed fungicide against sigatoka leaf spot, only 8 per cent (16 in number) were prefered double spray and remaining persons (37.5 per cent) were taken only once. Out of 13 calixin users, only 1.5 per cent (3 in number) took double spray. Two times spraying was adopted by 2.5 per cent of Bavistin users and 2.5 per cent of Indofil users and 1.5 per cent of Blue Copper users. None of Kavach users took to spraying two times.

TABLE 24

FUNGICIDE USAGE BY SAMPLE FARMERS FOR SIGATOKA LEAF SPOT

| Name of the district | Use of fungicide for different banana diseases | | Use of fungicide for Sigatoka leaf spot | | Fungicides used by sample farmers for Sigatoka leaf spot | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Bavistin | | Indofil M.45 | | Bavistin+ IndofilM.45 | | Calixin | | Kavach | | Blue copper | |
| | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % | No. | % |
| Tirunelveli | 34 | 68.0 | 19 | 38.0 | 10 | 20.0 | 7 | 14.0 | 2 | 4 | - | - | - | - | - | - |
| V.O.Chidambaranar | 29 | 58.0 | 18 | 36.0 | 12 | 24.0 | 4 | 8.0 | 2 | 4 | - | - | - | - | - | - |
| Tiruchirapalli | 38 | 76.0 | 25 | 50.0 | 7 | 14.0 | 4 | 8.0 | - | - | 9 | 18 | 5 | 10 | - | - |
| Madurai | 34 | 68.0 | 29 | 58.0 | 4 | 8.0 | 5 | 10.0 | - | - | 5 | 10 | 7 | 14 | 8 | 16 |
| Total | 135 | 67.5 | 91 | 45.5 | 33 | 16.5 | 20 | 10.0 | 4 | 2 | 14 | 7 | 12 | 6 | 8 | 4 |

# Fig. 5. FUNGICIDE USAGE FOR SIGATOKA LEAF SPOT

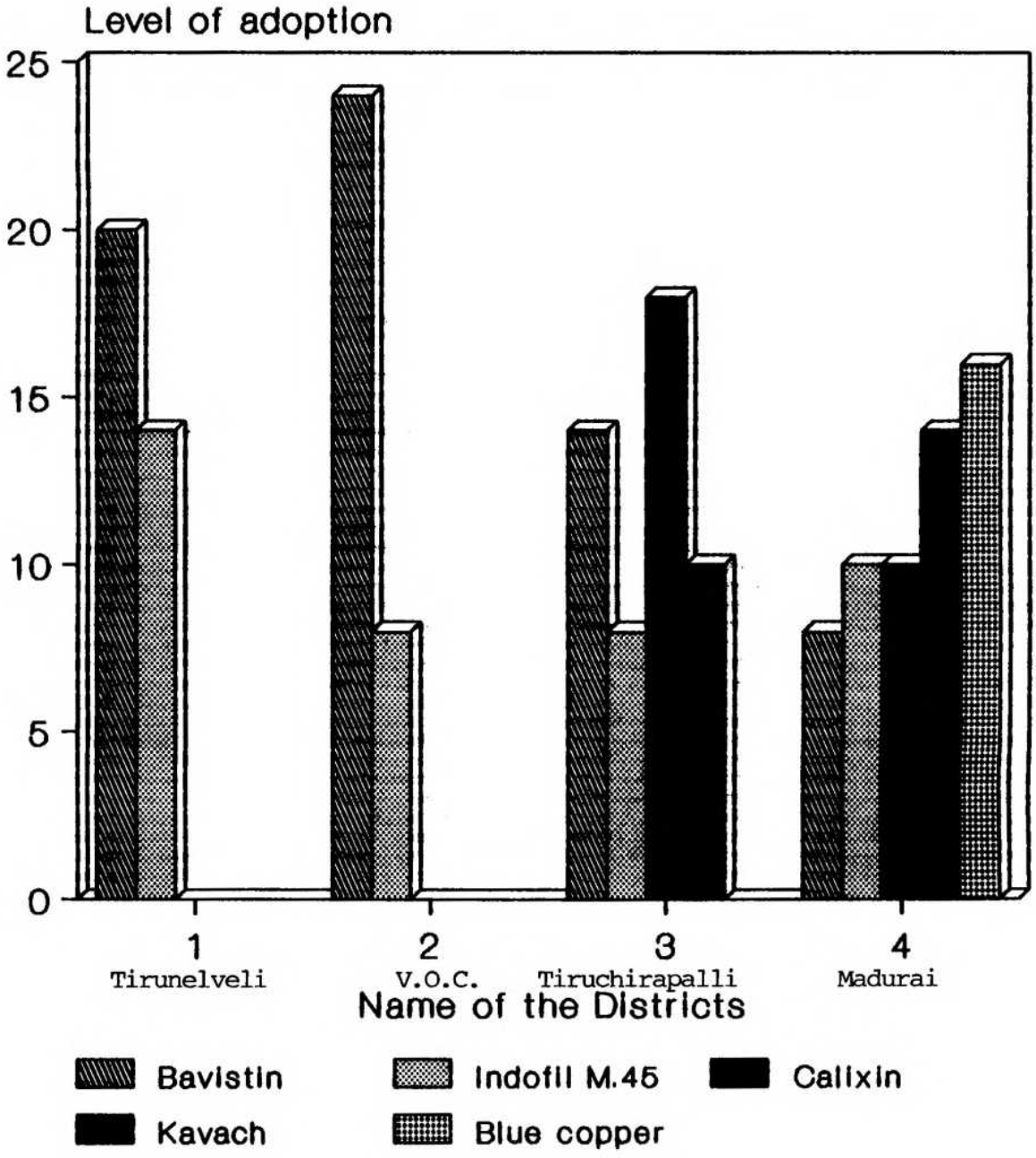


TABLE 25

FREQUENCY OF FUNGICIDE APPLICATION WITH SPECIAL REFERENCE TO KAVACH

| Name of the districts | Name of the chemicals | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Bavistin | | Indofil M.45 | | Bavistin + Indofil M.45 | | Calixin | | Kavach | | Blue copper | |
| | S | D | S | D | S | D | S | D | S | D | S | D |
| Tirunelveli | 8(4) | 2(1) | 6(3) | 1(0.5) | 2(1) | - | - | - | - | - | - | - |
| V.O.Chidambaranar | 12(6) | - | 3(1.5) | 1(0.5) | 2(1) | - | - | - | - | - | - | - |
| Tiruchirapalli | 5(2.5) | 2(1) | 3(1.5) | 1(0.5) | - | - | 7(3.5) | 2(1) | 5(2.5) | | - | - |
| Madurai | 3(1.5) | 1(0.5) | 3(1.5) | 2(1) | - | - | 4(2) | 1(0.5) | 7(3.5) | | 5(2.5) | 3(1.5) |
| Total | 28(14) | 5(2.5) | 15(7.5) | 5(2.5) | 4(2) | - | 11(5.5) | 3(1.5) | 12(6) | - | 5(2.5) | 3(1.5) |

S - Single spray; D - Double spray
Values in the parentheses indicate the percentage of farmers who took single spray/double spray for control of sigatoka leaf spot.

### 5.3.3. Adoption level of recommended practices

The results in Table 26 showed that only 6 per cent of the farmers used Kavach in the selected districts. Regarding fungicide adoption for Sigatoka, 4 package of practices such as (i) kilogram of fungicide recommended/litre of water, (ii) thorough coverage (iii) sprays during evening time and avoiding night irrigation and (iv) removal of affected leaves were recommended by the company and extension agencies. Among the Kavach users, 25 per cent followed only one practice. 50 per cent followed two practices and 25.0 per cent followed three recommended practices and none of them followed all the four practices. Nobody used Sandovit as a wetting agent. The probable reasons for non adoption of Sandovit was lack of awareness among the users.

Nearly 60 per cent of Bavistin users adopted 75 per cent of recommended practices and only 6.10 per cent adopted cent per cent of the recommended practices, whereas 75 per cent of recommended practices was adopted by 60 per cent of Indofil M.45 users. In other words, none of the fungicide users except a proportion of Bavistin users, adopted cent per cent of recommended practices. Table 26 further shows that, the adoption levels of recommended practices were less in Kavach users, in comparison to the adoption levels of Bavistin, Indofil M.45 and Blue copper as the sample farmers

TABLE 26

ADOPTION LEVEL OF KAVACH AND ITS COMPETING CHEMICALS

| Name of the fungicides | No.of farmers used | | Adoption level | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | 25% | | 50% | | 75% | | 100% | |
| | No. | % | No. | % | No. | % | No. | % | No. | % |
| Indofil M.45 | 20 | 10.0 | 3 | 15.0 | 5 | 25.0 | 12 | 60.0 | - | - |
| Bavistin | 33 | 16.5 | 4 | 12.1 | 7 | 21.2 | 20 | 60.6 | 2 | 6.1 |
| Calixin | 14 | 7.0 | 1 | 7.1 | 10 | 71.2 | 3 | 21.4 | - | - |
| Blue copper | 8 | 4.0 | 2 | 25.0 | 1 | 12.5 | 5 | 62.5 | - | - |
| Kavach | 12 | 6.0 | 3 | 25.0 | 6 | 50.0 | 3 | 25.0 | - | - |

Respondents who adopted one out of four practices - 25 per cent
Respondents who adopted two out of four practices - 50 per cent
Respondents who adopted three out of four practices - 75 per cent
Respondents who adopted four out of four practices - 100 per cent

had higher awareness about them, and they were also available in the market for more than a decade.

The adoption level was found to be influenced by companies' Sales promotion tools like field work, demonstrations, distribution of leaflets, wall paintings, film shows, radio and T.V. advertisements etc., and a discussion is presented in the later portion of this report.

### 5.4. Relationship Between Awareness and Adoption of Banana Growers with their Socio-personal Characteristics

#### 5.4.1. Influence of the independent variables on the awareness level of farmers

It could be observed from Table 27 that out of eight variables, age, education, income, farm size and extension agency contact were found to have positive and significant influence on the awareness of the fungicides, and remaining variables like social participation, farming experience and occupational status were not having a significant influence on the fungicide awareness. The eight independent variables together contributed to 72.19 per cent of the variation in fungicide awareness level of banana growers. The 'F' value was found to be significant.

The results confirmed that if the farm size increased by one hectare, keeping other variables at mean level, the

**TABLE 27**

**MULTIPLE REGRESSION ANALYSIS - AWARENESS OF FUNGICIDE**

Sample size (n = 200)

| Variable number | Characteristics | Partial regression coefficient | 't' value |
|---|---|---|---|
| $X_1$ | Age | 1.2883 | 2.3006* |
| $X_2$ | Educational status | 0.2319 | 2.2730* |
| $X_3$ | Income | 0.3529 | 2.2422* |
| $X_4$ | Social participation | -0.0135 | -0.6770NS |
| $X_5$ | Farm size | 1.0578 | 2.9056** |
| $X_6$ | Farm experience | -0.0876 | -1.0940NS |
| $X_7$ | Occupational status | 0.0606 | 0.1098NS |
| $X_8$ | Extension agency contact | 2.2670 | 2.0120* |

$R^2$ = 0.7219
** = Significant (at 1 per cent level)
* = Significant (at 5 per cent level)
NS = Non significant

level of awareness increased by 1.0578 units. Similarly for one unit increase in educational status, extension agency contact , income (in thousand rupees) and age the level of awareness increased by 0.2319 units, 2.2670 units 0.3529 units and 1.2883 units respectively. Thus the results of the study could bring out salient features affecting the awareness level of farmers.

### 5.4.2. Influence of the independent variables on the adoption of banana growers

Table 28 indicated that income, social participation and extension agency contact were having a positive and significant influence on the adoption of fungicides. It may be seen that a unit increase in extension agency contact would increase the adoption by 1.3893 units at ceteris paribus condition. Similarly one unit increase in income and social participation, keeping other variables at mean level would increase adoption by 2.6442 units and 1.2145 units respectively. All the other variables were not found to have significant influence on adoption. The coefficient of determination ($R^2$) was 0.8723. It indicated that all the variables contributed to 87.23 per cent variation in adoption. The F value was found to be significant.

TABLE 28

MULTIPLE REGRESSION ANALYSIS-ADOPTION OF FUNGICIDES

| Variable number | Characteristics | Partial regression coefficient | 't' value |
|---|---|---|---|
| $X_1$ | Age | 0.0951 | 0.1095 |
| $X_2$ | Educational status | 0.1385 | 0.4187 |
| $X_3$ | Income | 2.6442 | 2.0866* |
| $X_4$ | Social participation | 1.2145 | 2.2776* |
| $X_5$ | Farm size | 0.0273 | 0.2047 |
| $X_6$ | Farm experience | -0.3588 | -0.5033 |
| $X_7$ | Occupational status | -0.2512 | -0.2442 |
| $X_8$ | Extension agency contact | 1.3893 | 2.3771* |

$R^2$ = 0.8723
* = Significant (at 5 per cent level)
NS = Non significant

## 5.5. Factors associated with farmers'perception on Kavach and its competing fungicides

The Tables 29 and 30 display the overall perception level of Kavach and its competing chemicals as revealed by the mean and standard deviation parameters.

From Table 29, it could be observed that among the five fungicides, Bavistin got higher perception level and it accounted for 38.57per cent followed by Indofil M.45 (25.51 per cent) and Kavach (21.42 per cent).

The various factors which influence the acceptance of the given fungicides were identified and farmers' perceptions of those factors were analysed.

**Price**

It is apparent from Table 30 that 60.78 per cent of the banana growers who were aware about calixin, expressed that the price was reasonable. Out of 98 banana growers who knew about Indofil M.45, 59.13 per cent strongly agreed with price and among 140 sample farmers who were aware about Bavistin, 51.42 per cent of them accepted its price as influencing factor. But 42.85 per cent of banana growers who knew Kavach disagreed with its price.

**TABLE 29**

**LEVEL OF PERCEPTION ON FUNGICIDES**

| Name of the chemicals | Level of perception | | | | | |
|---|---|---|---|---|---|---|
| | High | | Medium | | Low | |
| | No. | % | No. | % | No. | % |
| Kavach | 3 | 21.42 | 9 | 64.28 | 2 | 14.28 |
| Bavistin | 54 | 38.57 | 72 | 51.42 | 14 | 10.00 |
| Indofil M.45 | 25 | 25.51 | 73 | 74.48 | - | - |
| Calixin | 10 | 19.60 | 36 | 70.58 | 5 | 9.80 |
| Blue copper | 5 | 18.51 | 18 | 66.66 | 4 | 14.81 |

**Efficiency**

It could be concluded from Table 30 that 94.11 per cent of sample farmers who knew calixin were highly satisfied with its diseases control efficiency, followed by Bavistin (77.14 per cent), Blue copper (66.66 per cent), Indofil M.45 (48.97 per cent) and Kavach (7.14 per cent). Out of 14 banana growers who were aware about Kavach, only 7.14 per cent of them were highly satisfied with its efficiency.

**Smell**

From Table 30 it could be inferred that 64.28 per cent of banana growers who were aware about Kavach agreed with its smell. Nearly 70 per cent of farmers who were aware about Blue copper, strongly agreed with its smell. Smell of Bavistin was disagreed by 51.42 per cent of sample farmers and 46.93 per cent of Indofil M.45 users strongly disagreed with its smell.

**Availability**

As regards the availability of Kavach, more than three fourth (78.57 per cent) of farmers who were aware of Kavach indicated its easy availability while 37.25 per cent of Calixin users disagreed with its easy availability.

**Available in convenient size**

Table 30 showed that 73.46 per cent of farmers who knew about Indofil M.45 strongly agreed with its convenient size,

TABLE 30

FACTORS ASSOCIATED WITH FARMERS' PERCEPTION ON KAVACH AND ITS COMPETING FUNGICIDES

| Criterias | Level of Farmers' perception | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Strongly agree | | Agree | | Undecided | | Disagree | | Strongly disagree | |
| | No | % | No | % | No | % | No | % | No | % |
| **Kavach** | | | | | | | | | | |
| Price | | - | | - | 4 | 28.57 | 6 | 42.85 | 4 | 28.57 |
| Efficiency | 1 | 7.14 | 7 | 50.00 | 4 | 28.57 | 2 | 14.28 | | - |
| Smell | 3 | 21.42 | 9 | 64.28 | 2 | 14.28 | | - | | - |
| Availability | 11 | 78.57 | 3 | 21.42 | | - | | - | | - |
| Available in convenient size | | - | 2 | 14.28 | 6 | 42.85 | 6 | 42.85 | | - |
| Rainfastness | | - | | - | 1 | 7.14 | 8 | 57.14 | 5 | 35.71 |
| Broad spectrum | | - | | - | 7 | 50.00 | 7 | 50.00 | | - |
| Durability | | - | | - | 7 | 50.00 | 3 | 21.40 | 4 | 28.57 |
| Side effect | 8 | 57.14 | 6 | 42.85 | | - | | - | | - |
| Safety to use | 8 | 57.14 | 6 | 42.85 | | - | | - | | - |
| **Bavistin** | | | | | | | | | | |
| Price | 72 | 51.42 | 54 | 38.57 | 14 | 10.00 | | - | | - |
| Efficiency | 108 | 77.14 | 18 | 12.85 | | - | 14 | 10.00 | | - |
| Smell | | - | | - | 36 | 25.71 | 72 | 51.42 | 32 | 22.85 |
| Availability | 72 | 51.42 | 54 | 38.57 | | - | 14 | 10.00 | | - |
| Available in convenient size | 108 | 77.14 | 18 | 12.85 | 14 | 10.00 | | - | | - |
| Rainfastness | | - | 54 | 38.57 | 54 | 38.57 | 32 | 22.85 | | - |
| Broad spectrum | 90 | 64.28 | 36 | 25.71 | | - | 14 | 10.00 | | - |
| Durability | | - | 54 | 38.57 | 54 | 38.57 | 22 | 15.71 | 10 | 7.14 |
| Side effect | | - | 54 | 38.57 | 72 | 51.42 | 14 | 10.00 | | - |
| Safety to use | | - | | - | 36 | 25.71 | 36 | 25.71 | 68 | 48.57 |

**Endofil 0.45**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Price | 58 | 59.13 | 40 | 40.81 | | - | | - | | |
| Efficiency | 40 | 40.97 | 32 | 32.65 | 8 | 8.16 | | - | 10 | 10.20 |
| Smell | | - | | - | 20 | 20.40 | 32 | 32.65 | 46 | 46.93 |
| Availability | 62 | 63.26 | 36 | 36.73 | | - | | - | | - |
| Available in convenient size | 72 | 73.46 | 15 | 15.30 | 11 | 11.22 | | - | | - |
| Rainfastness | | - | 20 | 20.40 | 48 | 48.97 | 30 | 30.61 | | - |
| Broad spectrum | 50 | 51.02 | 40 | 40.81 | 8 | 8.16 | | - | | - |
| Durability | 24 | 24.48 | 32 | 32.65 | 32 | 32.65 | 10 | 10.20 | | - |
| Side effect | 32 | 32.65 | 56 | 57.14 | 10 | 10.20 | | - | | - |
| Safety to use | 8 | 8.16 | 16 | 16.32 | | - | 42 | 42.85 | 32 | 32.65 |

**Calixin**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Price | 31 | 60.78 | 20 | 39.21 | | - | | - | | - |
| Efficiency | 48 | 94.11 | 3 | 5.88 | | - | | - | | - |
| Smell | | - | 16 | 31.37 | 35 | 68.62 | | - | | - |
| Availability | | - | | - | 16 | 31.37 | 19 | 37.25 | 16 | 31.37 |
| Available in convenient size | 24 | 47.07 | 16 | 31.37 | 5 | 9.80 | 6 | 11.76 | | - |
| Rainfastness | | - | | - | 16 | 31.37 | 30 | 58.82 | 5 | 9.80 |
| Broad spectrum | | - | | - | | - | 21 | 41.17 | 30 | 58.82 |
| Durability | | - | 20 | 39.21 | 31 | 60.78 | | - | | - |
| Side effect | 16 | 31.37 | 25 | 49.01 | 10 | 19.60 | | - | | - |
| Safety to use | 30 | 58.82 | 21 | 41.17 | | - | | - | | - |

**Blue copper**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Price | | - | 20 | 74.07 | 7 | 25.92 | | - | | - |
| Efficiency | 18 | 66.66 | 9 | 33.33 | | - | | - | | - |
| Smell | 19 | 70.3 | 8 | 29.62 | | - | | - | | - |
| Availability | 24 | 88.88 | 3 | 11.11 | | - | | - | | - |
| Available in convenient size | 10 | 37.03 | 12 | 44.44 | 5 | 18.51 | | - | | - |
| Rainfastness | | - | | - | 1 | 3.70 | 20 | 74.60 | 6 | 22.22 |
| Broad spectrum | 25 | 92.59 | 2 | 7.40 | | - | | - | | - |
| Durability | | - | 4 | 14.81 | 12 | 44.44 | 11 | 40.74 | | - |
| Side effect | | - | 4 | 14.81 | 3 | 11.11 | 20 | 74.6 | | - |
| Safety to use | | - | 8 | 29.62 | 15 | 55.55 | 4 | 14.81 | | - |

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but only 14.28 per cent of farmers who knew Kavach agreed with its convenient size availability and rest of them disagreed with it.

**Rain Fastness (Persistence)**

The rain fastness of Kavach was very poor as per the farmers opinion. Nearly 40 per cent of Bavistin users agreed that it was not washed by rain water while about 93 per cent of Kavach users were dissatisfied with it in this regard.

**Broad spectrum**

It could be seen from the above Table that 92.59 per cent recognised the broad spectrum characters of Blue copper followed by Bavistin (64.28 per cent) and Indofil M.45 (51.02 per cent). Fifty per cent of the farmers aware of Kavach disagreed with its broad spectrum nature.

In other characters, viz., durability, lack of side effect and safety to use Indofil M.45, Kavach and calixin respectively were adjudged to be the best ones.

**5.6. Buying preferences**

The buying preference of sample farmers was studied by examining the information, sources and factors contributing to buying behaviour of farmers from with various traders.

### 5.6.1. Sources of information on fungicides

Forty two per cent of sample farmers obtained information from different kinds of people. Details on the different sources of information relating to fungicides are presented in Table 31. Only the major source of information are given in the table which shows that relatives/ neighbours/friends, posters/wall painting and dealer/local retailers happened to cover 21.05 per cent, 15.13 per cent and 11.84 per cent of the farmers respectively. Demonstrations and sprayingmen were also important and each respectively covered 9.86 per cent and 9.21 per cent of the farmers in the study area. Promotional tools like hoardings and signboards did not act as source of awareness.

### 5.6.2. Buying Behaviour of Farmers From Various Traders

The three major traders of fungicides were Private retailers/dealers, Government depots and co-operatives. The buying behaviour of sample farmers were influenced by several factors. The influence on fungicide buying behaviour of sample farmers were ranked, using Garett's Ranking Technique.

From Table 32, it could be inferred that the major reason for the purchase of fungicide from government depots was the availability of subsidy followed by the availability of technical advice and quality ensurement.

**TABLE 31**

**SOURCE OF INFORMATION ON FUNGICIDES**

| Source of Information | No.of farmers | Percentage |
|---|---|---|
| Relative/neighbour/friends | 32 | 21.05 |
| Posters/Wall paintings | 23 | 15.13 |
| Dealer/local retailer | 18 | 11.84 |
| Demonstration/field work | 15 | 9.86 |
| Spraying men | 14 | 9.21 |
| Govt. officials (or) Extension agents | 12 | 7.89 |
| Television | 9 | 5.92 |
| Radio | 7 | 4.60 |
| Film shows | 7 | 4.60 |
| Preharvest contractors | 6 | 3.94 |
| Leaflets | 4 | 2.63 |
| Newspaper/Magazines | 3 | 1.97 |
| Company representative | 2 | 1.31 |
| Co-recommendation compatibility | 0 | 0.00 |
| Total | 152 | 100.00 |

TABLE 32

FACTORS CONTRIBUTING TO THE BUYING BEHAVIOUR OF FUNGICIDE WITH VARIOUS TRADERS

| Reasons | Name of the trader | | | | | |
|---|---|---|---|---|---|---|
| | Govt. Depots | | Primary Agrl Co-op. Societies | | Private retailers | |
| | Rank | Score | Rank | Score | Rank | Score |
| Readily available at all times | VI | 19 | VI | 12.03 | I | 45.00 |
| Correct price | IV | 27 | III | 36.48 | VI | 16.64 |
| Quality ensured | III | 30 | II | 37.96 | V | 23.05 |
| Available on loan | - | - | I | 40.55 | II | 39.25 |
| Long term contact | V | 22 | IV | 27.03 | III | 31.11 |
| Better technical advice available | II | 36 | V | 17.59 | IV | 24.92 |
| Subsidy available | I | 46 | - | - | - | - |

The farmers who were buying fungicide from cooperatives ranked the availability of loan as the major factor followed by quality ensurement and correct price. Most of the banana growers complained that, the primary agricultural cooperative societies never provided fungicides at the right time. Hence ready availability was ranked last.

Table 32 indicates that the most important factor which influenced buying of fungicide from private retailer/dealer was the ready availability. The other factors in the order of ranking were availability of loan, long term contact and availability of technical advice.

### 5.7.1. Constraints in adoption of Kavach

Out of sample of 200 farmers, 93 per cent revealed their unawareness of Kavach. In the rest 7 per cent, adoption was seen among all but 2 farmers who did not adopt due to higher price of Kavach.

Among the 12 adopters of Kavach on banana, 66.67 per cent reported a poor result and 33.33 per cent reported that the price was too high to use it again in the future.

## 5.8. Profile characteristics of dealers

In this section, the major characteristics of sample dealers were discussed and the results are presented below.

### 5.8.1. Educational status of sample dealers

A perusal of Table 33 revealed that 45 per cent of the sample dealer having education upto secondary level, followed by 30 per cent with collegiate education, 20 per cent with primary education while 5 per cent of the sample dealers were illiterates.

### 5.8.2. Social participation of sample dealers

The data in Table 34 revealed that 90 per cent of the sample dealers had social participation and link with more than one organisation, nearly eight per cent had participation with only one organisation. Only 2.5 per cent of sample dealers who were acted as office bearers had social participation with only one organisation and none were office bearer in more than one organisation.

### 5.8.3. Credit period allowed by sample dealers

It could be seen from Table 35 that 40 per cent of sample dealers allowed as credit period of 30 days while 22.5 per cent allowed a credit period of 31 - 60 days. It is also to be pointed out that 35 per cent of the sample dealers did not allow any credit period or in otherwords, they had only cash sales.

## 5.9. Market share of different fungicides

In this section, the results of mean annual turnover of sample dealers, percentage of dealers dealing different

TABLE 33

EDUCATIONAL LEVEL OF SAMPLE DEALERS

(n=40)

| Name of the districts | Illiterate | | Primary | | Secondary | | Collegiate | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % | No. | % | No. | % |
| Madurai | 0 | 0 | 2 | 20 | 3 | 30 | 5 | 50 | 10 | 100 |
| Tiruchirapalli | 0 | 0 | 3 | 30 | 5 | 50 | 2 | 20 | 10 | 100 |
| Tirunelveli | 1 | 10 | 1 | 10 | 6 | 60 | 2 | 20 | 10 | 100 |
| V.O.Chidam-baranar | 1 | 10 | 2 | 20 | 4 | 40 | 3 | 30 | 10 | 100 |
| Total | 2 | 5 | 8 | 20 | 18 | 45 | 12 | 30 | 40 | 100 |

TABLE 34

SOCIAL PARTICIPATION OF SAMPLE DEALERS

(n=40)

| Name of the districts | Participation in one organisation | | Participation in > one organisation | | Office bearer in one organisation | | Office bearer in > one organisation | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % | No. | % | No. | % |
| Madurai | 0 | 0 | 10 | 100 | 0 | 0 | 0 | 0 | 10 | 100 |
| Trichirapalli | 2 | 20 | 8 | 80 | 0 | 0 | 0 | 0 | 10 | 100 |
| Tirunelveli | 1 | 10 | 9 | 90 | 0 | 0 | 0 | 0 | 10 | 100 |
| V.O.Chidam-baranar | 0 | 0 | 9 | 90 | 1 | 10 | 0 | 0 | 10 | 100 |
| Total | 3.0 | 7.5 | 36.0 | 90.0 | 1.0 | 2.5 | 0 | 0 | 40.0 | 100 |

types of fungicides and chemical wise share of different fungicides were discussed. First the mean annual turnover of sample dealers were analysed and presented in Table 36.

### 5.9.1. Mean annual turnover of sample dealers

In Table 36, it could be seen that Tiruchirapalli district dealers had the highest turnover of Rs. 146.47 lakhs, While Madurai, V.O.Chidambaranar and Tirunelveli dealers had turnover of Rs.142 lakhs, Rs.138.61 lakhs and Rs. 16.40 lakhs respectively. Among the four districts, Tiruchirapalli district again occupied first position of fungicide transaction (Rs.1.45 lakhs) followed by Madurai (Rs.1.42 lakhs), V.O.Chidambaranar (Rs.1.30 lakhs) and Tirunelveli (Rs 0.17 lakh)

Among transaction of different commodities, fertilizers stood first covering 90.96 per cent of total transactions in Tiruchirapalli district followed by insecticides (7.99 per cent) and fungicides (0.99 per cent). When future expectations of commodity transaction of sample dealers were gauged, it showed increase of about Rs.8.50 lakhs in Tiruchirapalli district. The farm input consumption of Tiruchirapalli district was high, because among four districts, it covered the highest area under sugarcane, banana, groundnut and vegetables.

TABLE 35

DISTRIBUTION OF SAMPLE DEALERS WHO ALLOWED CREDIT PERIOD TO THE FARMERS

(n=40)

| Name of the Districts | Dealer who did not allow credit period | | Dealers who allowed credit period (in days) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Upto 30 days | | 31-60 days | | Above 60 days | | Total days | |
| | No. | % | No. | % | No. | % | No. | % | No. | % |
| Madurai | 3 | 30 | 4 | 40 | 2 | 20 | 1 | 10 | 10 | 100 |
| Tiruchirapalli | 4 | 40 | 4 | 40 | 2 | 20 | 0 | 0 | 10 | 100 |
| Tirunelveli | 3 | 30 | 4 | 40 | 3 | 30 | 0 | 0 | 10 | 100 |
| V.O.Chidam-baranar | 4 | 40 | 4 | 40 | 2 | 20 | 0 | 0 | 10 | 100 |
| Total | 14. 0 | 35.0 | 16.0 | 40 | 9.0 | 22.5 | 1.0 | 2.5 | 40.0 | 100 |

## TABLE 36

## MEAN ANNUAL TURNOVER OF SAMPLE DEALERS

(Rupees in lakhs) (n = 40)

| Name of the product | Last year | | Future expectation | |
|---|---|---|---|---|
| | Total value | % | Total value | % |
| **Madurai** | | | | |
| Fungicides | 1.42 | 1.00 | 1.44 | 0.96 |
| Insecticides | 14.86 | 10.46 | 15.58 | 10.45 |
| Herbicides | 0.14 | 0.10 | 1.13 | 0.75 |
| Fertilizers | 113.98 | 80.26 | 115.18 | 77.30 |
| Seeds | 11.60 | 8.17 | 15.65 | 10.57 |
| Total | 142.00 | 100.00 | 148.99 | 100.00 |
| **Tiruchirapalli** | | | | |
| Fungicides | 1.45 | 0.99 | 1.48 | 0.95 |
| Insecticides | 11.71 | 7.99 | 15.81 | 10.19 |
| Herbicides | 0.01 | 0.06 | 0.11 | 0.07 |
| Fertilizers | 133.17 | 90.93 | 137.55 | 88.70 |
| Seeds | 0.11 | 0.07 | 0.12 | 0.07 |
| Total | 146.45 | 100.00 | 155.07 | 100.00 |
| **Tirunelveli** | | | | |
| Fungicides | 0.17 | 1.03 | 0.11 | 1.60 |
| Insecticides | 1.46 | 8.80 | 1.50 | 8.91 |
| Herbicides | 0.11 | 0.67 | 0.11 | 0.60 |
| Fertilizers | 14.52 | 88.53 | 16.21 | 89.60 |
| Seeds | 0.14 | 0.85 | 0.16 | 0.88 |
| Total | 16.40 | 100.00 | 18.09 | 100.00 |
| **V.O.Chidambaranar** | | | | |
| Fungicides | 1.30 | 0.93 | 1.37 | 0.89 |
| Insecticides | 12.82 | 9.24 | 16.67 | 10.83 |
| Herbicides | 0.11 | 0.07 | 0.11 | 0.07 |
| Fertilizers | 122.45 | 88.34 | 124.58 | 80.99 |
| Seeds | 1.92 | 1.38 | 11.08 | 7.20 |
| Total | 138.60 | 100.00 | 153.81 | 100.00 |

In case of Madurai district,the share of fertilizers in the total transaction was 80.26 per cent followed by insecticide (10.46 per cent). Based on Table 36, the future expectation of seeds increased by 2.33 per cent from the existing level. Total turnover of V.O.Chidambaranar district dealers was Rs.138.61 lakhs. Out of this, fungicides occupied little less than one per cent (0.93 per cent) which is about Rs.1.3 lakh rupees. Whereas fertilizers, insecticides, seeds and herbicides contributed 88.34 per cent, 9.25 per cent and 1.38 per cent

Among the 4 districts, Tirunelveli had very poor turnover (Rs.16.42 lakhs). Because, it covered the least area under sugarcane, vegetables, groundnut and cotton. Out of Rs.16.42 lakhs of total turnover, fertilizer stole the major share of 88.53 per cent followed by insecticides (8.80 per cent). The share of fungicide was only 1.03 per cent.

### 5.9.2. Percentage of dealers dealing different types of fungicides

It could be inferred from Table 37 that 39 dealers (97.5 per cent) were dealing with Bavistin, followed Indofil M.45 (87.5 per cent) and Blue copper (35 per cent). While kavach was dealt by 30 per cent of dealers only. In these districts, 50 per cent, 40 per cent, 20 per cent and 10 per cent of the dealers dealt with kavach in Madurai,

TABLE 37

PERCENTAGE OF FARMERS OBTAINING DIFFERENT TYPES OF FUNGICIDES

(n = 40)

| Particulars | Name of the districts | | | | | | | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Madurai | | Tirunelveli | | Tirunelveli | | V.O.Chidambaranar | | | |
| | No. | % | No. | % | No. | % | No. | % | No. | % |
| Bavistin | 10 | 100 | 9 | 90 | 10 | 100 | 10 | 100 | 39 | 97.5 |
| Indofil M.45 | 8 | 80 | 9 | 90 | 9 | 90 | 9 | 90 | 35 | 87.5 |
| Blue copper | 9 | 90 | 3 | 30 | 2 | 20 | - | - | 14 | 35.0 |
| Calixin | 1 | 10 | 3 | 30 | - | - | - | - | 4 | 10.0 |
| Kavach | 5 | 50 | 4 | 40 | 2 | 20 | 1 | 10 | 12 | 30.0 |
| Rinosan | 2 | 20 | - | - | - | - | 2 | 20 | 4 | 10.0 |
| Redomil | 4 | 40 | - | - | - | - | - | - | 4 | 10.0 |
| Kitaxin | 2 | 20 | - | - | - | - | 6 | 60 | 8 | 20.0 |
| Fytolan | 2 | 20 | 1 | 10 | - | - | - | - | 3 | 7.5 |
| Ziran | 1 | 10 | 1 | 10 | 2 | 20 | - | - | 4 | 10.0 |
| Emisan | - | - | 1 | 10 | 1 | 10 | - | - | 2 | 5.0 |
| Sulfur | 2 | 20 | 1 | 10 | 1 | 10 | - | - | 4 | 10.0 |
| Cuman-L | - | - | 1 | 10 | 2 | 20 | 2 | 20 | 5 | 12.5 |

Tiruchirapalli, Tirunelveli and V.O.Chidambaranar districts respectively. In Madurai district, out of 10 sample dealers, 9 were dealing Blue copper.

### 5.9.3. Chemicalwise share of different fungicides

From Table 38 it could be inferred that in Tiruchirapalli district, Indofil M.45 constituted major share with (44.84 per cent) followed by Bavistin (24.41 per cent) Blue copper (16.15 per cent) and Redomil (8.07 per cent) but share of Kavach was very small. Expected future demand seemed to be very bleak.

In case of Madurai district, the major share of fungicide was constituted by Blue copper (55.78 per cent) followed by Indofil M.45 (16.61 per cent), Bavistin (14.76 per cent), Redomil (6.87 per cent) and Kavach (2.76 per cent). The future share of Bavistin Indofil M.45, calixin and Redomil were gauged at 18.50 per cent, 18.10 per cent, 2.02 per cent and 8.11 per cent respectively.

It could be further noted from Table 38 that in V.O.Chidambaranar district, Bavistin accounted for 48.41 per cent of total share of fungicides followed by Indofil M.45 (40.79 per cent) and Kavach share was only 0.33 per cent.

TABLE 38

CHEMICALWISE SHARE OF DIFFERENT FUNGICIDES

(n = 40)

| Name of the fungicides | Unit | No.of dealers | Last year | | Future expectation | |
|---|---|---|---|---|---|---|
| | | | Quantity | % | Quantity | % |
| **Madurai** | | | | | | |
| Bavistin | kg | 10 | 176 | 14.76 | 228 | 18.50 |
| Indofil M.45 | kg | 9 | 198 | 16.61 | 223 | 18.10 |
| Blue copper | kg | 9 | 665 | 55.78 | 621 | 50.40 |
| Calixin | li | 1 | 20 | 1.67 | 25 | 2.02 |
| Kavach | kg | 5 | 33 | 2.76 | 15 | 1.21 |
| Redomil | kg | 4 | 82 | 6.87 | 100 | 8.11 |
| Ziram | kg | 1 | 5 | 0.40 | 5 | 0.40 |
| Fytolan | kg | 2 | 13 | 1.09 | 15 | 1.21 |
| **Tiruchirapalli** | | | | | | |
| Bavistin | kg | 9 | 514 | 24.41 | 525 | 26.73 |
| Indofil M.45 | kg | 9 | 944 | 44.84 | 914 | 46.53 |
| Blue copper | kg | 3 | 340 | 16.15 | 307 | 15.63 |
| Calixin | li | 3 | 42 | 1.99 | 53 | 2.69 |
| Kavach | kg | 4 | 25 | 1.18 | 10 | 0.50 |
| Redomil | kg | 1 | 170 | 8.07 | 85 | 4.32 |
| Ziram | kg | 1 | 40 | 1.90 | 55 | 2.80 |
| Fytolan | kg | 1 | 30 | 1.42 | 15 | 0.76 |
| **Tirunelveli** | | | | | | |
| Bavistin | kg | 10 | 80 | 35.55 | 217 | 50.23 |
| Indofil M.45 | kg | 9 | 89 | 39.55 | 146 | 33.79 |
| Blue copper | kg | 2 | 30 | 13.33 | 32 | 7.40 |
| Kavach | kg | 2 | 12 | 5.35 | 10 | 2.31 |
| Emisan | kg | 1 | 5 | 2.22 | 7 | 1.62 |
| Cuman-L | li | 2 | 9 | 4.00 | 20 | 4.62 |
| **V.O.Chidambaranar** | | | | | | |
| Bavistin | kg | 10 | 718 | 48.41 | 777 | 47.72 |
| Indofil M.45 | kg | 9 | 605 | 40.79 | 702 | 43.12 |
| Kavach | kg | 1 | 5 | 0.33 | 0 | 0 |
| Kitazin | li | 6 | 62 | 4.18 | 69 | 4.23 |
| Hinosan | li | 2 | 80 | 5.39 | 80 | 4.91 |
| Cuman-L | li | 2 | 13 | 0.87 | 0 | 0 |

In Tirunelveli district, the maximum share was snatched by Indofil M.45 with 35.55 per cent followed by 39.55 per cent of Bavistin. Kavach ranked fourth (5.33 per cent). The future expected share of Bavistin would increase from 35.55 per cent in 1994 to 50.23 per cent in 1995 and Kavach was expected to decrease from 5.33 per cent to 2.31 per cent.

**5.10. Dealers' Perception on Fungicide Companies**

In this section the perception of the dealers about different fungicide firms namely, Sandoz India Limited, BASF, EID Parry Ltd and Indofil are discussed. Based on the dealers' opinion, companies were classified into five categories excellent, good, satisfactory, bad and worst. Here the companies were analysed through seven attributes namely, quality of the product, price of the product, company's advertisement and sales promotional tools, relation with dealers, credit policies, margin and discount rate.

**Quality of the product**

From Table 39, it could be inferred that 80 per cent of sample dealers expressed an 'excellent' about the quality of Sandoz products and none of them had any bad perception about its quality. Next in order came Indofil with 50.0 per cent of the respondents quoting with perception. But only less than one fourth (17.5 per cent) of the sample dealers had an excellent perception about the quality of EID parry's product.

**Price of the product**

Among the four firms, EID parry ranked first since 50 per cent of the sample dealers opined that its products were reasonably priced, followed by BASF and Indofil. But, little less than three-fourth (72.5 per cent) of them opined that the product price of Sandoz India Ltd., was not reasonable and that was very high.

**Advertisement and sales promotional tools**

The performance of Sandoz's advertisement and sales promotional tool was excellent as opined by 92.5 per cent of sample dealers and BASF was supposed to the poor in this aspect.

**Relation with dealers**

The 72.5 per cent of the sample dealers had excellent opinion about EID parry's rapport with the dealers. While Sandoz India Limited was considered excellent in this regard by only 37.5 per cent of sample dealers and 10 per cent of sample dealers had a bad perception about the performance of Sandoz in terms of better rapport with dealers.

**Credit policy**

BASF allowed more credit period and also allowed more amount, as quoted by 80 per cent of sample dealers who highly satisfied with its credit policy. Forty five per cent of the sample dealers were highly satisfied with credit

TABLE 39

DEALERS' PERCEPTION ON SOME PUBLICIZED COMPANIES

(n = 40)

| Criterias | Dealers perception about different companies | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Excellent | | Good | | Satisfactory | | Bad | | Worst | |
| | No. | % | No. | % | No. | % | No. | % | No. | % |
| **Sandoz (India) Limited** | | | | | | | | | | |
| Quality of the product | 32 | 80.0 | 8 | 20.0 | - | - | - | - | - | - |
| Price of the product | - | - | 1 | 2.5 | 2 | 5.0 | 29 | 72.5 | 8 | 20.0 |
| Advertisement and sales promotional tools | 37 | 92.5 | 3 | 7.5 | - | - | - | - | - | - |
| Relation with dealers | 15 | 37.5 | 6 | 15.0 | 15 | 37.5 | 4 | 10.0 | - | - |
| Credit policy | - | - | 5 | 12.5 | 11 | 27.5 | 22 | 55.0 | 2 | 5.0 |
| Marketing margin | - | - | 3 | 7.5 | 8 | 20.0 | 26 | 65.0 | 3 | 7.5 |
| Discount rate | 21 | 52.5 | 4 | 10.0 | 9 | 22.5 | 6 | 15.0 | - | - |
| **BASF** | | | | | | | | | | |
| Quality of product | 13 | 32.5 | 4 | 10.0 | 12 | 30.0 | 9 | 22.5 | 2 | 5.0 |
| Price of product | 18 | 45.0 | 7 | 17.5 | 10 | 25.0 | 5 | 12.5 | - | - |
| Advertisement and sales promotional tools | 4 | 10.0 | 2 | 5.0 | - | - | 22 | 55.0 | 12 | 30.0 |
| Relation with dealers | 8 | 20.0 | 4 | 10.0 | - | - | 21 | 52.5 | 7 | 17.5 |
| Credit policy | 32 | 80.0 | 5 | 12.5 | 3 | 7.5 | - | - | - | - |
| Marketing margin | 29 | 72.5 | 10 | 25.0 | 1 | 2.5 | - | - | - | - |
| Discount rate | 17 | 42.5 | 3 | 7.5 | - | - | 13 | 32.5 | 7 | 17.5 |

**Indofil**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Quality of the product | 20 | 50.0 | 5 | 12.5 | 3 | 7.5 | 9 | 22.5 | 3 | 7.5 |
| Price of the product | 17 | 42.5 | 3 | 7.5 | 2 | 5.0 | 14 | 35.0 | 4 | 10.0 |
| Advertisement and sales promotional tools | 22 | 55.0 | 2 | 5.0 | 10 | 25.0 | 4 | 10.0 | 2 | 5.0 |
| Relation with dealers | 9 | 22.5 | 6 | 15.0 | 15 | 37.5 | 7 | 17.5 | 3 | 7.5 |
| Credit policy | 18 | 45.0 | 9 | 22.5 | 7 | 17.5 | 5 | 12.5 | 1 | 2.5 |
| Marketing margin | 19 | 47.5 | 7 | 17.5 | 7 | 17.5 | 3 | 7.5 | 4 | 10.0 |
| Discount rate | 13 | 32.5 | 4 | 10.0 | 4 | 10.0 | 10 | 25.0 | 9 | 22.5 |

**Bio-gavy**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Quality of the product | 7 | 17.5 | 4 | 10.0 | 24 | 60.0 | 2 | 5.0 | 3 | 7.5 |
| Price of the product | 24 | 50.0 | 10 | 25.0 | 3 | 7.5 | 3 | 7.5 | - | - |
| Advertisement and sales promotional tools | 30 | 75.0 | 7 | 17.5 | 3 | 7.5 | - | - | - | - |
| Relation with dealers | 29 | 72.5 | 7 | 17.5 | 2 | 5.0 | 2 | 5.0 | - | - |
| Credit policy | 16 | 40.0 | 4 | 10.0 | 9 | 22.5 | 11 | 27.5 | - | - |
| Marketing margin | 22 | 55.0 | 8 | 20.0 | 6 | 15.0 | 3 | 7.5 | 1 | 2.5 |
| Discount rate | 18 | 45.0 | 9 | 22.5 | 10 | 25.0 | 2 | 5.0 | 1 | 2.5 |

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policy of Indofil. While, 55 per cent of sample dealers were not satisfied with the credit policy of Sandoz India Ltd.

**Margin**

It could be seen from Table 39 that BASF allowed high margin to dealer, compared to other companies. Nearly 70 per cent of the sample dealer were highly satisfied with its margin. But 65 per cent of sample dealers were not satisfied with the margin allowed by Sandoz India Limited, and they opined that it allowed a very poor margin.

**Discount rate**

Sandoz stood first place in this aspect, ie., nearly 52 per cent of sample dealers were happy with its discount rate.

**5.11. Suggestions to improve sale of Kavach**

The suggestions of the dealers who are at present marketing Kavach to improve the sale volume of it are presented in Table 40. It was their most important suggestion to make recommendation that Kavach could be used on all major crops and this notification has to come from M/s. Sandoz India Limited, based on the performance of Kavach on different crops. Next in importance was increasing the margin of the dealers followed by improving the field work and reducing the price of it besides allowing a higher credit period.

**TABLE 40**

**SUGGESTIONS TO IMPROVE SALE OF KAVACH**

| Suggestions | Total score | Mean score | Rank |
|---|---|---|---|
| Work on all crops | 800 | 66.66 | I |
| Increase the margin | 790 | 65.83 | II |
| Improve field work | 750 | 62.50 | III |
| Reduce price | 730 | 60.83 | IV |
| Increase the credit period | 620 | 51.66 | V |
| Improve advertisement and sales promotional activities | 540 | 45.00 | VI |
| Improve quality | 530 | 45.00 | VII |
| Sale through Sandoz | 490 | 40.83 | VIII |
| Increase the discount rate | 380 | 31.66 | IX |
| Improve distributor push | 370 | 30.83 | X |

# SUMMARY AND CONCLUSION

# CHAPTER VI

## SUMMARY AND CONCLUSION

A study on the farmers' awareness and adoption of fungicides in general and of Kavach in particular was undertaken in the major banana growing areas of Tamil Nadu for Sandoz (India) Limited.

The specific objectives of this study were

i. to analyse the awareness and adoption of fungicide usage in the cultivation of banana in the selected districts of Tamil Nadu with special reference to sigatoka leaf spot;

ii. to analyse the farmers perceptions about fungicides and dealers' perception on companies; and

iii. to suggest suitable marketing strategies to improve the sale of Kavach in Tamil Nadu with particular reference to banana.

The study was conducted in Kulithalai, Chinnamanur, Srivaikundam and Cheranmahadevi blocks of Tiruchirapalli, Madurai, V.O.Chidambaranar and Tirunelveli districts which were selected by purposive sampling as they are the major banana growing districts in Tamil Nadu. Three Villages in each block were selected based on random sampling technique. 200 farmers were selected by probability proportionate sampling method and 40 dealers were selected based on simple random sampling.

The data was collected through a well structured and pre-tested interview schedule, and analysed with suitable statistical tools. The salient findings were as follows.

**Profile of the Respondents'**

Most of the respondents (44.00 per cent) belonged to above 45 years of age.

With regard to education most of the respondents were illiterates (46.00 per cent)

Majority of the respondents (45.5 per cent) had a farming experience of more than 20 years.

45 per cent of the respondents belonged to the income group of upto Rs. 60,000/-.

A little less than half of the respondents (48.5 per cent) had agriculture as their main occupation.

Half of the respondents (50.00 per cent) were member in only one organisation.

More than half of the sample respondents (61.00 per cent) had a medium level of extension agency contact.

**Awareness Level**

The awareness level of sigatoka leaf spot was found to be high (70.00 per cent) in Madurai district and low in Tirunelveli district (60.00 per cent). But only 18 per cent of the sample banana farmers knew about yield loss of sigatoka leaf spot exactly and its control measures were known to 52.5 per cent of the selected farmers. With regard

to fungicide awareness, Bavistin earned 70.00 per cent of the fungicide awareness followed by Indofil M.45 (49.00 per cent), Calixin (25.5 per cent) and Kavach (7 per cent).

**Adoption Level**

More than 45 per cent of the banana growers used fungicides for control of sigatoka leaf spot. But only 8 per cent were prefered double spray against sigatoka leaf spot. The adoption level of Bavistin was the highest (16.5 per cent) followed by Indofil M.45 (10 per cent), Calixin (7 per cent), Kavach (6 per cent) and Blue Copper (4 per cent). The adoption was found to be maximum in Madurai district (58 per cent) and minimum in V.O.Chidambaranar district (36 per cent).

**Adoption Level of Recommended Practices**

Most of the Bavistin users (60.60 per cent) adopted 75 per cent of practices, followed by 60.00 per cent of Indofil M.45 users who adopted the same percentage of practice. The adoption levels of Kavach users was very poor and only 25.00 per cent of Kavach users followed 75 per cent of the recommended practices.

**Influence of the Characteristics of the Respondents on their Awareness and Adoption Levels**

The results of multiple regression analysis revealed that variables age, education, income, extension agency-

contact and farm size had a positive and significant influence on the awareness and variables namely Income, extension agency contact, social participation had significant contribution towards the adoption level.

**Perception Level of Fungicides**

Nearly 70 per cent of Calixin known persons accepted its cost as a reasonable price. But 45 per cent of Kavach known persons had not accepted its price as a reasonable one, and >75 per cent of Calixin and Bavistin known persons were highly satisfied with its disease control efficiency. Smell, easy availability, no side effect nature of Kavach were accepted by 64.28 per cent, 78.57 per cent and 57.14 per cent of Kavach known persons respectively. But, they were not satisfied with its broad spectrum (50.00 per cent), durability (21.40 per cent), rainfastness (57.14 per cent) and available in convenient size (42.85 per cent). The performance of Sandozs' advertisment, quality of product, rapport with dealers and discount rate were excellent as opined by 92.5 per cent, 80 per cent, 37.5 per cent and 52 per cent of dealers who were dealing Sandoz products. But, they were not satisfied with its price of product, credit policy and margin.

**Major Findings on Kavach**

* The awareness of the banana growers about symptoms of sigatoka leaf spot, resistant varieties for

sigatoka leaf spot and control measures for the same were comparatively more but, the level of awareness of exact yield loss due to sigatoka leaf spot disease was less.

* When compared to other fungicides, the awareness of and adoption of Kavach against sigatoka leaf spot was very poor but, its competing fungicides namely, Bavistin and Indofil M.45 were getting higher awareness and usage for sigatoka leaf spot in the order mentioned.
* None of the Kavach users were spraying twice but less number of Bavistin, Indofil M.45, Calixin and Blue Copper users were applying twice.
* Adoption of recommended practices of Kavach users were very less than its competing fungicides. Majority of Kavach users were unaware about management practices. This poor adoption of recommended practices would face poor efficiency of diseases control.
* Lack of awareness, poor efficiency and higher price of Kavach were major reasons for non-adoption of Kavach in the order mentioned.
* Dealers were happy with quality of Sandoz's products, advertisement and its discount rate but, they were not satisfied with its margin and credit period.

**Suggestions**

* It is suggested that **M/s. Sandoz (India) Ltd.,** may educate the farmers about correct yield loss resulting due to sigatoka leaf spot and create awareness about Kavach through effective promotional methods such as posters, wall paintings and demonstration/field work.
* Demonstration should be laid in more villages with large area under banana to make the farmers to see the beneficial effect of Kavach by themselves.
* Supply of good quality product and minimum price of the product is necessary to capture and retain domestic market in a competitive environment. So the company may try to reduce the price of Kavach to a competitive level.
* Company may market Kavach through co-operatives and State Agricultural Depots to increase the sale volume.
* Higher margin and long period of credit were major suggestion to improve sale volume of Kavach.
* In order to promote better sales of Kavach, care should be taken to see that sales promotional aspects are oriented in such a way that Kavach also receives equal importance like Ekalux. Since Ekalux has established well in the market and got good opinion among the farmers, a combined field propaganda will pay dividends.

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