STUDY ON FARMERS BUYING BEHAVIOUR TOWARDS PESTICIDES IN COIMBATORE DISTRICT

Thesis submitted in part fulfilment of requirements for the Degree of Master of Science (Agriculture) in Agricultural Marketing Management to the

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CERTIFICATE

This is to certify that the thesis entitled "**STUDY ON FARMERS BUYING BEHAVIOUR TOWARDS PESTICIDES IN COIMBATORE DISTRICT**" 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, Coimbatore is a record of **bona fide** research work carried out by **Miss.A.RAKILA** under my supervision and guidance and that no part of this thesis has been submitted for the award of any other degree, diploma, fellowship or other similar titles or prizes and that the work has not been published in part or full in any scientific or popular journal or magazine.

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EXTERNAL EXAMINER

Dedicated to my late mother

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A. Rakila.

(A.RAKILA)

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INTRODUCTION

CHAPTER I

INTRODUCTION

Agriculture forms the backbone of the Indian economy and despite concerted efforts on industrialisation in the last few decades, agriculture is still considered as the dominant sector of the economy and source of livelihood for over 63 per cent of the population in our country[1]. It is really a matter of pride that Indian agriculture has today achieved a respectable place in the world. It is able to feed the ever increasing population at near self sufficiency level.

The challenge of the coming decade is to feed our burgeoning population expected to reach one billion by the year 1999 from the present level of 850 million. This calls for a renewed efforts to step up food grains production from the present level of 180 million tonnes to 240 million tonnes[2]. In order to achieve higher agricultural production to keep pace with increasing population it is necessary to ensure timely and increased availability of critical inputs like fertilizers, pesticides, machinery, hybrid seeds and

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[1] Ruddar Datt and K.P.M.Sundaram, **Indian Economy**, (New Delhi : S.Chand and Company Private Ltd., 1990) pp.398-399.

[2] K.R.Kapoor, "Fertilizers and Agriculture", **Fertilizer News**, 35 (8) : p.11, 1990.

improved package of practices by the farmers. The pesticide input, infact, plays the crucial role in insuring the efficiency of all the associated inputs plus time, efforts and energy spent on the cultivation and also protect from pests, diseases and weeds.

The adoption of high yielding varieties, chemical fertilizers and other improved technologies have increased the agricultural production in India, along with, the pest menance have also increased to a greater extent[3]. Pest is an organism that inflicts severe economic damage to agricultural crops or produces or to human resources in the process of their multiplication. This covers a wide variety of organisms from virus, fungi, bacteria to birds and weeds.

An estimated annual crop loss of over Rs.6000 crores was inflicted by various pests. The share of loss by each one indicates that the weeds alone accounted for around 33 per cent, diseases 28 per cent, insects 20 per cent, rats 6 per cent, birds and others accounted for the rest. The management strategy for each type of pest being different, control operations are complex and highly technical[4].

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[3]D.P.Agarwal and M.L.Jalan, "Marketing of Pesticides - A Case Study of Gorakpur District", **Indian Journal of Marketing**, 16 (2) : p.25, 1986.

[4]Open session, 26th Annual General Meeting of Pesticides Association of India, **Pesticides Information**, 15 (4) : p.2, 1990.

Pesticide use

The use of pesticides as a means to prevent losses by pests and diseases in agriculture commenced in India around 1948-49. Originally, pesticides such as DDT and BHC were imported in the formulated form into our country for mosquito control. Slowly, the farmers started using these pesticides for agricultural purposes as well. The first unit for the manufacture of technical BHC and its formulation was started in the country in 1952, followed by another unit in 1955 for the manufacture of DDT[5]. The annual demand at present is as high as 1,25,000 tonnes (including 41,000 tonnes used in public health programmes) and it is predicted that the demand may be around 2,00,000 tonnes by turn of this century. At present, around 71,000 tonnes of pesticides are being manufactured in India, while rest of them are being imported. The average consumption of pesticides in India is one of the lowest in the world with 327 gms/ha compared to 10 kgs/ha in Japan[6]. Also the Indian market constitutes only 1.9 per cent of the total world market of pesticides, the United States of America is leading with 33 per cent[7].

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[5]Manohar Lal Jalan, **Marketing of Agricultural Inputs**, (Bombay : Himalaya Publishing House, 1987), pp.78-79.

[6]R.L.Narasimha Murthy, "Pesticide Management in Social Context", **Pestology**, 17 (8) : p.44, 1993.

[7]B.P.S.Mann, Pesticides Association of India, Open Session of the Annual General Meeting, **Pesticides Information**, 16 (3) : pp.1-8, 1990.

The consumption pattern of major agrochemical groups used in India showed that the insecticides rank first (75 per cent) followed by herbicides (13 per cent), fungicides (8 per cent) and others (4 per cent). When we look at the world scenerio, we find that herbicides dominates (43 per cent) the market, followed by insecticides (31 per cent), fungicides (21 per cent) and others (5 per cent)[8].

In India, the pesticides use is not evenly spread throughout the country and it is concentrated in a few states growing commercial crops. Consumption of pesticides in different states is presented in Appendix 1. This indicates that it is primarily linked with the states where substantial gains in productivity have been achieved through the green revolution or to the plantation crops.

Crop-wise usage of pesticide scenario is presented in Table 1 and this showed a picture of imbalanced and indiscriminate use of pesticides. Farmers utilized maximum pesticides (52-55 per cent) for cotton crop. While, cereals, millets, pulses and oilseeds have a market share of only 6-7 per cent of pesticides[9].

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[8]Prasad Chandran, "Herbicides : Brand Leader Concept", **Pesticides**, 23 (6) : p.15, 1989.

[9]L.L.M.Niraj Kulshrestha, "Pesticides and Environmental Pollution : Legislative Control in India", **Pestology**, 16 (10) : p.5, 1992.

Table 1. Estimated market share of pesticides utilisation of some major crops and their share to total cropped area in India (in percentage)

Crop	Market share of pesticide utilised	Share to total cropped area
Cotton	52-55	5
Rice	17-18	24
Chillies/ vegetables/fruits	13-14	3
Plantation crops	7-8	2
Cereals/millets/ oilseeds/pulses	6-7	58
Sugar cane	2-3	2
Others	1-2	6

Source : **Pestology**, 16(10): p.5, 1992.

Pesticides have contributed a lot of good for the world food supply and increased the food grains and fibre production. The use of pesticides thus becomes inevitable to sustain the current level of food production or to increase it further for future needs. Many of those concerned with pesticides are aware of the problems created by improper usage of these chemicals including development of 'resistance' to pesticides, 'resurgence' of pests and toxic persistent 'residues' in food and environment. In India, nearly 60 per cent of the indigenously manufactured pesticides are being used, for the past decades and as such

suffer the disadvantages of the above three problems. This not only results in reduced crop production but also in a need to import new pesticides to overcome mainly 'resistance' problem, causing heavy burden on foreign exchange[10].

It is possible to use pesticides effectively and safely while delivering all benefits and keeping residues in food and environment well within the safe limits[11]. To achieve this proper pesticide management is necessary and it involves proper knowledge of product and its usage. This can be conveyed to the users through different heads viz., i) the right pesticide ii) the right usage (dose) iii) the right equipment and iv) the right method of spraying.

Farmers nowadays have started realising the significance and advantages of plant protection measures, hence the increased use of pesticides among the farmers can be accelerated by educating them through proper methods. Pesticides are available to the farmers at different retail points namely private dealers, state departments depots and co-operatives. The pesticides manufacturing firms also has

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[10] R.L.Narasimha Murthy, **Op. Cit.**, p.44, 1993.

[11] Agnihotri, "Seminar on Food Safety in India", **Pestology**, 17 (9) : p.65, 1993.

the responsibility to see that pesticides are made available to the farmers at right time, right place and are also expected to educate the farmers for it's correct usage. Thus the utilization of pesticides at farm level is influenced by many factors and it also depends on purchase decisions of farmers, alternatives sought in case of purchase of a particular brand from a particular dealer and problems faced by farmers in purchasing of pesticides.

Although a number of studies on pesticide use pattern, farmers adoption behaviour regarding plant protection are available, the changing situations and other circumstances warrant more and more studies in this regard. So an attempt was made to study the farmers buying behaviour and their pesticide use pattern especially in Coimbatore district as this is one of the developed district and comprises vast potential for higher pesticide usage. The study was also focussed on farmers brand and dealer loyalty, dealer's opinion about the farmers pesticide purchase and usage and effectiveness of promotional methods followed by pesticide firms.

Objectives

The study aims to explore and analyse the farmer's attitude towards purchase decisions and use pattern of pesticides.

The specific objectives of the present study are:

i. to study the pesticide use pattern at farm level,

ii. to study the pesticide buying behaviour of farmers,

iii. to study the effectiveness of promotional methods on farmers buying behaviour and

iv. to identify the problems encountered by the farmers and to suggest suitable remedial measures.

Hypotheses

The study proposes the following hypotheses:

i. Farmers are using the pesticides rationally and they are loyal to dealers.

ii. Promotional methods influences the farmers buying behaviour and pesticide usage.

Scope of the study

This study will throw more light on the various factors which determines, the pesticide use. It aims to get a clear picture of the farmers who are the ultimate end users. It will also help the pesticide marketing firms to take up remedial measures to remove the impediments if any, so as to increase the pesticide sales. Also, this will help the pesticide firms to reorient their strategies for effective marketing of their products. In this context, the results of the present study could assist the firms in making right decisions relating to their marketing aspects,

promotional strategies and to formulate the effective marketing plan to improve their business. This study will also help the policy makers and planners to formulate strategies to achieve the national objectives of increased food production to meet the increasing demand.

Limitations of the study

The study is based on the primary data collected from the sample respondents by survey method. As none of the farmers maintained proper farm records for farming operations, they had to furnish the information from their memory and hence the collected data were subjected to recall bias. However, every effort had been taken to minimise the bias by including questions that facilitated cross checkings. Hence, the findings of the study may be considered appropriate for the situation prevailing in the study area and extra care should be taken while making generalisations.

Organisation of the thesis

The write up of the study is organised in the following manner.

Chapter I : Introduction

The background, objectives, hypotheses, scope and limitations of the study.

Chapter II	:	Concepts and review. A brief review of past studies and concepts used in the present study are presented.
Chapter III	:	Description of the study area. General and agricultural characteristics of the study area are presented.
Chapter IV	:	Design of the study. Methodology and various tools of analysis used in the study are explained.
Chapter V	:	Results and discussion. Major findings of the empirical analyses concerning the study area are presented and discussed.
Chapter VI	:	Summary and conclusions. Summary of results, the conclusions drawn and a set of policy descriptions are presented.

CONCEPTS AND REVIEW

CHAPTER II

CONCEPTS AND REVIEW

In this chapter, the various concepts and earlier studies relevant to this study had been discussed. This will help to get a clear understanding of the problems taken and will facilitate meaningful interpretation of the results. The concepts are reviewed under the following headings.

1. Market and marketing
2. Pesticide and pesticide use
3. Buying behaviour
4. Brand and brand loyalty
5. Dealer loyalty
6. Market functionaries and
7. Promotion

1. Market and marketing

Quite a large number of definitions are available for market and marketing. Among them some of the important definitions are reviewed here.

a. Market

According to Hill the market was described as some sphere (or) space where (i) the forces of demand and supply were at work (ii) the prices were determined or modified (iii) the ownership of some quantity of goods and services

were transferred and (iv) certain physical and institutional arrangements were evident[1].

Arvind viewed market as a set of all actual and potential buyers of a product[2].

Acharya and Agarwal referred market as a social institution which performs activities and provides facilities for exchanging commodities between buyers and sellers[3].

Kotler defined market as the set of all potential customers sharing a particular need or want, who might be willing and able to engage so as to satisfy their need or want[4].

Russell and Ronald defined market as a group of people who can (i) be identified by some common characteristics, interest or problem; (ii) use a certain

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[1]Barkely Hill, **An Introduction to Economics for Students of Agriculture**, (Oxford : Perguman Press, 1980), p. 91.

[2]I.Korba Arvind, "Marketing concepts and small scale sector", **Indian Journal of Marketing, 13 (4)** :p. 19, 1982.

[3]S.S.Acharya and N.L.Agarwal, **Agricultural Marketing in India**, (New Delhi : Oxford and IBH Co., 1987), p.9.

[4]Philip Kotler, **Marketing Management**, (New Delhi : Prentice Hall of India Limited, 1989), p.9.

product to advantage; (iii) afford to buy it; and (iv) be reached through some medium[5].

For this study market refers to a place where actual and potential buyers and sellers are in communication with one another for the purpose of exchange of goods and services.

b. Marketing

Cundiff and Still defined marketing as the business process by which products are matched with markets and through which transfer of ownerships are effected[6].

According to Elling marketing is ascertaining, creating and satisfying the wants of people and doing it at a profit[7].

Stanton defined marketing as a total system of business activities designed to plan, price, promote and distribute want satisfying goods and services to potential customers[8].

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[5] Thomas Russell and Ronald Lane, **Kleppner's Advertising Procedure**, (New Jersey : The Prentice Hall Series, 1990), p.78.

[6] Edward W. Cundiff and Richard R. Still, **Basic Marketing Concepts, Environment and Decisions**, (New Delhi : Prentice Hall of India Limited, 1968), p.2.

[7] Karl A. Elling, **Introduction to Modern Marketing An Applied Approach**, (New York : The MacMillan Co., 1969), p.5.

[8] William J. Stanton, **Fundamentals of Marketing**, (Singapore : McGraw Hill Book Company, 1984), p.74.

Acharya and Agarwal referred marketing to a series of activities involved in moving the goods from the point of production to the point of consumption. It includes all activities involved in the creation of time, place, form and possession of utility[9].

Kotler defined marketing as a social and managerial process by which individuals and groups obtain what they need and want through creating and exchanging products and value with others[10].

For this study, marketing refers to the performance of all business activities which directs the flow of goods and services from the producer to the ultimate user of the product.

2. Pesticide and pesticide use

a. Pesticide

Pesticide in general are products, synthetic or natural, utilized for control of insect pests, fungi, bacteria, weeds, nematodes, rodents etc. Growth regulators and defoliants are also sometimes grouped under pesticides[11].

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[9] S.S. Acharya and N.L.Agarwal, **Op.Cit.**, p.2, 1987.

[10] Philip Kotler, **Op.Cit.**, p.9, 1989.

[11] Baldev Singh, D.Bhusan and R.C.Adlakka, "Indian Pesticide Industry : A Review", **Pesticides**, 8 (4): p.9, 1974.

Kashyap defined pesticides as chemical entities or mixtures, intended for preventing, destroying, repelling or mitigating any pest[12].

According to Prasad and Nagia pesticides include insecticides, herbicides, fungicides, rodenticides, nematicides, fumigants and plant growth regulators[13].

For this study, pesticides are referred to those chemicals used for the control of insect pests, disease causing organisms like fungi, bacteria, etc., nematodes and rodents.

b. Pesticide use

The role of pesticides is most significant of the various agro-chemicals in the sense that these act as a protective umbrella for other inputs. The rational use of pesticides in the farm, will maximise the benefits. But, there are numerous problems faced by farmers in the purchase and use of pesticides.

Darwin and Richard referred that regarding the application of pesticides the decision to spray was complicated by the presence of more than one pest, inter

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[12] S.K. Kashyap, "Management of Pesticides Poisoning", **Pesticide Information**, 3 (4): pp.1-8, 1982.

[13] Hari Prasad and D.K. Nagia, "Pesticide Formulations and Their Status of Registration in India", **Plant Protection Bulletin**, 43(3 and 4): pp.36-44, 1991.

relationships between pests and beneficial predators and parasites[14].

Malkhede and Pawaskar reported that the use of pesticides and fertilizers in Amaravathi district increased considerably inspite of sharp rise in prices of the same. The availability of loans, inputs, yield prospects, price of the products, awareness and knowledge of the cultivatOrs were the influential factors[15].

Marothia reported that in crops like maize, paddy and wheat, the level of pesticide use has increased inspite of increase in the prices of the same. The increase was attributed to the fact that capital intensive farmers had understood the economic significance of use of pesticides in crop production and storage[16].

Chadra found that rapid changes in cropping pattern, increased use of fertilizers, introduction of new

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[14] Darwin C. Hall and Richard B.Naggard, "On the Timing and Application of Pesticides", **American Journal of Agricultural Economics**, 55(2): pp.198-201, 1973.

[15] Malkhede and P.G.Pawaskar, "Importance of Price of Inputs in Determining the Levels of Their Use in Four Sample Villages of Amaravathi District, "**Indian Journal of Agricultural Economics**, 29(4): p.205, 1973.

[16] D.K. Marothia, "Impact of Increase in Input Prices on Production and Profitability of Major Crops of Tarai", **Indian Journal of Agricultural Economics**, 31(3) pp.81-85, 1976.

high yielding varieties have all contributed to the increased use of pesticides[17].

Perritt revealed that 95 per cent of farmers purchase and apply pesticides to protect subsistance food crops in the field and during storage[18].

The use of pesticides is more complicated because it requires training to identify the pest, to select the appropriate pesticide and to use it in required quantities at the right time. Because of this, the use of pesticides continue to be at a lower level and disproportionate to fertilizers used in the country[19].

Mann indicated that the use of pesticides in oil seeds and pulses were considerably low affecting the yield[20].

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[17] S.S.Chadra, "Pesticides Industry in India-A Pesticide Association of India View", **Pesticides Annual**, pp.1-4, 1978.

[18] R.W.Perritt, "Small Farmers Resource Management: A Case study of Pesticide use in Rio Grande Dosul, Brazil, **Dissertation Abstracts**, 49(7): p.1919, 1989.

[19] The working Group of Ministry of Petroleum, Recommendations, **Pesticides**, 22(4): pp.27-28, 1978.

[20] B.P.S. Mann, "Role of Pesticides in Agriculture", **Pesticides Information**, 10(3): pp.16-19, 1984.

The pesticide use decisions of cultivators were based on their expectation regarding the timing and intensity of pest attack and effectiveness of pesticides[21].

Rao and Singh observed that the dry powders constituted the maximum portion of the total quantity of pesticides used by different size group of farms as well as major commercial crops[22].

Jennings indicated that the benefits confessed by pesticide use are reduction in both labour cost of food production and risk of crop losses and removal of some of market uncertainties, the possibility to specialise and concentrate production with greater flexibility and for monoculture farming, the support of pesticides for a complex arrays of markets and economic regulations affecting price, quality and availability of food[23].

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[21] K.Seeta Prabu, "The Treatment of Pesticides in the Production Function Frame Work: A Skeptical Note", **Indian Journal of Agricultural Economics**, 40(2): pp.12-139, 1985.

[22] A.Nageswara Rao and J.J.Singh, "Economics of Different Form of Pesticide Use in Andhra Pradesh", **Pesticides**, 20(7): pp.19-23, 1986.

[23] A.L.Jennings, "Some Economic and Social Aspects of Pesticide Use", **ACS symposium Series**, 446: pp.31-37, 1991.

The major factor which determine the quantity of pesticides was the type of pest followed by intensity of pest and disease[24].

The objective of efficient pesticide usage can be defined as the application of an adequate dose of a suitable pesticide to a pathogen or pest at the correct time[25].

Murthy reported that chemical control using pesticides is widely used method of pest control because it ensures maximum control in minimum possible time which is necessary in a developing country like India[26].

Mohanan observed that choice of pesticides have been influenced by past experience (89 per cent), quality (68 per cent), co-operatives and private traders were the initial suppliers of pesticides. Agricultural department was approached by farmers because of provision of subsidy (77 per cent) and technical guidance (54 per cent)[27].

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[24]Sri Sankari, "A study of Demand for Pesticides at Farm Level for Cotton", (Unpublished M.Sc (Ag.) Thesis, Department of Agricultural Economics, Tamil Nadu Agricultural University, Coimbatore, 1991), p.115.

[25]Gangawane, "Rational Pesticide Use", **Pesticides**, 21(12): pp.11-14, 1987.

[26]R.L. Narasimha Murthy, "Pesticide Management in Social Context", **Pestology**, 17(8): pp.44-45, 1993.

[27]N. Mohanan, "Farmer's Experiences with Cotton Pests and Pesticides", **Pesticides**, 14(3): pp.3-6, 1980.

Kumar **et al.,** concluded that the adoption of plant protection measures is varying among the different categories of farmers. The various practices like control of diseases, seed treatment, soil treatment, rat control, etc., are being advocated without a coherent strategy which is reflected in differential level of achievement of targets by the plant protection staff in the district[28].

Verma in his study reported that in the villages of Ghaziabad on an average 20.5 per cent farmers used insecticides, 13.6 per cent used fungicides and none had ever used any weedicide[29].

Availability of easy and cheaper control measures, availability of skilled labour and applicances and finance in time influences plant protection use[30].

Patel **et al.** identified the constraints in plant protection as lack of adequate finance for purchase of equipments and pesticides. A large proportion of

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[28]Nirmal Kumar, P.K.Singh and V.K.Singh, "Constraints to Use of Plant Protection Measures", **Pesticide Information**, 15(2): pp.15-17, 1989.

[29]R.K. Verma, "Plant Protection Problems and Farmers Awareness to Pesticides in Ghaziabad Rural Urban Continuum", **pesticides**, 24(2): pp.9-11, 1990.

[30]B.R. Devane and M.G.Bilegaokar, "Factors Influencing Decision Making in the Use of Crop Protection", **Pestology**, 4(5): pp.35-38, 1980.

small farmers did not own appliances and borrow it (or) did not practice plant protection at all[31].

Singh **et al.**, reported that the untimely supply, high supply cost, inadequate quantity, malpractices and difficult procedures were some of the problems encountered by farmers while purchasing pesticides from co-operatives[32].

Sagar and Pal made an attempt to identify the problems and observed that more attention has to be paid on adequate quantity and timely supply of pesticides, regulatory measures to prevent adulteration in pesticides, skilled labour for pesticide application are needed to make the farmers to adopt plant protection[33].

Farmers are facing numerous problems in the purchase of pesticides at a nominal price, when most needed in desired quantity and quality. Farmers were also dissatisfied regarding the steps taken by government agencies in handling cost free pesticides[34].

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[31] G.A.Patel, K.R.Picholiya and C.Gopinath, :Use of Marketing of Plant Protection Appliances- A review", **Pesticides Information**, 6(3): p.17, 1980.

[32] Ram Iqbal Singh, Ram Kumar and Shri Ram, "Impact of Input Supply Systems in Crop Production in District Moradabad-Uttar Pradesh", **Indian Journal of Agricultural Economics**, 28(4): pp.130-137, 1973.

[33] R.L. Sagar and M.K.Pal, "Farmers Perception on Plant Protection Problems and Their Suggestion for Increasing the Yield of Crops Under Jute Based Multiple Cropping System", **Pesticides Information**, 10(2): p.18, 1984.

[34] D.P. Agarwal and M.L.Jalan, "Marketing of Pesticides- A Case Study of Gorakhpur District", **Indian Journal of Marketing**, 16(12): pp.25-29, 1986.

Verma identified nine major constraints for slow adoption of pesticides such as lack of knowledge, not convinced by extension agency, high cost, untimely availability, lack of curiosity for spraying entire area, high cost of application, lack of finance, problems in preparation of correct solution and scarcity of labour[35].

High cost was the major impediment to the adoption of pesticides among small farmers[36].

Srivastava and Patel reported that farmers get substandard quality of product from local formulators. Non-availability of credit, shorter credit period and farmers illiteracy which leads to cheating by dealers are some problems in pesticide usage[37].

The farmers are also not able to recognise the pest attack and type of diseases in their crops[38].

Resistance to insecticides developed by pests, residues left by pesticides in food and destruction of

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[35]R.P.Verma, "Adoption of Cane Growers Towards Plant Protection Resources in Central Uttar Pradesh", **Pesticides Information**, 14(3): p.16, 1988.

[36]A.M.Mkhushk, S.M.Quyyam, B.H.Chakarani and A.H.Ansari, "The shocking Truth", **pakistan Agriculture**, 10(12): pp.44-47, 1988.

[37] and [38]U.K. Srivastava and N.T.Patel, "An Overview of Pesticide Industry in India", **Pesticide Information**, 13(4): pp. 19-28, 1988.

natural pest control agents are some of the problems in pesticide usage[39].

For this study, pesticide use refers to the quantity of pesticides used by farmers at various stages of crop growth to get rid of pest and disease infestation.

3. Buying behaviour

Buying behaviour is of immense significance both to the buyer and seller, for the former in satisfying his needs and for the later in catering the needs of his buyer and realising more profit. The buying behaviour of farmers with regard to pesticides involves a complicated series of stimulus response to many factors.

Narver and Savitt indicated that the process of buying behaviour either implicit or explicit, which every buyer went through in making a decision to accept or reject offerings to fulfill his needs. The process consisted of four sequential stages problem, recognition, search, choice and post-decision evaluation[40].

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[39] D.C. Apapilla, "The Pesticide Problem and Food", **Solidarity**, 115: pp.43-52, 1987.

[40] John C. Narver and Ronald Savitt, **The Marketing Economy, An Analytical Approach**, (New York: Holt, Rinchart and Winston Inc., 1971), p.4.

According to Metha, buying behaviour involved search of alternatives, evaluation of alternatives, choice decision and post-purchase feelings and reactions[41].

Walters[42] and Sivakumar[43] considered buying behaviour as the process wherein individuals decide whether, what, when, where, how and from whom to purchase goods and services.

According to Rao and Singh, buyers not only looked for what a product could do for them but also for what they meant[44].

In this study, buying behaviour refers to the factors which influence the farmers in purchase of pesticides, considering what, when, how and from whom they purchased, the impact of promotional efforts of the pesticide firms, private dealers and government extension agencies.

4. Brand and brand loyalty

Brand name has a significant influence on farmers purchase decisions and successful brands have proved better

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[41] Subash C. Metha, **Indian Consumers**, (New Delhi: Tata McGraw Hill Publishing Company Ltd., 1974), p.8.

[42] C. Glenn Walters, **Consumer Behaviour, Theory and Practice**, (Illinois: Richard D.Irwin Inc., 1974), p.7.

[43] S.D. Sivakumar, **Op. Cit.**, p.38, 1987.

[44] A.Nageswara Rao and J.J. Singh, **Op. Cit.**, pp.19-23, 1986.

income earners to many firms. Brand loyalty is an integral part of the buying behaviour and through this the buying behaviour could be explained.

Brand is a name, term, sign, symbol, design or combination of them which is intended to identify the goods and services of one seller group or group of sellers and to differentiate them from another[45].

A brand has both a name, by which it was called and often a mark, by which it was recognised visually. The brand name could communicate to retailers and consumers as what to expect from the product[46].

Brand was considered as an aggregate of all the characters of a product of a firm that enabled to differentiate it from the similar product of other firms[47].

Cunningham indicated that the manufacturers of branded goods expected their customers to be brand loyal and accept no substitute. He indicated that in many instances,

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[45] American Marketing Association, **Marketing Definition, A Glossary of Marketing Terms**, (Chicago: American Marketing Association, 1960), p.35.

[46] E. Branson Robert and Douglas G.Nowell, **Introduction to Agricultural Marketing**, (New York: McGraw Hill Book Company, 1983), p.351.

[47] R. Kannan, "An Analysis of Demand for FACT Fertilizer and Their Promotional Strategies", (Unpublished M.Sc.(Ag.) Thesis, Department of Agricultural Economics, Tamil Nadu Agricultural University, Coimbatore, 1991), p.11.

90 per cent or more of a family's purchases concentrated on a single brand over three years. 'Secondary loyalties' were also found to exist, while they were loyal to certain extent to one brand they also had a lesser degree of loyalty to another brand of the same product[48].

Padmaraj[49], Sivakumar[50] and Sankari[51] considered any farmer who purchased a particular brand for more than one year to be brand loyal.

Govindarajan identified that quality, availability of preferred brand, availability of alternate brand, advertisements, peer group influence and accalamatization to the brand were the factors contributing to the brand loyalty of farmers for a particular brand[52].

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[48]Ross M. Cunningham, **Brand Loyalty-What, Where and How Much**, (Boston: Harward Business Review, 1956), p.116.

[49]D.Padmaraj, "An Economic Analysis of Fertilizer Use and Fertilizer Buying Behaviour in Paddy Farms of Andhra Pradesh", (Unpublished M.Sc.(Ag.) Thesis, Department of Agricultural Economics, Tamil Nadu Agricultural University, Coimbatore, 1983), p.17.

[50]S.D.Sivakumar, "A Study on the Market Structure and Buying Behaviour of the Farmers With Reference to pesticides", (Unpublished M.Sc.(Ag.), Thesis, Department of Agricultural Economics, Tamil Nadu Agricultural University, Coimbatore, 1987), p.41.

[51]Sri Sankari, **Op. Cit.**, p.55, 1991.

[52]R. Govindarajan, "An Analysis of Cotton Seed Marketing and Farmers Buying Behaviour in Kamarajar District", (Unpublished M.Sc.(Ag.), Thesis, Department of Agricultural Economics, Tamil Nadu Agricultural University, Coimbatore, 1987), p.46.

To study the brand loyalty Sivakumar employed a linear multiple regression model. The factors such as price of the particular brand, quality of the brand, efficiency of the brand, advertisements and peer group influence were included as explanatory variables in the model[53].

For this study, brand refers to a name and symbol of the product which is seen visually and can be differentiated from similar products available in different purchasing points. If a farmer purchased a particular brand for more than one year he was considered as loyal to that brand.

5. Dealer loyalty

Dealer loyalty is another significant factor which influences the buying behaviour of farmers and through this the buying behaviour could be explained.

Kohls observed that location, brand, price, service and management were the key factors considered by most of the farmers while selecting their dealers[54].

According to Singh, nearness of the store, reputation of the store and acquaintance with store owner,

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[53] S.D. Sivakumar, **Op. Cit.**, p.60, 1987.

[54] R.L. Kohls, "Farmers Behaviour and Decisions in Purchasing Farm Supplies", Reviewed by Thomas F.Funk in **Farmer Buying Behaviour : An Integrated Review of Literature**, (Guelph: Society of Agricultural Economics and Extension Education, 1972), p.3.

good quality products, reasonable prices, better services play a significant role as the reason for store loyalty[55].

The major reasons for not loyal to a store were limited variety, bad behaviour of the salesman , higher prices and poor service. These factors lead customer to store switching[56].

The farmers purchased pesticides more often from private retailers and co-operative societies, than from government agencies[57].

The choice of agency was based on the provision of incentives in the form of subsidy[58].

Sankari identified that credit availability, distance from farm to dealer location, price of the product, peer group influence and availability of preferred brand were the factors contributing to the dealer loyalty of farmers[59].

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[55]and[56]Raghbir Singh, "Consumer's Store Loyalty and Preferences", **Indian Journal of Marketing**", 12(6 and 7): p.14, 1983.

[57]D.P. Agarwal and M.L. Jalan, **Op.cit.**,p.25,1986.

[58]S.R. Singh and Y.P.Singh, "Discriminating Factors in Selection of Plant Protection Equipments User's Survey", **pestology**, 10(2): pp.25-30, 1986.

[59]Sri Sankari, **Op. Cit.**, p.164, 1991.

Govindarajan used linear multiple regression model to study the dealer loyalty through price of cotton seeds, credit availability, faith with the dealer, availability of preferred variety, quality of seeds, peer group influence and distance from farm to seed depot[60].

To study the factors contributing to the dealer loyalty of the farmer, linear multiple regression model was used by Sivakumar. The factors considered for the study were price of the pesticides, credit availability, availability of preferred brand, customer service, discount, advertisement, distance from the farm and malpractices[61].

For this study, if a farmer made 75 per cent of his purchases from a particular dealer for more than one year, he was considered to be loyal to that dealer.

6. Market functionaries

Market functionaries were those engaged in marketing of products and were classified by the nature of functions they perform. For the present study, the concepts of wholesaler and retailer were reviewed briefly.

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[60]R. Govindarajan, **Op. Cit.**, p.46, 1987.

[61]S.D. Sivakumar, **Op. Cit.**,pp.62-63, 1987.

a. Wholesaler

Wholesalers are those who sell a product to a retailer for resale, perceive a product in terms of profits that may be gained by his retail customers[62].

Vachharajani defined the wholesalers as an institutional agency or private organisation. They may be one or more in a given area. They distribute principal products through a number of retailers, and in some cases, they also retail themselves[63].

Wholesalers are those engaged in selling goods or services to those who buy for resale or business use[64].

Wholesalers are any traders who buy from manufacturing firms and resell to the retailers[65].

For this study, wholesaler is any trader who bought from manufacturing firms and resold to the retailers.

b. Retailer

A retailer is one who operates an establishment that sells, merchandise, normally in small quantities to consumers[66].

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[62] Karl A. Elling, **Op. Cit.**, p.107, 1969.

[63] N.M.Vachharajani, **Hand Book of Fertilizer Marketing**, (New Delhi: The FAI, 1976), pp.135-147.

[64] Philip Kotler, **Principles of Marketing**, (New Delhi: Prentice Hall of India Private Limited, 1984), p.569.

[65] S.D. Sivakumar, **Op. Cit.**, p.23, 1987.

[66] Karl A. Elling, **Ibid.**, p.77, 1969.

Retailers are those engaged in selling goods or services directly to final consumers for their personal, non-business use[67].

The retailer was an intermediary who sold to the last man to consume. The cooperative societies and agricultural department depots also fall under this category[68].

Pesticide retailer is any trader whose primary sales volume was from selling pesticides to farmers for farm business use[69].

For this study, a retailer refers to any trader who sells goods directly to end users in variable quantities.

7. Promotion

Banks described promotion as all the activities designed to induce intermediate and ultimate consumers to buy a product or service other than normal sales call, media advertising and publicity[70].

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67 Philip Kotler, **Op. Cit.**, p.554, 1984.

68 S.D. Sivakumar, **Op. Cit.**, p.23, 1987.

69 Sri Sankari, **Op. Cit.**, p.54, 1991.

70 Seymour Banks, "Trends Affecting the Implementation of Advertising and Promotion", **Journal of Marketing**, 37(1): pp.19-28, 1973.

Stanton defined promotion as an exercise in information, persuation and communication and these three were interrelated[71].

For this study promotion includes all the promotional efforts carried out by the marketing firm such as advertising, sales promotion and publicities.

a. Advertising

American Marketing Association defined advertising as any paid form of nonpersonal presentation and promotion of ideas, goods and services by an identified sponsor[72].

Bansal defined advertising as a very visible form of marketing activity and one of utmost importance to many industries. It referred to mass communication given through paid media for the benefit of its sponsor[73].

Day found that advertising played an essential role in motivating the people and gaining acceptance of a new or established food product but word of

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[71] William J. Stanton, **Fundamentals of Marketing**, (New Delhi: McGraw Hill Book Company, 1984), p.431.

[72] Committee Reports: "Reports of the Definition Committee", **The Journal of Marketing**, 13(2): p.213, 1948.

[73] S.C. Bansal, "Advertising Expenditure: A Capital Expenditure, Some Empirical Observations", **Indian Journal of Marketing**, 13(6 and 7): pp.3-7, 1983.

mouth was needed to maintain interest and to effect purchase[74].

Yadav has conducted a study on different media preference for advertising. He concluded that among three media classes viz., printed, audio/audio visual and hoardings, audio/audio visual was very popular among the audiance[75].

Advertising would include any paid form of non-personal presentation of message regarding fertilizers by an identified sponsor using media such as leaflets, posters, newspapers and magazines, radio, television, wall painting, audio-visual films, etc[76].

Namasivayam reported that the socio-economic factors such as age, education, income influenced customers preference. The results indicated that uneducated persons preferred the media-T.V and cinema for soap advertisement.

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[74] S. Day, "Attitude Change, Media and Word of Mouth", **Journal of Advertising Research**, 2(12): pp.31-40, 1982.

[75] Pradeep Kumar yadav, "Advertising in Perspective-A Case Study", **Marketology**, 16(3): pp.31-33, 1984.

[76] R. Kannan, **Op. Cit.**, p.12, 1991.

Similarly the influence of income on advertisement media was studied and found that low income group people preferred cinema as a medium[77].

The advertising for the present study would include any paid form of non personal presentation of message regarding pesticides, using various media.

b. Personal selling

American Marketing Association defined personal selling as oral presentation in conversation with one or more prospective buyers for the purpose of making sales[78].

Personal selling consisted of individual personal communication in contrast to the mass, impersonal communication of advertising, sales promotion and other functional tools[79].

Kotler observed personal selling as an element of promotion mix which was very efficient in achieving marketing objectives and carrying out certain activities such as prospecting, communicating, selling, servicing, information gathering and allocation[80].

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77 Namasivayam, "Advertising Media Preference", **Indian Journal of Marketing**, 18(5-7): pp.23-28, 1988.

78 Committee Reports, **Op. Cit.**, p.213, 1948.

79 William J. Stanton, **Op. Cit.**, p.447, 1984.

80 Philip Kotler, **Op. Cit.**, p.502, 1984.

c. Publicity

American Marketing Association defined publicity as non-personal stimulation of demand for a product (or) service (or) business unit by planting commercially significant news about it in a published medium (or) obtaining favourable presentation of it upon radio, television (or) stage that is not paid for by the sponsor[81].

Publicity is a non-personal promotion that is not paid for by the organisation benefiting from it[82].

d. Sales promotion

Sales promotion is a short-term incentive to encourage purchase or sale of a product or service[83].

Stanton indicated that sales promotion was designed to supplement and co-ordinate personal selling and advertising efforts. Sales promotion included such activities as setting up store displays, holding trade shows and distributing samples, premium or "cent-off" coupons[84].

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81 Committee Reports, **Op.Cit.**, p.501, 1948.

82 William J.Stanton, **Op. Cit.**, p.674, 1984.

83 Philip Kotler, **Op. Cit.**, pp.428-429, 1984.

84 William J. Stanton, **Ibid.**, p.465, 1984.

Sales promotion are those sales activities that supplement both personal selling and marketing, co-ordinate the two, and help to make them effective for example, display[85].

For this study, sales promotion refers to the short term incentives offered to the dealers over and above the normal commission given for trading the product, and to farmers, free trials and demonstration, contests, exhibition etc.

e. Measurement of promotional effectiveness

Kotler argued that advertisers tried to measure the communication effect of promotional efforts i.e., its potential on awareness, knowledge, retention, recall, conviction, preference, image of the product, adoption, post adoption and satisfaction of that particular brand. Similarly the sales effect of promotional efforts measured changes in sales and cost of promotional efforts to total sales[86].

Desai concluded that measuring promotional effectiveness was more than merely measuring exposure of

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[85] J. Thomas Russell and Ronald Lane, **Op. Cit.**, p.371, 1990.

[86] Philip Kotler, **Op. Cit.**, pp.638-642, 1984.

cultivators to various promotional efforts. The effectiveness of promotional efforts should be judged in terms of the contribution of these efforts to growth in fertilizer sales[87].

Sane evaluated the sales promotion adopted by pharmaceutical companies for their veterinary products using weighted average ranking method. He concluded that Sarabhai Company was found to have highest average merit in all the criterion of marketing mix used namely product reliability, product availability, product price, frequency of sales man visit,free samples, gifts given, presentation and packaging of products[88].

A heuristic model was employed to measure the effectiveness of advertising. Every advertisement campaign would repay the company in terms of retaining the brand loyal customers and induce those customers loyalty to competitive brands to use their products[89].

Srinivasan studied the impact of promotional efforts of pesticide and fertilizer marketing firms on

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87 Gunvant M. Desai, "Measuring Promotional Effectiveness", **Fertilizer News**, 20(4): pp.3-9, 1975.

88 Ganpule Sane, "Evaluation of Sales Promotional Mix Adopted by Pharmaceutical Companies", **Indian Journal of Marketing**, 13(5): p.32, 1984.

89 Anonymous, "A Heuristic Model for Evaluating Advertising Effectiveness", **Indian Journal of Marketing**, 15(4): pp.21-23, 1984.

farmers with the help of multiple regression model. He constructed an index for promotional efforts by scoring different promotional techniques based on its merits. The scores of promotional techniques which convinced the farmers to use that particular brand were summed up. The percentage of this summed score to the total score was taken as the promotional index. He found that the promotional efforts had no significant impact on the farmers, but price of the product and area in which it was used were found to be significant[90].

Selvakumar studied the effectiveness of promotional efforts in marketing of fertilizers with the help of multiple regression model. He found that promotional index and packages were found to influence significantly the use of fertilizers at farm level[91].

Sivakumar identified credit with high interest, high price, distance from the farm, non availability of preferred brand, adulteration and limited stock were the problems expressed by the respondents in purchase of

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[90] A. Srinivasan, **Op. Cit.**, p.64, 1986.

[91] P.S. Selvakumar, "Study of Promotional Efforts of Neyveli Lignite Corporation Limited in Marketing of Urea and Buying Behaviour of Farmers Towards Fertilizer", (Unpublished M.Sc.(Ag.), Thesis, Department of Agricultural Economics, Tamil Nadu Agricultural University, Coimbatore, 1990), p.118.

pesticides from the private dealers by using Garett's Ranking Technique[92].

The effectiveness of promotional methods are estimated by linear multiple regression and the details are explained in the chapter-design of the study

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[92] S.D. Sivakumar, **Op. Cit.**, p.141, 1987.

DESIGN OF THE STUDY

CHAPTER III

DESIGN OF THE STUDY

A brief description of the methodology followed in selection of study area, selection of sample respondents, method of collection of data and the various tools of analyses used are presented and discussed in this chapter.

Selection of study area and sampling procedure

Coimbatore district in Tamil Nadu was purposively selected as universe for this study considering the usage of pesticides in this district is relatively higher compared to all other districts. In the first stage, three blocks namely, Anaimalai, Udumalpet and Pollachi (South) were selected at random by arranging the names of the blocks in the district alphabetically. In the second stage, from each selected blocks four villages were selected at random in the same manner. Thus totally, twelve villages were selected for this study. Considering the objectives of the study, the sample includes farmers and dealers, who have greater influence in the farmer's decision making process. In the third stage, from each of the twelve selected villages, the list of farmers were arranged and ten farmers were randomly selected, with regard to dealers the list of pesticide dealers were obtained from the Assistant Director of

Agriculture and ten dealers were randomly selected from each block. Thus, 120 farmers and 30 dealers spread over in three blocks formed the sample for this study. The map of the study area is presented in figure 1.

Period of study

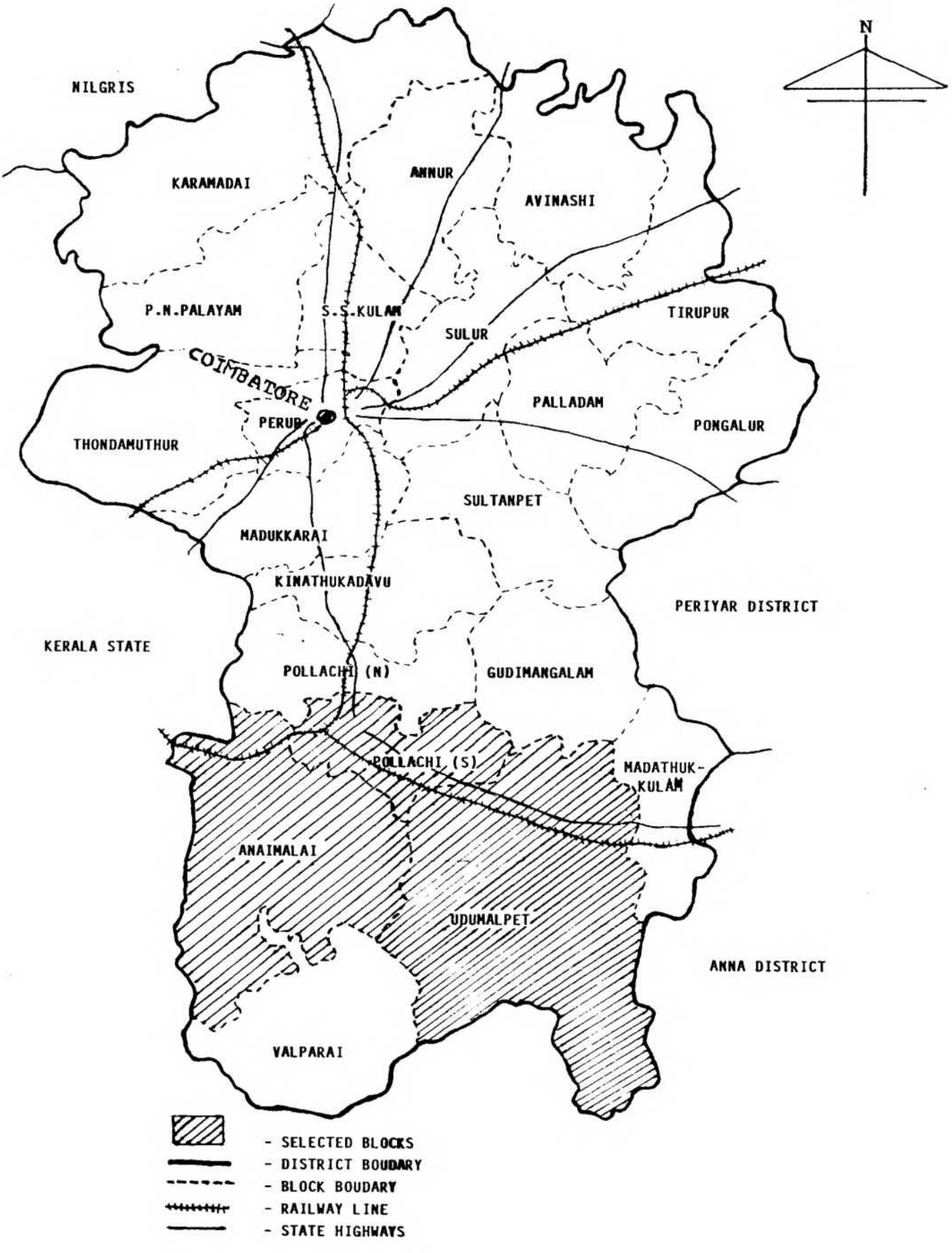
Field survey was conducted during the months of September and October 1993. The data and information collected were related to the agricultural year 1992-93.

Method of data collection

A reconnaissance survey of the area was undertaken to explore the possibility of conducting the study. Two different interview schedules were prepared based on the objectives of the study, one for the sample farmers and another for dealers of pesticides and used for collection of primary data. The information from the sample respondents was gathered by personally interviewing them. Primary data for the study covered the size of holding, educational status, land use pattern, cropping pattern, pesticide usage, purchase decisions, buying behaviour, brand awareness, impact of promotional efforts, etc., were collected by interviewing the farmers.

The objectives and scope of the study were first explained to them to win their co-operation. Even though the farmers of the study region did not maintain any farm

Fig.1 MAP SHOWING SELECTED BLOCKS IN COIMBATORE DISTRICT



records, they were able to furnish necessary information by memory recall and by virtue of their experience. From the selected dealers, information on product-line, experience in pesticide trade, sale of pesticides during the past years, purchase behaviour of farmers, brand image of pesticides as perceived by the farmers and promotional efforts of pesticide marketing firms, etc., were collected.

Secondary data on cropping pattern, soil type, land-use pattern, irrigation facilities etc., were gathered from the records of Agriculture and Statistical departments.

Method of analysis

The collected data were coded, processed, classified and fitted into tables to make the findings meaningful. These data were also subjected to both conventional and functional analysis.

Conventional analysis

Percentage analysis : Percentages were worked out to study the pattern of utilisation of pesticides at farm level, identify the number of farmers who bought from private dealers, agricultural depot and co-operative societies and the alternatives, i.e., how the farmers would choose in the absence of credit and in case of price rise in preferred brand. Percentages were also worked out to know the dealer

loyalty, brand loyalty, etc. Percentages were also worked out to know the awareness of promotional methods adopted by firms among the farmers.

Functional analysis

Linear multiple regression models were specified to analyse the factors influencing the brand loyalty, dealer loyalty of the farmers and effectiveness of promotional efforts in pesticides marketing on the farmers decision.

a. Brand loyalty : To study the various factors influencing the brand loyalty and their relative importance, a linear multiple regression model was specified as follows :

$$Y = b_0 + b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 + b_5x_5 + b_6x_6 + u$$

where,

Y = Brand loyalty

b_0 = Intercept

b_1 to b_6 = Coefficients to be estimated

x_1 = Price of the preferred pesticide in Rs. per 10 milli litres

x_2 = Efficiency of the brand

x_3 = Influence by advertisements

x_4 = Package of the brand

x_5 = Peer group influence

x_6 = Availability of preferred brand

u = Error term

If a farmer had been using a particular brand for more than one year, he was deemed to be loyal to the brand. A score of one was given to a farmer if he had used the brand for one year, if he had used for two years, a score of two was given and so on.

The independent variables x_2 to x_5 were measured using a four point continuous scale. The scores four, three, two and one were assigned to quantify highly satisfactory, satisfactory, moderately satisfactory and not at all satisfactory, respectively as expressed by the respondents.

Price of the preferred brand

The prices of similar group of pesticides from various firms varied and this variation would influence the choice of the brand made by the farmer. A farmer would use the same brand repeatedly only if he was satisfied with the price of that brand. Hence the actual price of the pesticide in rupees per 10 milli litres prevailing in the retail outlet was included.

Efficiency of the brand

The opinion of the farmers regarding the control of pests by a particular brand was considered as it was bound to influence his loyalty towards it. If the farmer found that a particular pesticide is efficient or more

effective in controlling the pest, then he considers the pesticide as an efficient one. Hence, the same was included as a variable in this model.

Influence by advertisements

The advertisements about their brands of pesticides by various firms and dealers would influence the farmers to a great deal while choosing a particular brand, hence the same had been included as a variable in this model.

Package of the brand

The good package and different sizes of package also influence the farmer's brand choice. Small and marginal farmers require small packages since they are cultivating smaller areas and they may not prefer purchase of a larger package. Hence the same was included as a variable in this model.

Peer group influence

The friends, neighbours, relatives, extension workers and others were presumed to have influenced significantly the brand choice of the farmers and hence the same was included as a variable in this model.

Availability of the preferred brand

The availability of the preferred brand at all times in the retail outlet in the same area would also influence the farmer's loyalty towards the brand. The easy availability of a brand will make the farmer's loyal towards it.

b. Dealer loyalty : To study the different factors that are influencing the dealer loyalty and their relative importance, a linear multiple regression model was specified as follows:

$$Y = b_0 + b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 + b_5x_5 + b_6x_6 + b_7x_7 + b_8x_8 + u$$

Where,

Y = Dealer loyalty

b_0 = Intercept

b_1 to b_8 = Coefficients to be estimated

x_1 = Credit availability, $D_1 = 1$, if credit was available, $D_1 = 0$, if credit was not available

x_2 = Quality of the product

x_3 = Availability of the preferred brand

x_4 = Price of the product

x_5 = Technical guidance/customer service

x_6 = Malpractices

x_7 = Peer group influence

x_8 = Advertisements

u = Error term

If a farmer, purchased from a particular dealer for more than one year, then he was considered as dealer loyal. A score of one was given to a farmer who had purchased from a dealer for one year, if he had purchased for two years, a score of two was given and so on.

The independent variables x_2 to x_8 were measured using a four point continuous scale. The scores four, three, two and one were assigned to quantify highly satisfactory, satisfactory, moderately satisfactory and not at all satisfactory.

Credit availability

Availability of credit facilities at the retail outlets found to influence the dealer loyalty positively among the farmers i.e., the farmers would be more loyal to a dealer who extends credit facilities through out the year. The amount and terms of credit offered were important to the farmers. The variable x_1 was represented as a dummy variable, specified as one if credit was available from that dealer and zero if credit was not available from that dealer.

Quality of the product

This refers to the availability of quality pesticides with a dealer. When the farmers feel that high

quality and efficient pesticides were sold by the dealer, then, they tend to remain loyal to that particular dealer.

Availability of preferred brand

Availability of preferred brand, timeliness, and adequacy of pesticides with a dealer made a farmer more loyal to the dealer.

Price of the product

The prices stated by different organisations in pesticide retailing varied and the farmer in his efforts to economise the expenditure on pesticides would become more loyal to a dealer who offers pesticide at a comparatively lower price.

Technical guidance/customer service

It includes the treatment given by the dealer to the customer, technical guidance in the form of solving the problems regarding pest control induces a farmer to remain loyal to the dealer. The farmer tend to be more loyal to a dealer who maintains a cordial and friendly relationship with his customers.

Malpractices

Adulteration, sale of expired pesticides, ill-filled containers, duplicate products, higher price were some of the common malpractices adopted by traders. The

farmers were disloyal to the dealers who were doing the above malpractices whenever they happen to know it.

Peer group influence

The friends, neighbours, relatives, extension officers and others were presumed to have influenced substantially for the preference of a particular dealer by the farmers and they were more loyal to those dealers.

Advertisements

Dealers, similar to pesticide firms advertise among the farmers for those products available at their sale point or retail outlet. This advertisements create an awareness among the farmers about the various products the dealer has got to offer, thereby making a farmer to go to a dealer for his purchases.

c. Effectiveness of promotional methods : To estimate the impact of promotional efforts on the farmer's decision, a linear multiple regression model of the following form was specified :

$$Y = b_0 + b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 + b_5x_5 + u$$

Where,

Y = Quantity of pesticide used for cotton in 10 milli litres

b_0 = Intercept

$b_1 tob_5$ = Coefficients to be estimated

x_1 = Price of pesticide in rupees per 10 milli litres

x_2 = Area under cotton in ha

x_3 = Quality of the pesticide used

x_4 = Promotional index i.e., Index of exposure to promotional efforts

x_5 = Price of output in rupees per quintal of kapas

u = Error term

The quantity of different pesticides used for cotton by the farmer in 1992-93 were summed up and expressed in 10 milli litres.

Price of pesticide

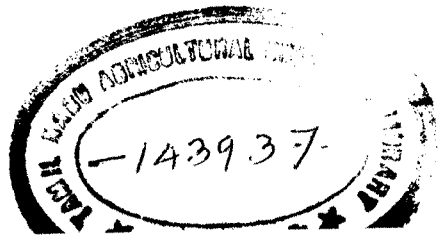
Price of pesticides per 10 milli litre prevailing in the retail outlet were calculated and expressed as a variable in rupees.

Area under cotton

Area in which cotton was grown was aggregated during 1992-93 and expressed in hectares. This variable was included based on the assumption that greater the area, greater would be the pesticide use.

Quality of the pesticides used

The quality of the pesticides used by a farmer for cotton crop was quantified into scores of four, three, two and one representing the highly satisfactory, satisfactory,



moderately satisfactory and not at all satisfactory levels respectively as expressed by the farmers.

Index of exposure to promotional efforts

To quantify this variable a scale was developed. Different promotional efforts were listed and given scores. The scores thus obtained were listed below :

	Scores
Demonstration	6
Film shows	5
Media advertising	4
Wall painting	3
Leaflets	2
Personal selling	1

The different promotional efforts which convinced the farmers were considered and the scores were summed and divided by total score 21, and expressed in percentage. The promotional index in the above method was prepared for each farmer.

Price of output

The farmer would use more pesticides to prevent his crop from pest attack when he realises that the price of his produce is likely to increase. Hence if price of produce increases, the quantity of pesticide use will also tend to increase subsequently.

d. Garrett's ranking technique

To rank the problems encountered by the farmers in purchasing pesticides from different agencies like private dealers, department depots and co-operative societies, garrett's ranking technique was used. The order of merits assigned by the respondents 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 i th reason by j th individual

N_j = Number of reasons ranked by j th individual

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

DESCRIPTION OF THE STUDY AREA

CHAPTER IV

DESCRIPTION OF THE STUDY AREA

An understanding of the agro climatic and socio economic features such as soil type, topography, rainfall distribution, irrigation status, land use and cropping pattern of the study area would help to understand the decision making process of the farmers. Therefore, the agroclimatic features of the study area is presented in this chapter.

Location: The study was conducted in Anaimalai, Pollachi (South) and Udumalpet blocks in Coimbatore district. Anaimalai block is surrounded by Anaimalai reserve forest in the south , Kerala state in the north west, Pollachi (south) and Pollachi (north) blocks in the north and Udumalpet block in the east. The block comprises of 19 revenue villages with 86 hamlets and four town panchayats.

Pollachi (south) block is situated in southwestern part of Coimbatore district. The block has an elevation of 270.02 metres from mean sea level. The block comprises of 29 revenue villages, 26 village panchayats and three town panchayats.

Udumalpet block is situated in the southern most part of the Coimbatore district under the foot of the Anaimalai reserve forest. Its boundary touches Gudimangalam

block in the north, Pollachi (south) and Anaimalai blocks in the west,Valparai taluk in the south-west and Madathukkulam block in the east. The block comprises of 51 revenue villages,34 village panchayats and one town panchayat.

Demography:

The details of the demographic features of the selected blocks is presented in Table 2. According to 1991 census the total population of Anaimalai block was 120041 with 50.35 per cent males and 49.64 per cent females. The SC and ST population of the block was about 23 per cent of the total population. Among the total population 55870 persons were literates. The level of literacy was 61.29 per cent among males and 38.70 per cent among females. The agricultural population of the block sums upto 47.10 per cent to the total population (8752 cultivators and 47794 agricultural Labourers). There was 31125 households in this block.

As per 1991 census the total population of Udumalpet block was 131557 consisting of 67109 males and 64448 females. Among the total population 24.47 per cent were SC and ST . Among the population 48.34 per cent (63603) were literates . The literacy level was 62.25 per cent among males and 37.74 per cent among females. The agricultural population of the block was (53132) 40.38 per cent with

Table 2. Demographic features of the selected blocks

Particulars	Anaimalai block	Udumalpet block	Pollachi (South) block
Population			
Total population	120041 (100.00)	131557 (100.00)	58936 (100.00)
Males	60441 (50.35)	67109 (51.00)	30058 (51.00)
Females	59600 (49.64)	64448 (48.98)	28878 (48.99)
SC and ST	27501 (23.00)	32195 (24.47)	12760 (21.65)
Literacy			
Total literacy	55870 (46.54)	63603 (48.34)	30554 (51.84)
Male	34085 (61.29)	39593 (62.25)	18729 (61.29)
Female	21785 (38.70)	24010 (37.74)	11825 (38.70)
Agricultural Population			
Total agri-cultural population	56546 (47.10)	53132 (40.38)	24112 (40.91)
Cultivators	8752 (15.47)	12949 (24.37)	7153 (29.66)
Agricultural labourers	47794 (84.52)	40183 (75.62)	16959 (70.33)
Households			
Total number of households	31125 (25.92)	33551 (25.50)	14857 (25.20)

(Figures in the parentheses indicate percentages to total)

Source: National Informatic Centre, District Collectorate, Coimbatore.

12949 cultivators and 40183 agricultural labourers. The total number of households in this block was 33551.

According to 1991 census the total population of Pollachi (South) block was 58936 with 30058 males and 28878 females. The SC and ST population accounts for 21.65 per cent of the total population. The literacy level of the block was 51.84 per cent and it was 61.29 per cent among males and 38.70 per cent among females. The total agricultural population of the block was 24112 (40.91 per cent) consisting of 7153 cultivators and 16959 agricultural labourers. There was 14857 households in the block.

Rainfall

Rainfall is one of the important factor that influences the cropping pattern of the area. A farmer would give more attention to his crop during the crop stand based on the rainfall received during that period. The monthwise distribution of rainfall (1988-1992) of the three blocks are presented in Table 3, 4 and 5.

Anaimalai block has received an average rainfall of 693.08 mm. Of this 46 per cent (319.54 mm) was received during south-west monsoon, 29 per cent (200.83 mm) during north-east monsoon and summer showers contributes 22.28 per cent (154.46 mm). Udumalpet block has received an average

Table 3. Monthwise distribution of rainfall in Anaimalai block (1988-1992)

(mm)

Months	1988	1989	1990	1991	1992	Average
January	-	-	52.5	26.0	-	15.7
February	-	-	-	9.8	-	1.96
March	2.6	85	32.1	-	-	23.94
April	99.6	30	53.4	71.6	-	50.92
May	109	112.2	14.6	55.6	106.6	79.6
June	100.2	78.9	63.3	106.5	99.4	89.66
July	114.6	213	91.9	184.2	76.8	136.1
August	72	68.1	50.8	66.3	85.6	68.56
September	43.2	18.1	3.8	-	61.0	25.22
October	15.4	68.3	223.8	87.2	-	78.94
November	32.4	61.00	173.9	-	257.5	104.96
December	82.44	-	2.2	-	-	16.93
Total	671.44	734.60	762.3	607.2	689.9	693.08
Average	55.95	61.21	63.52	50.60	57.24	

Source : Records of Agricultural Officer, Anaimalai block.

Table 4. Monthwise distribution of rainfall in Udumalpet block (1988-1992)

(mm)

Months	1988	1989	1990	1991	1992	Average
January	-	-	209.2	3.0	-	42.44
February	-	-	-	-	-	-
March	4.2	34.4	2.5	-	3.0	8.82
April	3.4	43.4	34.80	69.0	7.0	28.64
May	2.1	45.7	19.4	104.6	162.0	66.76
June	0.5	1.8	6.4	58.8	101.0	33.70
July	3.1	107.2	9.4	93.0	56.0	53.74
August	0.5	7.4	9.0	11.4	-	5.66
September	0.4	70.8	10.8	27.0	237.2	69.24
October	2.7	160.8	188.8	233.0	57.0	128.46
November	2.6	143.7	161.2	96.0	20.0	84.7
December	0.5	16.8	9.8	-	-	5.42
Total	20.0	632.0	661.3	695.8	643.2	530.46
Average	1.67	52.67	55.11	57.98	53.60	

Source : Records of Agricultural Officer, Udumalpet block

Table 5. Monthwise distribution of rainfall in Pollachi (South) block (1988-1992)

(mm)

Months	1988	1989	1990	1991	1992	Average
January	-	-	66.0	22.0	-	17.6
February	-	-	4.0	-	-	0.8
March	10.0	86.0	88.0	58.0	-	48.4
April	195.4	30.0	47.0	72.0	31.2	75.12
May	114.0	100.0	74.0	72.6	147.8	101.68
June	42.4	78.2	98.0	84.0	201.4	100.8
July	146.0	148.4	88.9	254.4	108.9	149.32
August	66.0	123.0	78.0	43.4	78.0	77.68
September	32.4	24.0	2.0	11.8	50.0	24.04
October	19.0	155.0	246.6	81.4	39.6	108.32
November	47.4	48.0	157.0	-	218.4	94.16
December	10.0	2.0	8.0	-	-	4.0
Total	682.6	794.6	957.5	699.6	875.3	801.92
Average	56.88	66.21	79.79	58.3	72.94	

Source : Records of Agricultural Development Officer, Pollachi (South) block

rainfall of 530.46 mm. Of this 41 per cent (218.58 mm) has been received during north-east monsoon, 31 per cent (162.34 mm) during south-west monsoon and summer rainfall was 20 per cent (104.22 mm).

Pollachi (South) block has received an average rainfall of 801.92 mm. Of this 43.87 per cent (351.84 mm) was received during south-west monsoon, 25.75 per cent (206.48 mm) during north-east monsoon and summer rainfall was 28.08 per cent (225.2 mm).

Land use pattern

A study on the land utilisation pattern of the study area would indicate the scope if any, for better utilisation of land as well other associated inputs. The details of land utilisation pattern of the three blocks are presented in Table 6,7 and 8.

The total geographical area of Anaimalai block has declined to nearly half during the year 1989-90 mainly due to a drastic reduction in the area under forest because of reorganisation. The area under forest has declined from 30827 hectares to only 96 hectares in the year 1989-90. The other land use characteristics has not shown any noticeable change and almost same trend could be seen in barren and uncultivable land, land put to non-agricultural use, cultivable waste and lands under miscellaneous tree crops

Table 6. Land use pattern in Anaimalai block (ha)

Particulars	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92
Total geographical area	65570 (100.00)	65570 (100.00)	65570 (100.00)	34839 (100.00)	34839 (100.00)	34839 (100.00)
Area under forest	30827	30827	30827	96	96	96
Barren and uncultivated land	590	590	590	590	590	590
Land put to non-agrl. use	4400	4410	4410	4410	4410	4410
Cultivable waste	8	8	8	8	8	8
Permanent pasture and grazing lands	160	160	160	160	160	160
Land under miscellaneous trees and grooves	10	10	10	96	99	95
Current fallows	5679	5227	6615	6869	7283	6376
Other fallows	4	4	4	12	12	12
Net area sown	23892 (36.44)	24334 (37.11)	22946 (34.99)	22598 (64.86)	22181 (63.67)	23122 (66.37)
Area sown more than once	6720 (10.25)	6940 (10.58)	6237 (9.51)	6161 (17.68)	6076 (17.44)	6535 (18.76)
Gross cropped area	30612 (46.69)	31274 (47.70)	29183 (44.51)	28759 (82.55)	28759 (82.55)	29657 (85.13)

(Figures in the parentheses indicate percentages to total geographical area)

Source : Distict statistical office, Coimbatore.

Table 7. Land Use Pattern in Udumalpet block (ha)

Particulars	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92
Total geographical area	88148 (100.00)	88148 (100.00)	90056 (100.00)	89947 (100.00)	89947 (100.00)	89947 (100.00)
Area under forest	44904	44904	46780	46859	46858	46930
Barren and uncultivated land	1540	1540	1540	1540	1540	1540
Land put to non-agrl. use	6220	6707	6735	6754	6770	7050
Cultivable waste	110	81	91	82	69	69
Permanent pasture and grazing lands	-	-	-	-	-	-
Land under miscellaneous trees and grooves	23	22	22	32	31	16
Current fallows	6923	5692	11663	8646	8891	9892
Other fallows	148	-	-	-	2	136
Net area sown	28280 (32.08)	29202 (33.13)	23225 (25.79)	26034 (28.94)	25786 (28.67)	24314 (27.03)
Area sown more than once	2690 (3.05)	2782 (3.16)	2350 (2.61)	4512 (5.02)	2407 (2.68)	2570 (2.85)
Gross cropped area	30970 (35.13)	31984 (36.28)	25575 (28.40)	30546 (33.96)	28193 (31.34)	26884 (29.88)

(Figures in the parentheses indicate percentages to total geographical area)

Source : District statistical Office, Coimbatore.

Table 8. Land use pattern in Pollachi (South) block (ha)

Particulars	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92
Total geographical area	20638 (100.00)	20638 (100.00)	20638 (100.00)	20638 (100.00)	20638 (100.00)	20638 (100.00)
Area under forest	-	-	-	-	-	-
Barren and uncultivated land	-	66	75	75	75	60
Land put to non-agrl. use	3295	3295	3295	3295	3295	3305
Cultivable waste	2	2	2	2	2	2
Permanent pasture and grazing lands	13	13	13	13	13	13
Land under miscellaneous trees and grooves	6	6	6	5	15	17
Current fallows	3541	3655	4014	4705	4797	3751
Other fallows	-	-	-	-	-	-
Net area sown	13715 (66.46)	13592 (65.86)	13233 (64.12)	12543 (60.78)	12441 (60.28)	12490 (65.36)
Area sown more than once	1976 (9.57)	2066 (10.01)	2118 (10.26)	1401 (6.79)	2242 (10.86)	1722 (8.34)
Gross cropped area	15691 (76.03)	15658 (75.87)	15351 (74.38)	13944 (67.56)	14683 (71.15)	15212 (73.71)

(Figures in the parentheses indicate percentages to total geographical area)

Source : District statistical Office, Coimbatore.

and grooves. Current fallows and other fallows has shown a marginal increase over the years. The net area sown accounts for 34.99 per cent of the total geographical area in 1988-89 and due to a decrease in total geographical area it has increased to 64.86 per cent from 1989-90 onwards. The same trend was observed for area sown more than once. Gross cropped area accounts for 44.51 per cent in 1988-89 and increased to 85.13 per cent in 1991-92.

In Udumalpet block the total geographical area was 89947 ha in 1991-92 and the area under current fallows has increased from 6923 ha to 9892 ha during the reference period. Forest area and land put to non-agricultural use has shown a marginal increase over the years, whereas cultivable waste has declined from 110 ha to 69 ha. The net sown area in the block has decreased from 32.08 per cent in 1986-87 to 27.03 per cent in 1991-92 and area sown more than once accounts for about three per cent of the total geographical area. Land put to non-agricultural use accounts for eight per cent of the total geographical area. The gross cropped area accounts for around 30 per cent of the total geographical area in 1991-92.

In Pollachi (South) block 65.36 per cent of the total geographical area was accounted for net sown area and 8.34 per cent was accounted for area sown more than once.

Among the selected blocks, maximum gross cropped area in total geographical area of over 70 per cent was observed in this block. Since it is predominantly a sub urban area, the area under forest is nil and many other land use characteristics like cultivable waste are negligible.

Soils

The soil type in Anaimalai block is mostly sandyloam and red soils and gravelly soil in a limited area. In Udumalpet block the soil type constitutes a majority of red soil and rest is black cotton soil. In Pollachi (South) block, the major soil type ranges from black to red soil.

Irrigation

For intensive and extensive cultivation, adequate irrigation facilities are indispensible. Assured irrigation throughout the crop period encourages the farmers to follow improved cultivation practices, which consequently increases the scope for the pesticide use. The details on the source-wise irrigation for the selected blocks is presented in Table 9.

In Anaimalai block, Aliyar feeder canal, Aliyar old ayacut and Parambikulam main canal forms the major source of canal irrigation besides well irrigation to nearly 10,000 ha. In Udumalpet block, Amaravathi reservoir

Table 9. Source-wise area irrigated in the study area(ha)

Particulars	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92
Anaimalai block						
Canals	11541	9900	11171	11978	9202	9702
Tanks	147	126	249	250	250	498
Tube wells	-	6	8	10	10	15
Dug wells	7295	6550	8047	5480	8630	9037
Net area irrigated	6086	11549	12802	13284	12117	14123
Area irrigated more than once	6540	5153	5780	4432	5575	5675
Gross area irrigated	12626	16702	18582	17716	17692	19798
Udumalpet block						
Canals	13023	1238	10355	5867	10511	6129
Tanks	1197	2129	2090	1112	1450	1450
Tube wells	-	21	22	20	40	46
Dug wells	7320	12443	7216	14353	10269	10483
Net area irrigated	16009	12407	16951	16641	18569	18708
Area irrigated more than once	3251	3440	2595	4388	1444	4828
Gross area irrigated	19260	15847	19546	21029	20013	23536
Pollachi (South) block						
Canals	6429	3245	5933	1913	6217	6266
Tanks	31	-	-	99	72	72
Tube wells	-	-	-	-	-	-
Dug wells	4123	3719	44392	6324	1841	2699
Net area irrigated	8334	6272	7527	7591	7294	8426
Area irrigated more than once	1135	711	2817	873	1049	1916
Gross area irrigated	9469	6983	10344	8464	8343	10342

Source : District statistical Office, Coimbatore.

Project and Thirumoorthy dam of Parambikulam Aliyar project constitutes major source of irrigation besides 1450 tanks and nearly 10,000 wells. In Pollachi (South) block, Parambikulam Aliyar Project and Pollachi canals forms the major source of canal irrigation besides dug wells. The gross area irrigated was 19798, 23536 and 10342 ha in 1991-92 in Anaimalai, Udumalpet and Pollachi (South) blocks, respectively.

Cropping pattern

The crops and the varieties grown are important determinants of pesticide use. The cropping pattern in Anaimalai block is presented in Table 10. The major crop in Anaimalai block is paddy, since canal irrigation is available. Other major crops grown includes groundnut, cotton, coconut, cholam and other millets. It could be seen from the table, paddy occupied 19.38 per cent of the gross cropped area, groundnut 35.02 per cent, cotton 2.21 per cent and coconut 27.88 per cent of the gross cropped area respectively in 1991-92. Paddy and cotton had shown a reduction in area and groundnut and coconut area has increased. This indicates that in order to avoid risk, water problem, farmers are slowly changing their cropping pattern by growing coconut which involves minimum risk.

Table 10. Cropping pattern in Anaimalai block (ha)

Crop	1989-90	1990-91	1991-92	Mean
Paddy	6157 (21.40)	5754 (20.36)	5748 (19.38)	5886.33
Cholam	1107 (3.84)	1739 (6.15)	1574 (5.30)	1473.33
Other millets	1006 (3.49)	114 (0.40)	34 (0.11)	384.66
Pulses	678 (2.35)	1410 (4.98)	869 (2.93)	985.66
Vegetables	286 (0.99)	363 (1.28)	397 (1.33)	348.66
Fruit crops	470 (1.63)	459 (1.62)	491 (1.65)	473.33
Cotton	1109 (3.85)	825 (2.91)	657 (2.21)	863.66
Groundnut	9817 (3.41)	9889 (34.99)	10387 (35.02)	10031
Coconut	5306 (18.44)	6721 (23.78)	8270 (27.88)	6765.33
Other crops	2823 (9.81)	983 (3.47)	1230 (4.14)	1678.66
Net cropped area	22598 (78.57)	22181 (78.49)	23122 (77.96)	22633.66
Area sown more than once	6161 (21.42)	6076 (21.50)	6535 (22.03)	6257.33
Total cropped area	28759 (100.00)	28257 (100.00)	29657 (100.00)	288791

(Figures in parentheses indicate percentage to total cropped area).
Source : District statistical office, Coimbatore

Table 11. Cropping pattern in Udumalpet block (ha)

Crop	1989-90	1990-91	1991-92	Mean
Paddy	6431 (21.05)	5399 (19.15)	3055 (11.36)	496.16
Cholam	4967 (16.26)	3389 (12.02)	2248 (8.36)	3534.66
Maize	40 (0.13)	1906 (6.76)	2770 (10.30)	1572.00
Other millets	116 (0.37)	119 (0.42)	96 (0.35)	110.33
Pulses	4568 (14.95)	3593 (12.74)	3869 (14.39)	4010.00
Cotton	2846 (9.31)	1400 (4.96)	1346 (5.06)	1864
Groundnut	3094 (10.12)	3015 (10.69)	2024 (7.52)	2711
Coconut	4256 (13.93)	4105 (14.56)	4019 (14.94)	4126.66
Vegetables	1109 (3.63)	608 (2.15)	827 (3.07)	848
Fruit crops	517 (1.69)	362 (1.28)	216 (0.80)	365
Other crops	2602 (8.51)	4297 (15.24)	6414 (23.85)	4437.66
Net cropped area	26034 (85.22)	25786 (91.46)	24314 (90.44)	25378
Area sown more than once	4512 (14.77)	2407 (8.53)	2570 (9.95)	3163
Total cropped area	30546 (100.00)	28193 (100.00)	26884 (100.00)	28541

(Figures in parentheses indicate percentage to total cropped area)

Source : District statistical office, Coimbatore.

Table 12. Cropping pattern in Pollachi (South) block (ha)

Crop	1989-90	1990-91	1991-92	Mean
Paddy	290 (2.07)	190 (1.29)	221 (1.45)	233.66
Cholam	3436 (24.64)	1928 (13.13)	2461 (16.17)	2608.33
Other millets	39 (0.27)	195 (1.32)	273 (1.79)	169
Pulses	1140 (8.17)	1696 (11.55)	1902 (12.50)	1579.33
Cotton	1447 (10.37)	664 (4.52)	1183 (7.77)	1098
Groundnut	2045 (14.66)	4366 (29.73)	2754 (18.10)	3055
Coconut	5672 (40.67)	4927 (33.55)	5405 (35.53)	5334.66
Vegetables	296 (2.12)	248 (1.68)	463 (3.04)	335.66
Fruit crops	67 (0.48)	108 (0.73)	112 (0.73)	95.66
Other crops	488 (3.49)	361 (2.45)	438 (2.87)	429
Net cropped area	12543 (89.99)	12441 (84.73)	13490 (88.67)	12824.66
Area sown more than once	1401 (10.04)	2242 (15.26)	1722 (11.32)	1788.33
Total cropped area	13944 (100.00)	14683 (100.00)	15212 (100.00)	14613

(Figures in parentheses indicate percentage to total cropped area).
Source : District statistical office, Coimbatore.

In Udumalpet block, paddy, cotton, groundnut, maize and vegetables are the major crops in gardenlands, whereas small millets and pulses are cultivated in rainfed lands. It could be seen from the table11, paddy occupied 11.36 per cent of gross cropped area. Groundnut, cotton, coconut and pulses occupied 7.52 per cent, 5.06 per cent, 14.94 per cent and 14.39 per cent respectively in 1991-92. Maize crop has shown a sharp increase from 40 ha to 2770 ha in 1991-92. This indicates that farmers are preferring maize crop in this block. Area sown more than once has decreased from 4512 ha to 2570 ha and similarly the gross cropped area also decreased from 30546 ha to 26884 ha.

Coconut is the major crop in Pollachi (South) block and other crops like groundnut, paddy, cotton, pulses and vegetables are also grown in this block. It could be seen from the table12, paddy accounted for only 1.45 per cent of the gross cropped area and groundnut, cotton, coconut, pulses and vegetables accounts for 18.1, 7.7, 35.53, 4.5, and 3.04 per cent, respectively in 1991-92. Area under pulses and vegetables has shown a slight increase.

Marketing

There are three regulated market yards in the study area and they are located in Anaimalai, Udumalpet and Pollachi. The notified commodities in these markets are

groundnut, turmeric, paddy, cane jaggery, coconut, maize, chillies and onion. All the three blocks have weekly shandies in different days where farmers market their produce.

Banking and credit

Under the credit plan, loan facilities are extended for agricultural and allied activities, small scale industries, handlooms, village and cottage industries including self employment. In Anaimalai block there are 15 Primary Agricultural Credit Societies, six Commercial Banks, two Co-operative Agricultural Credit Societies and one Land Development Bank. These financial institutions meet the short-term and long-term credit needs of the farmers. In Udumalpet block, there are 21 Primary Agricultural Credit Societies, one Land Development Bank and eight Commercial bank branches functioning to cater the financial needs of the farmers. In Pollachi (South) block, there are nine Primary Agricultural Credit Societies, seven Commercial banks, one Land Development Bank and one Co-operative Agricultural Credit Society.

Infrastructural facilities

Almost all the villages in the selected blocks are well connected with a good work net work of road transport and communication facilities (post and telecommunications).

Other infrastructural facilities like primary health, electricity, educational institutions and veterinary hospitals are satisfactory in these three blocks.

Anaimalai block, has one consumer product market maintained by panchayat union to cater the needs of the consumers. Udumalpet block has one central warehouse with a capacity of 2500 metric tonnes to store the agricultural commodities, 43 milk producers co-operative society, one hill tribes labour contract society and six textile mills, 30 small spinning units are also functioning in this block. In addition, 50 small scale industries like cast iron workshops, ginning factories and rice mills are also present in this block. Pollachi (South) block has 31 milk producers co-operative societies and eight veterinary hospitals and one agricultural storage godown.

Pesticide marketing

For marketing of pesticides, private dealers, co-operative societies and agricultural depots plays a vital role. The use of pesticide by farmers depends on a large extent on dealers efficiency, their service, experience and credit extended by them.

Anaimalai block has one main agricultural depot, one sub-agricultural depot, two co-operative societies and 30 private dealers for pesticide marketing. They meet the

pesticide needs of the farmers. Udumalpet block has 28 private dealers, one main agricultural depot, one sub-agricultural depot and 11 co-operative societies to meet the plant protection requirements of the farmers. In Pollachi (South) block, 38 private dealers, three co-operative societies, one main agricultural depot and one sub-agricultural depot are engaged in pesticides marketing.

The private dealers offer credit facilities to their regular and well known customers. In department depots credit facilities are not entertained but pesticides are sold at subsidised rates. In the case of co-operative societies, pesticides are supplied as a part of the loan and this was mostly availed by members who obtained loan from the society.

RESULTS AND DISCUSSION

CHAPTER V

RESULTS AND DISCUSSION

The information gathered from the sample respondents were tabulated, processed and analysed statistically. The findings of the study are presented and discussed in this chapter under the following sections:

i. general characteristics of the sample farmers,

ii. general characteristics of the sample dealers,

iii. pesticide use pattern of the sample farmers,

iv. buying behaviour of the farmers,

v. effectiveness of promotional efforts in marketing of pesticides

vi. problems faced by farmers in buying pesticides.

i. General characteristics of the sample farmers

The general characteristics of the sample farmers of Anaimalai, Udumalpet and Pollachi (South) blocks are discussed below. The quantum of pesticides used by the sample farmers in three were subjected to "Analysis of Variance" and the results showed significance among the blocks. Hence further analyses and discussions were carried out block wise.

Education level: The education level of the farmers had a positive influence on the level of adoption of various

modern practices and innovations including the pesticide usage. The farmers were classified into , illiterate, elementary education level, high school education level and college education level and the details are furnished in Table 13.

Table 13. Educational status of the sample farmers (Number)

Educational Status	Anaimalai	Udumalpet	Pollachi (South)	Total
Illiterate	8 (20.00)	7 (17.50)	8 (20.00)	23 (19.18)
Elementary	11 (27.50)	9 (22.50)	8 (20.00)	28 (23.33)
High School	18 (45.00)	22 (55.00)	21 (52.50)	61 (50.83)
College	3 (7.50)	2 (5.00)	3 (7.50)	8 (6.66)
Total	40 (100.00)	40 (100.00)	40 (100.00)	120 (100.00)

(Figures in the parentheses indicate percentages to the total)

The table revealed that, 45 per cent of Anaimalai farmers, 55 per cent of Udumalpet farmers and 52.50 per cent of the Pollachi (South) farmers have high school education. While 27.50, 22.50 and 20 per cent of the Anaimalai, Udumalpet and Pollachi (South) farmers, respectively, have elementary education. Twenty per cent of

Anaimalai and Pollachi (South) farmers and 17.50 per cent of Udumalpet farmers were illiterate and only 7.50 per cent of Anaimalai and Pollachi (South) farmers and 5 per cent of Udumalpet farmers have collegiate education. On an average, nearly half of the sample farmers (50.83 per cent) have high school education, followed by elementary education (23.33%) and collegiate education (6.66%). So it is clear that 80.82 per cent of the sample farmers were literate and only 19.18 per cent of the sample farmers were illiterate. The high literacy level in all the three blocks might have favourable influence on the awareness and pesticide use pattern.

Farming experience of the respondents : The number of years of experience in farming would have positive influence on the adoption of different improved technologies, particularly the plant protection measures. The details on the farming experiences of the respondents in the study area is presented in Table 14.

It could be seen from the table, that 42.50 per cent of the sample farmers had more than 20 years of farming experience, and 33.33 per cent had 10-20 years of farming experience. Among the blocks, the respondents in Udumalpet have comparatively more farming experience (50 per cent) than their counterparts in Pollachi (South) and Anaimalai blocks. Ten to twenty years of farming experience was

highest in Anaimalai block, with 37.50 per cent of the respondents and for less than ten years of farming experience it was in Pollachi (South) block with 30.00 per cent of the respondents.

Table 14. Farming experience of the respondent farmers (Number)

Block	Less than 10 years	10 year and above but less than 20 years	Above 20 years	Total
Anaimalai	10 (25.00)	15 (37.50)	15 (37.50)	40 (100.00)
Udumalpet	7 (17.50)	13 (32.50)	20 (50.00)	40 (100.00)
Pollachi (South)	12 (30.00)	12 (30.00)	16 (40.00)	40 (100.00)
Total	29 (24.16)	40 (33.33)	51 (42.50)	120 (100.00)

(Figures in parentheses indicate percentages to total)

Size of holdings: In general,the buying behaviour of the sample farmers with respect to agricultural inputs is influenced mostly by the farm size, nature of the land and types of crops grown. The details on average size of holdings and nature of land in the study area are furnished in Table 15.

Table 15. Average size of sample farms in the study area (ha)

Type of land	Anaimalai	Udumalpet	Pollachi (South)
Wet land	1.61	0.24	0.20
Garden land	1.00	1.82	1.27
Dry land	0.13	0.20	0.72
Total	2.74	2.26	2.19

It could be seen from the table, that the average size of holdings worked out to 2.74 ha in Anaimalai block, 2.26 ha in Udumalpet block and 2.19 ha in Pollachi (South) block. Among the blocks, the maximum size of holding in wet land was observed in Anaimalai block (1.61 ha), garden land in Udumalpet block (1.82 ha) and dry land in Pollachi (South) block (0.72 ha) respectively. Thus, it is clear that Anaimalai block has immense potential to use pesticides for the wetland crops and Udumalpet and Pollachi (South) blocks have greater potential to use pesticides for the garden land crops.

Availability of sprayers in sample farms : The availability of sprayers in the farms itself has got a significant bearing on the timely application of pesticides and the quantum of pesticides applied. The details on availability of sprayers in sample farms are presented in Table 16.

Table 16. Availability of sprayers in sample farms
(Number of farmers)

Block	Owned	Hired	Total
Anaimalai	8 (20.00)	32 (80.00)	40 (100.00)
Udumalpet	7 (17.50)	33 (82.50)	40 (100.00)
Pollachi (South)	6 (15.00)	34 (85.00)	40 (100.00)
Total	21 (17.50)	99 (82.50)	120 (100.00)

(Figures in the parentheses indicate percentages to total)

The table showed that only 17.50 per cent of the farmers owned sprayers and majority of the farmers (82.50 per cent) are hiring the sprayers whenever they are in need. A maximum of 34 farmers (85.00 per cent) in Pollachi (South) block hired sprayers and the minimum was in Anaimalai block with 32 farmers (80.00 per cent). A maximum of only 8 farmers (20.00 per cent) in Anaimalai block have owned sprayers and the minimum was observed in Pollachi (South) block with 6 farmers (15.00 per cent).

Cropping pattern : The cropping pattern of the sample farms in three blocks showed the crops grown and it influences the choice of pesticide application. A diverse variety of crops

were grown in the three blocks. The details on the crops grown in the sample farms are given in the Table 17.

Table 17. Cropping pattern in the study area for 1992-93 (ha)

Crops	Anaimalai		Udumalpet		Pollachi (South)	
	Area in ha	% to GCA	Area in ha	% to GCA	Area in ha	% to GCA
Paddy	66.30	46.04	7.60	5.75	8.40	8.07
Cholam	9.42	6.54	3.10	2.35	2.80	2.69
Maize	5.84	4.05	10.44	7.89	1.86	1.79
Cotton	7.63	5.29	41.01	31.03	10.72	10.30
Ground -nut	18.80	13.05	20.57	15.56	52.43	50.38
Coconut	15.24	10.58	9.26	7.01	22.50	21.62
Pulses	10.98	7.62	38.20	28.90	0.70	0.67
Other crops	9.79	6.79	2.00	1.51	4.66	4.48
Gross Cropped Area (GCA)	144.00	100.00	132.18	100.00	104.07	100.00

It could be seen from the table, that paddy is the major crop in Anaimalai block with 46.04 per cent of gross cropped area followed by groundnut and coconut with 13.05 per cent and 10.58 per cent, respectively. Similarly cotton is the major crop in Udumalpet block with 31.03 per cent of gross cropped area followed by pulses and groundnut with 28.90 per cent and 15.56 per cent, respectively. In Pollachi (South) block, groundnut was the major crop with

50.38 per cent of the gross cropped area followed by coconut and cotton with 21.62 per cent and 10.30 per cent of the gross cropped area, respectively. So the major crops in the study area were paddy, cotton, groundnut, pulses and coconut. The pesticide use was comparatively more for cotton, paddy and groundnut crops.

Cropping intensity : Cropping intensity is a measure of land use efficiency as it shows the percentage of gross cropped area to net cropped area. If the land is put to continuous cropping, it invites more pest infestation and hence influences the pesticide use. Cropping intensity of the sample farms is presented in Table 18.

Table 18. Cropping intensity of the sample farms (ha)

Particulars	Anaimalai	Udumalpet	Pollachi (South)
Net cropped area	80.80	91.40	74.20
Area cropped more than once	63.20	40.78	29.87
Gross cropped area	144.00	132.18	104.07
Cropping intensity (percentage)	178.21	144.62	140.25

It could be noticed from the table, highest cropping intensity was in Anaimalai block (178.21 per cent) followed by Udumalpet block (144.62 per cent) and Pollachi

(South) block (140.25 per cent). This was mainly due to the fact that gross cropped area was more in Anaimalai block because of assured irrigation through canals, followed by Udumalpet and Pollachi (South) blocks. The net cropped area was maximum in Udumalpet block (9.40 ha) followed by Anaimalai (80.80 ha) and Pollachi (South) blocks (74.20 ha). The low cropping intensity restricted the pesticide usage in general.

ii. General characteristics of the sample dealers

The product lines, business experience in pesticide sales, brands maintained and promotional strategies followed by the sample dealers are analysed and discussed.

Product Mix: The product lines dealt by the sample dealers were analysed and the results are presented in Table 19.

It could be seen from the table, 20 per cent of Anaimalai block sample dealers dealt with pesticides and fertilizers, 40 per cent with pesticides and seeds and another 40 per cent with pesticides, fertilizers and seeds, while none of them dealt with pesticides alone and pesticides along with fertilizers, seeds and agricultural implements. In the case of Udumalpet block, 70 per cent of the sample dealers dealt with pesticides, seeds and

Table 19. Product lines of sample dealers (Number)

Product line	Anaimalai	Udumalpet	Pollachi (South)	Total
Pesticides	-	1 (10.00)	1 (10.00)	2 (6.66)
Pesticides & fertilizers	2 (20.00)	-	-	2 (6.66)
Pesticides & seeds	4 (40.00)	2 (20.00)	6 (60.00)	12 (40.00)
Pesticides, fertilizers & seeds	4 (40.00)	7 (70.00)	2 (20.00)	13 (43.33)
Pesticides, fertilizers, seeds and Agrl. Implements	-	-	1 (10.00)	1 (3.33)
Total	10 (100.00)	10 (100.00)	10 (100.00)	30 (100.00)

(Figures in parentheses indicate percentages to total)

fertilizers, 10 per cent with pesticides alone and 20 per cent with pesticides and seeds, while none of them were dealing with the pesticides and fertilizers, and pesticides along with fertilizers, seeds and agricultural implements. In Pollachi (South) block, 60 per cent of dealers dealt with pesticides and seeds, 20 per cent with pesticides, fertilizers and seeds, and 10 per cent dealers each with pesticides alone and pesticides, fertilizers, seeds and agricultural implements. As a whole, 43.33 per cent of

dealers in the study area dealt with pesticides, fertilizers and seeds, 40 per cent of dealers with pesticides and seeds, 6.66 per cent with pesticides and fertilizers, while 6.66 per cent dealers dealt with pesticides alone and remaining 3.33 per cent dealers dealt pesticides along with fertilizers, seeds and implements. Thus the sample dealers had a considerable product mix and almost 94 per cent of them were dealing with two or more product lines so as to sustain their income level and also to satisfy the customer requirements as well as to attract farmers.

Business experience: The details on the business experience of dealers in pesticide sales are analysed and presented in Table 20.

Table 20. Business experience of sample dealers (Number)

Experience	Anaimalai	Udumalpet	Pollachi (South)	Total
Less than 10 years	3 (30.00)	5 (50.00)	2 (20.00)	10 (33.33)
10 to 20 years	5 (50.00)	4 (40.00)	4 (40.00)	13 (43.33)
Above 20 years	2 (20.00)	1 (10.00)	4 (40.00)	7 (23.33)
Total	10 (100.00)	10 (100.00)	10 (100.00)	30 (100.00)

(Figures in the parentheses indicate percentages to total)

It could be seen from the table, 40 per cent of the sample dealers in the Pollachi (South) block has a maximum business experience of over 20 years, whereas in Anaimalai block, a maximum of 50 per cent dealers had 10 to 20 years of business experience in pesticide sales and in Udumalpet a maximum of 50 per cent sample dealers had less than 10 years of business experience in pesticide sales. Among the total dealers in all the three blocks, a majority of them had an experience of 10 to 20 years in pesticide sales (43.33 per cent), followed by 33.33 per cent dealers with less than 10 years experience and 23.33 per cent dealers with very rich experience of over twenty years in pesticides marketing.

Brand: Sample dealers were enquired about the different brands dealt by them in pesticides (product line). The details of different pesticides dealt by dealers are presented in Table 21.

It could be seen from the table, that more than 20 sample dealers dealt with products like Dimercron, Nuvocron, Rogor and Ekalux, marketed by Ceiba, Rallis and Sandoz. These products could be considered as fast moving products among the sample dealers and it was learnt from discussion with the sample dealers that large quantities of these products were sold by each dealer every year. The products

Table 21. Number of dealers dealing different pesticides

Products	Brand	Anaimalai	Udumalpet	Pollachi (South)	Total
Dimecron	Ceiba	8	6	9	23
Nuvacron	Ceiba	7	8	6	21
Rogor	Rallis	5	13	2	20
Ekalux	Sandoz	7	7	6	20
Fenval	Searle	5	9	4	18
Cymbush	IEL	3	8	3	14
Dithane	Indofil	6	5	3	14
Metasystox	Bayer	3	6	4	13
Nuvan	Ceiba	6	3	3	12
Bavistin	BASF	4	3	3	10
Cuman L	Ceiba	3	4	3	10
Endosulfan	Parry	2	3	4	9
Monocil	Nocil	1	4	2	7
Thiodan	Hoechst	2	2	2	6
Suquin	Sudarshan	1	3	2	6
Sufos	Sudarshan	1	2	3	6

like Fenval, Cymbush, Dithane, Metasystox, Nuvan, Bavistin and Cuman L were dealt by more than ten sample dealers. The other products were dealt by only a few sample dealers in

all the three blocks and their volume was comparatively lower.

Promotional strategies of sample dealers: The promotional methods adopted by different dealers have got significant influence on the buying behaviour of the farmers and hence the same was analysed and the results are presented in Table 22.

Table 22. Promotional methods adopted by sample dealers

(Numbers)

Promotional method	Anaimalai	Udumalpet	Pollachi (South)	Total
Credit sales	8 (80.00)	6 (60.00)	7 (70.00)	21 (70.00)
Personal contact	7 (70.00)	8 (80.00)	5 (50.00)	20 (66.66)
Slides/Film show	5 (50.00)	7 (70.00)	6 (60.00)	18 (60.00)
Leaflets	6 (60.00)	6 (60.00)	5 (50.00)	17 (56.66)
Supplements	3 (30.00)	4 (40.00)	3 (30.00)	10 (33.33)
News paper advertisements	1 (10.00)	2 (20.00)	4 (30.00)	7 (23.33)
Discounts	1 (10.00)	3 (30.00)	1 (10.00)	5 (16.66)

(Figures in the parentheses indicate percentages to total dealers)

It could be seen from the table, that the credit sales (70 per cent), personal contact (66.66 per cent), slide show (60 per cent) and leaflets (56.66 per cent) were the most common methods employed by the dealers to attract customers. Around 80 per cent of the Anaimalai block dealers employed credit sales and 70 per cent employed, personal contact as effective promotional methods. In Udumalpet block, 80 per cent dealers employed personal contact and 70 per cent dealers employed slide/film show as effective promotional methods. In Pollachi (South) block, 70 per cent dealers employed credit sales and 60 per cent dealers employed slide/film show as effective promotional methods. Giving some kind of supplements, newspaper advertisements and discounts were also followed by the dealers to enhance the business.

The pesticide marketing firms are practicing various promotional efforts in order to influence their dealers and to push over the products among the farmers. They usually provide dealers' commission rebates, supplements, tour programmes, gifts etc., to encourage the dealers so as to purchase their products in large quantities. In addition, they are also conducting dealers meeting and training regularly to educate the dealers regarding correct usage of pesticides and other technical

matters. Since the dealers are the primary source of information on pesticide usage, quantity of application, compatibility of chemicals and other technical guidance to farmers, their level of knowledge on all these aspects are need to be increased. All the sample dealers also felt that besides giving higher commission rebates, conduct of dealers training at periodic interval would be more effective in enhancing their knowledge.

iii. Pesticides use pattern

The extent of usage of pesticides at farm level has got economic significance particularly in the case of cultivation of commercial crops. The extent of usage of pesticides by the sample farmers in the study area was assessed and the results are discussed below.

Level of knowledge on the use of pesticides : The knowledge on the use of pesticide is essential to increase the effectiveness of the pesticides applied. The details of level of knowledge on pesticides use by farmers is presented in Table 23.

It could be observed from the table, the Udumalpet block farmers were having a highest level of knowledge in using correct quantity of pesticides required for spray (67.50 per cent), time of spraying of the pesticides (47.50

Table 23. Level of knowledge of sample farmers on pesticide use (Numbers)

Particulars	Anaimalai	Udumalpet	Pollachi (South)	Total
Time of spray	17 (42.50)	19 (47.50)	16 (40.00)	52 (43.33)
Quantity of spray	25 (62.50)	27 (67.50)	23 (57.50)	75 (62.50)
Spraying technique	8 (20.00)	7 (17.50)	7 (17.50)	22 (18.33)
Compatibility of chemicals	10 (25.00)	14 (35.00)	11 (27.50)	35 (29.17)

(Figures in parentheses indicate percentages to total farmers)

per cent) and in knowing the compatibility of chemicals (35 per cent) than their counterparts in other blocks. Among the blocks, the Anaimalai block farmers were having higher level of knowledge about the spraying technique of pesticides (20 per cent) than their counterparts in other blocks. The table also revealed that more than 62.50 per cent of the sample farmers had knowledge on the correct quantity of chemicals needed for spray, 43.33 per cent about the time of spray and 29.17 per cent about the compatibility of chemicals. A very low percentage (18.33) of farmers had knowledge on spraying technique and correct handling of pesticides in order to reduce the application loss. In general, most of the farmers

had little knowledge about the compatibility of chemicals to be sprayed for the type of pest prevailing in their crop. Low level of knowledge results in loss of applied chemicals and it also reduces the effectiveness of the chemicals.

Quantity of pesticides : A number of factors which determines the quantity of pesticides to be used were identified and the relative importance of the major factors as perceived by farmers were assessed and the results are presented in Table 24.

Table 24. Factors influencing the quantity of pesticides used by sample farmers

Factors	Anaimalai	Udumalpet	Pollachi (South)	Total
Type of pests	18 (45.00)	22 (55.00)	17 (42.50)	57 (47.50)
Intensity of pests and diseases	28 (70.00)	25 (62.50)	26 (65.00)	79 (65.83)
Stage of crop growth	20 (50.00)	18 (45.00)	21 (52.50)	59 (49.17)
Dealer recommendations	33 (82.50)	29 (72.50)	30 (75.00)	92 (76.67)
Department recommendations	18 (45.00)	16 (40.00)	15 (37.50)	49 (40.83)
Peer group influence	8 (20.00)	10 (25.00)	9 (22.50)	27 (22.50)

(Figures in parentheses indicate percentages to total farmers)

It could be noticed from the table, that dealer recommendations and intensity of pest and diseases were the major factors that influenced the quantity of pesticides used, accounting for 76.67 per cent and 65.83 per cent respectively. Stage of crop, type of pest and agriculture department recommendations influenced 49.17 per cent, 47.50 per cent and 40.83 per cent respectively. Peer group influence was the lowest among the different factors. In all the blocks, dealer recommendations and intensity of pest and diseases were the foremost factors influencing the quantity of pesticides used by farmers. The next important factors were stage of crop growth, type of pests, agriculture department recommendation and peer group influence in Anaimalai and Pollachi (South) blocks, whereas in Udumalpet block, the order of influence was type of pests, stage of crop growth, department recommendations and peer group influence. Hence, private dealers could influence to a great extent the pesticide use pattern among the farmers and the farmers tended to be loyal to those dealers who provided technical advice on all aspects of plant protection.

Pesticide application: Pesticides application at farm level particularly the quantity, time and method of application are very important. The results of the study relating to

average pesticides application by the sample farmers in the study area are presented in Table 25.

Table 25. Average application of pesticides for major crops

Crop		Quantity (ml/ha)		
		Anaimalai	Udumalpet	Pollachi (South)
Paddy	Dimecron	255.23	175.90	-
	Nuvacron	280.20	320.00	300.30
	Rogor	300.00	-	-
	Ekalux	950.00	-	720.00
	Dithane (gm)	600.50	-	650.00
	Endosulfan (gm)	-	620.00	-
	Nuvan	255.36	230.45	180.00
	Cuman L	-	205.65	200.40
Cotton	Ekalux	1780.50	2600.00	1380.00
	Metasystox	2125.00	-	-
	Sufos	950.00	1630.75	1500.00
	Suquin	1510.20	1860.50	1075.00
	Simper	870.50	1220.62	970.00
	Angush	1075.00	1250.25	980.88
	Cymbush	315.75	450.70	290.00
	Fenval	430.20	600.00	350.00
	Nuvacron	-	1700.00	-
	Rogor	-	1450.75	560.00
Groundnut	Ekalux	650.25	7220.00	810.75
	Bavistin (gm)	255.00	250.50	270.00
	Nuvacron	715.36	660.60	695.50
	Dithane (gm)	-	750.00	730.00
	Nuvan	230.60	-	-
	Rogor	290.00	250.75	315.25
Pulses	Nuvacron	730.50	820.00	690.65
	Ekalux	990.75	1195.00	-
	Simper	152.42	500.00	200.50
	Cymbush	-	172.00	110.00
	Sufos	-	1280.76	965.28
	Nuvan	-	300.50	-
	Rogor	520.00	-	720.60
	Fenval	-	-	200.00

It could be noticed from the table, the average pesticide application for paddy, was higher in Anaimalai than other blocks and for cotton it was higher in Udumalpet than in other blocks. Ekalux, Nuvacron, Rogor and Nuvan were the most common pesticides used by majority of the farmers in all the blocks. The average pesticide application for groundnut was higher in Pollachi (south) block than in other blocks. Among the different crops in the study area, the average pesticide application was highest for cotton followed by groundnut, paddy and pulses. The combination of different group of chemicals for the control of various pests depended on many factors such as type of pests, source of guidance and the financial soundness of the farmers. The variety used, the extent of irrigation and quantity of other associated inputs usage had greater impact on the quantum of pesticides used and the extent of plant protection measures. Apart from this, prevailing weather conditions also affected the quantum of pesticides used, as it influenced the pest infestation. Excessive use of these yield increasing inputs led to luxurious vegetative growth, inviting the pests, thereby warranting greater use of pesticides. Hence, timely and optimal application of pesticides resulted in effective control of pests and diseases.

The table also reveals that application of quite a number of pesticides by different farmers was observed among the cotton growers for the control of various pests particularly the bollworms. Further, the major reason attributed for not using the same pesticide for different rounds in cotton spray schedule, was the development of quick resistance by different pests against that particular pesticide. Among the various groups of pesticides, the organophosphorous compounds were used more initially, followed by synthetic pyrethroids in case of heavy pest infestation which resulted in resurgence of pests. For other crops like groundnut, paddy and pulses, the quantity of pesticides used was comparatively lower than cotton since pests and diseases attack on the above crops was not severe as on cotton. In pulses, when heavy infestation of pests occurred in early stages itself, farmers tended to apply large quantum of pesticides.

Frequency of plant protection measures: The details on the frequency of plant protection measures carried out by sample farmers in all the blocks for the major crops are given in Table 26.

Table 26. Frequency of plant protection for major crops (Number of sprays)

Block	Cotton	Paddy	Groundnut	Total
Anaimalai	8 (53.33)	4 (26.66)	3 (20.00)	15 (100.00)
Udumalpet	11 (64.70)	3 (17.64)	3 (17.64)	17 (100.00)
Pollachi (south)	5 (41.66)	3 (25.00)	4 (33.33)	12 (100.00)
Overall	8 (53.33)	3 (20.00)	3 (20.00)	15 (100.00)

(Figures in parentheses indicate percentages to total)

It could be seen from the table, on an average eight rounds of sprays were given by cotton farmers in the study area, three rounds of sprays by paddy farmers and also by groundnut farmers in the study area. Among the blocks, as high as 11 rounds of sprays were taken up by Udumalpet farmers followed by farmers of Anaimalai (eight rounds) and Pollachi (South) (five rounds) for cotton. For paddy, four rounds of sprays were taken by Anaimalai farmers followed by three rounds of sprays by Udumalpet and Pollachi (South) blocks. For groundnut, four rounds of sprays were taken up by Pollachi (South) farmers followed by three rounds of sprays by Anaimalai and Udumalpet farmers. The variety used, extent of irrigation and quantity of manures and fertilizers

used, had a significant impact on the quantum of pesticide used and the expenditure on plant protection. Also weather conditions, were known to influence the plant protection measures, hence, timely and optimal application of pesticides would result in better control of pest and disease infestation.

Expenditure on plant protection : The detail of expenditure on plant protection and its share to total cost of cultivation of major crops in the study area is presented in Table 27.

Table 27. Expenditure on plant protection and its share to total cost of cultivation (Rs./ha)

Block	Cotton		Paddy		Groundnut	
	EPP	TCC	EPP	TCC	EPP	TCC
Anaimalai	5365.80	16750.00	1130.00	8430.00	817.50	8115.65
	(32.03)	(100.00)	(13.40)	(100.00)	(10.07)	(100.00)
Udumalpet	6958.25	18320.00	728.00	7280.00	969.25	8082.47
	(37.98)	(100.00)	(10.00)	(100.00)	(12.00)	(100.00)
Pollachi (South)	4785.20	14960.00	607.62	6840.00	1206.30	8930.25
	(31.98)	(100.0)	(8.88)	(100.00)	(13.50)	(100.00)
Average	5703.08	16676.66	821.87	7516.66	997.91	8376.12
	(34.19)	(100.00)	(10.93)	(100.00)	(11.91)	(100.00)

EPP-Expense on plant protection; TCC- Total cost of cultivation
(Figures in parentheses indicate percentages to TCC)

It could be seen from table, that the average expenditure on plant protection in the study area was Rs.5703.08/ha for cotton which accounted for 34.19 per cent of total cost of cultivation, Rs.821.87/ha for paddy which accounted for 10.93 per cent of total cost of cultivation and Rs.997.91/ha for groundnut which accounted for 11.91 per cent of total cost of cultivation. Among the blocks, the expenditure on plant protection (Rs.6958.25) as well as total cost of cultivation for cotton crop (Rs.18320.00) was maximum in Udumalpet block when compared to other two blocks. For paddy, the expenditure on plant protection (Rs.1130) as well as on cost of cultivation (Rs.8430) was higher in Anaimalai block and for groundnut, the expenditure on plant protection (Rs.1206.30) as well as cost of cultivation (Rs.8930.25) was higher in Pollachi (South) block when compared to the rest of the blocks.

iv. Buying behaviour of farmers

The buying behaviour of the farmers has got a significant bearing on the marketing strategy planning by the pesticide firms. The buying behaviour of farmers has involved a complicated series of stimulus response to many factors which the pesticide firms are trying to identify. Some of them are discussed hereunder.

Sources of purchase: Farmers were usually purchasing pesticides from three different sources **viz.,** the private dealers, the agriculture department depots and the co-operative societies. The sources for the purchase of pesticides by sample farmers were critically analysed and the results are presented in Table 28.

Table 28. Sources for purchase of pesticides (Number of farmers)

Source	Anaimalai	Udumalpet	Pollachi (South)	Total
Private dealers	17 (42.50)	21 (52.50)	15 (37.50)	53 (44.17)
Department depots	10 (25.00)	7 (17.50)	9 (22.50)	26 (21.67)
Co-operative societies	1 (2.50)	2 (5.00)	1 (2.50)	4 (3.33)
Private dealers and department depots	11 (27.50)	8 (20.00)	12 (30.00)	31 (25.83)
Depots and co-operatives	1 (2.50)	-	-	1 (0.83)
Dealers and co-operatives	-	2 (5.00)	3 (7.50)	5 (4.17)
Total	40 (100.00)	40 (100.00)	40 (100.00)	120 (100.00)

(Figures in parentheses indicate percentages to total)

It could be seen from the table, that 83 sample respondents purchased their pesticides from single source only, and the remaining 37 farmers purchased them from more than one source. Majority of farmers preferred the pesticide purchases from private dealers (44.17 per cent) and 21.67 per cent farmers purchased from department depots. The co-operative society was least preferred by any group of farmers and only those farmers who were availing crop loans purchased from co-operatives both as single and more than one source of purchase. Agriculture department depots were preferred by 58 (48.33 per cent) sample farmers both as single and double sources of purchase. Among the blocks, Udumalpet farmers preferred private dealers as a source of purchase of pesticides to a greater extent (52.50 per cent) than those in other blocks, and the purchase from department depots was higher in Anaimalai (25 per cent) followed by Pollachi (South) farmers (22.50 per cent) and Udumalpet farmers (17.50 per cent). Purchase from double sources was higher among Pollachi (South) farmers (37.50 per cent) when compared to the farmers in the rest of the two blocks.

Terms of purchase : The terms of purchase refers to purchase of pesticides by means of cash or credit or by both. Availability of the alternatives at retail outlets has substantially influenced the loyalty of the farmers towards

dealers. The details on the terms of purchase of the farmers in the study area are presented in Table 29.

Table 29. Terms of purchase for pesticides by sample farmers (Number)

Terms of purchase	Anaimalai	Udumalpet	Pollachi (South)	Total
By cash	6 (15.00)	8 (20.00)	9 (22.50)	23 (18.30)
By credit	13 (32.50)	9 (22.50)	8 (20.00)	30 (25.00)
By cash and credit	21 (52.50)	23 (57.50)	23 (57.50)	67 (55.83)
Total	40 (100.00)	40 (100.00)	40 (100.00)	120 (100.00)

(Figures in parentheses indicate percentages to total)

More than half of the sample farmers purchased pesticides by cash and credit (55.83 per cent) followed by credit alone (25 per cent) and by cash alone (18.30 per cent). Majority of farmers in Pollachi (South) purchased by the pesticides by cash alone (22.50 per cent) when compared to Udumalpet (20.00 per cent) and Anaimalai farmers (15.00 per cent). In Anaimalai block most of the farmers purchased them by credit alone (32.50 per cent) when compared to Udumalpet (22.50 per cent) and Pollachi (South) farmers (20.00 per cent). In all the blocks, majority of farmers

purchased pesticides by means of cash and credit, 52.50 per cent by Anaimalai farmers and 57.50 per cent each by Udumalpet and Pollachi (South) farmers. Thus, purchase by means of both cash and credit was predominant among the sample farmers in all the blocks. From this, it could be inferred that extension of credit facilities by the dealers would enable them to attract more and more customers.

Choice of alternatives in the absence of credit sales : Majority of farmers purchase pesticides by means of credit alone or credit and cash. In case of non-availability of credit sales with a particular dealer, the farmers choice of various alternatives available to them were identified and presented in Table 30. If the farmer experiences non-availability of credit sales with a particular dealer, then he has few options like switching over to another dealer who provides credit, availing credit from other sources like friends, money lenders etc., to meet the expenses and to reduce the quantity of pesticides applied.

The results revealed that 60.00 per cent of farmers switched over to another dealer who provided credit, when credit facilities were not offered by the present dealer. A very less percentage (11.67) of the sample farmers were ready to reduce the quantity of pesticides to be applied. The farmers who could neither switch over to other

Table 30. Choice of alternatives if credit sales are not available to farmers (Number of farmers)

Factors	Anaimalai	Udumalpet	Pollachi (South)	Total
Switch over to a dealer who provides credit	23 (57.50)	25 (62.50)	24 (60.00)	72 (60.00)
Credit from others	13 (32.50)	10 (25.00)	11 (27.50)	24 (28.33)
Reduce the quantum of application	4 (10.00)	5 (12.50)	5 (12.50)	14 (11.67)
Total	40 (100.00)	40 (100.00)	40 (100.00)	120 (100.00)

(Figures in parentheses indicate percentages to total)

dealers nor reduce the quantum of pesticides application was accounted to an extent of 28.8 per cent, but they could prefer to borrow from others in order to meet their expenses. This showed that farmers were very sensitive to the availability of credit at retail outlets. Anaimalai farmers to the tune of about 57.5 per cent could like to switch over to a dealer who gave credit as an alternative and 32.50 per cent might obtain credit from others, only 10 per cent would reduce the quantum of pesticide application. The same trend was observed in other two blocks also. Among

the blocks, switching over to other dealer was observed to be highest in Udumalpet block (62.50 per cent), borrowing from others was highest in Anaimalai block (32.5 per cent) and reducing the quantum of pesticides was highest in Udumalpet and Pollachi (South) blocks (12.50 per cent each).

Sources of information for selection of brand: A farmer selects a particular brand from the information he has got through various sources. The aspects on sources of information for selection of brand were analysed and the results are presented in Table 31.

Table 31. Sources of information for selection of brands (Number of farmers)

Sources	Anaimalai	Udumalpet	Pollachi (South)	Total
Private dealers	17 (42.50)	19 (47.50)	16 (40.00)	52 (43.33)
Extension workers	21 (52.50)	18 (45.00)	17 (42.50)	56 (46.67)
Media adverti-sements	16 (40.00)	16 (40.00)	15 (37.50)	47 (39.17)
Neighbours and friends	10 (25.00)	11 (27.50)	8 (20.00)	29 (24.17)
Company represen-tatives	5 (12.50)	6 (15.00)	4 (10.00)	15 (12.50)

(Figures in parentheses indicate percentages to total sample farmers)

Among the different sources, extension workers (46.67 per cent), private dealers (43.33 per cent) and media advertisements (39.17 per cent) formed the major sources of information for selection of brands and guided the farmers, followed by neighbours and friends (24.17 per cent) and company representatives (12.50 per cent). In Anaimalai and Pollachi (South) block extension workers (52.5 per cent) and (42.5 per cent); private dealers (42.5 per cent and 40.00 per cent) and neighbours and friends (25 per cent and 20 per cent) formed the major sources of information for selection of brands. In Udumalpet block, private dealers advice (47.50 per cent) was the major source of information followed by other sources like extension workers (45 per cent), media advertisements (40 per cent) and neighbours and friends (27.5 per cent).

The training and visit system enabled the extension workers to meet a large number of farmers and advice them on various aspects related to cultivation of crops including plant protection measures. They also suggested appropriate brands for control of specific pests, which the farmers tend to buy. The farmers who were loyal to dealers also relied on them in brand selection. This study clearly showed that both personal contact through appropriate persons and advertising in popular media could

help the pesticide marketing firms to popularise their brands among the farmers.

Price and the farmer behaviour: The price of the particular brand has got significant influence on the farmers buying behaviour. The response of sample farmers for increase in prices of the preferred brand was enquired and the results are presented in Table 32.

Table 32. Responses to price changes in preferred brand

(Number of farmers)

Factors	Anaimalai	Udumalpet	Pollachi (South)	Total
Same brand & same quantity	27 (67.5)	20 (50.00)	18 (45.00)	65 (54.17)
Same brand & reduced quantity	4 (10.0)	5 (12.50)	7 (17.50)	16 (13.33)
Switch over to low priced brands	9 (22.5)	15 (37.5)	15 (37.50)	39 (32.50)
Total	40 (100.00)	40 (100.00)	40 (100.00)	120 (100.00)

(Figures in parentheses indicate percentages to total)

From the table, it could be observed that when the price of the preferred brand increased, 67.5 per cent of Anaimalai farmers, 50 per cent Udumalpet farmers and 45

per cent Pollachi (South) farmers responded that they would buy the same brand and same quantity, while 22.5 per cent of farmers in Anaimalai, 37.5 per cent each in Udumalpet and Pollachi (South) farmers responded that they would switch over to some other low priced brands. Only 10 per cent in Anaimalai, 12.5 per cent in Udumalpet and 17.5 per cent of farmers in Pollachi (South) responded that they would like to buy the same brand by reducing the quantity. The farmers in Pollachi (South) and Udumalpet blocks were more sensitive to price changes than their counterparts in Anaimalai block.

Brand and dealer loyalty among farmers: The brand and dealer loyalty of the farmers are the two important aspects which influences the farmers buying behaviour. The dealers use several strategies to attract the farmers and make them loyal in order to promote sales. In the same way the pesticide firms also try to secure the loyal farmers towards their brands by various means of promotional strategies, highlighting the merits of their brands. The data gathered on brand and dealer loyalty of the farmers were analysed and presented in Table 33.

Table 33. Brand and dealer loyalty of sample farmers

(Number of farmers)

Loyalty	Anaimalai	Udumalpet	Pollachi (South)	Total
Dealer loyal only	20 (50.00)	18 (45.00)	20 (50.00)	59 (49.17)
Brand loyal only	9 (22.50)	11 (27.50)	10 (25.00)	30 (25.00)
Brand and dealer loyal	9 (22.50)	7 (17.50)	6 (15.00)	21 (17.50)
No brand or dealer loyal	2 (5.00)	4 (10.00)	4 (10.00)	10 (8.33)
Total	40 (100.00)	40 (100.00)	40 (100.00)	120 (100.00)

(Figures in parentheses indicate percentages to total)

When a farmer purchased the same brand for more than one year, he was termed to be loyal towards the brand. Similarly, when a farmer purchased pesticides from the same dealer for more than one year, he was considered as dealer loyal. Nearly half of the respondents (49.17 per cent) were loyal to dealers and 25 per cent were loyal to the brands. The respondents who were loyal to both brand and dealer were accounted for 17.5 per cent and a less percentage of respondents (8.33) were neither loyal to brand nor loyal to dealers. The same trend could be observed among the blocks

also. In all the blocks, dealer loyalty was more pronounced among the farmers, followed by brand loyalty. This may probably due to the fact that the dealers entertained credit sales to farmers. But this facility would be available only to a farmer who had been purchasing from the same dealer over a considerable period of time and to farmers who were well acquainted with the dealers. The credit terms and interest rates were closely guarded between the farmers and the dealers. The farmers remained loyal to brands considering the price of the brand, its quality and efficacy in controlling the pests, advertisements and dealer recommendation.

Functional analyses

a. **Brand loyalty:** Based on the linear relationship exhibited by the scatter diagram, a linear multiple regression model was specified and estimated in order to study the various factors that influenced the brand loyalty among the sample farmers in the study area and the results are presented in Table 34.

Table 34. Estimates of brand loyalty

Variables	Estimated co-efficient	Standard error	't'value	Remarks
Intercept	-1.138	0.810	-1.405	
Price of preferred brand (x_1)	0.005	0.001	3.964	**
Efficiency of preferred brand (x_2)	0.405	0.123	3.289	**
Influence by advertisements (x_3)	0.374	0.161	2.320	*
Package of the brand (x_4)	-0.223	0.139	-1.602	NS
Peer group influence(x_5)	0.252	0.137	1.842	NS
Availability of preferred brand (x_6)	0.165	0.114	1.446	NS

R^2 = 0.51 N = 51 F = 7.70

** - Significant at one per cent level of probability

* - Significant at five per cent level of probability

NS - Not significant

It could be seen from the table, that the co-efficient of multiple determination (R^2) was 0.51, which implies that the explanatory variables included in the function explained 51 per cent of variation in the brand

loyalty of the farmers. Among the independent variables, the price of the preferred brand (X_1) and efficiency of the preferred brand (X_2) were found to be highly significant at one per cent level whereas the variable, influence by advertisements (X_3) was significant at five per cent level. The results also exhibited that when price of a particular brand is comparatively lower to prices of other brands prevailing in the market, the farmer would naturally prefer the low priced brand and would continue his purchase of the same brand if the efficiency of the brand was upto his satisfactory level. Advertisements about the brand will also create a confidence among the farmers and keep them loyal to that brand. Even though the variables, peer group influence and availability of the brand had positive co-efficients they had not influenced significantly. The independent variable, package of the brand had a negative coefficient and also not significant. The negative sign might be due to the fact that larger package sizes discouraged the farmers. Hence the pesticide firms attempting to retain the loyalty of the farmers towards their brands should consider the price, efficiency and advertisements about their brand. Inferences were drawn based on sign and significance and the values of parameters were not interpreted as they may not convey any appropriate meaning.

b. Dealer loyalty : Based on the linear relationship exhibited by the scatter diagram a linear multiple regression model was specified and estimated so as to study the factors which would influence the dealer loyalty among the sample farmers. The estimated results are presented in Table 35.

Table 35. Estimates of dealer loyalty

Variables	Estimated coefficient	Standard error	't'value	Remarks
Intercept	-0.504	0.781	-0.646	
Credit availability (x1)	0.005	0.001	4.742	**
Quality of the product (x2)	0.359	0.110	3.259	**
Availability of preferred brand(x3)	0.295	0.147	1.996	*
Price of the product(x4)	0.327	0.129	2.528	*
Customer service(x5)	0.087	0.137	0.631	NS
Malpractices (x6)	-0.315	0.096	-3.265	**
Peer group influence (x7)	0.070	0.106	0.662	NS
Dealers advertisements (x8)	0.128	0.133	0.964	NS

R^2 = 0.62 N = 80 F = 8.55

** - Significant at one per cent level of probability
* - Significant at five per cent level of probability
NS - Not significant.

The coefficient of multiple determination (R^2) was 0.62 implying that 62 per cent of the variation in dealer loyalty was explained by the included variables. Except the malpractices, all the other coefficients of the selected variable had positive signs. The credit availability (X_1), quality of the product (X_2) and malpractices (X_6) were significant at one per cent level. Credit availability at the dealers outlet at all times and quality of the product available with the dealers had a considerable influence on farmers towards their dealers. Availability of preferred brand (X_3) and price of the product (X_4) were significant at five per cent level. As expected, the malpractices adopted by dealers was negative and the coefficient was highly significant indicating that farmers became disloyal, when they came to know that the dealers were doing some malpractices in the pesticide sales. The common malpractices prevailing at the retail outlet like illfilled containers, expired products sales, adulteration of products had significant negative influence. The results further showed the extent of significance that the farmers were attached to credit availability at the retail outlet and efficiency as well as quality of the product purchased from the retail outlet. The price prevailing at retail outlet and availability of preferred brand also influenced but to a limited extent of the farmers loyalty towards their dealer.

Peer group influence, dealers advertisement and customer service had positive signs but they were all not significant in influencing the dealer loyalty among the farmers.

v. Effectiveness of promotional methods

An attempt was made to assess the extent of influence of different promotional methods adopted by dealers and firms on the application of pesticides by the farmers. The linear multiple regression model was fitted and the estimates are presented in Table 36.

Table 36. Estimates of promotional methods

Variables	Estimated coefficient	Standard error	't'value	Remarks
Intercept	-0.410	0.653	-0.628	
Price of pesticides(x1)	-0.299	0.098	-3.058	**
Area under cotton (in ha) (x2)	0.621	0.012	4.834	**
Quality of pesticide (x3)	0.299	0.111	2.695	**
Promotional index(x4)	0.342	0.149	2.292	*
Price of output (x5)	0.196	0.129	1.526	NS

R^2 = 0.56 N = 85 F = 11.42

** - Significant at one per cent level of probability
* - Significant at five per cent level of probability
NS - Not significant

It could be seen from the table, that the coefficient of multiple determination (R^2) was 0.56, indicating that 56 per cent of the variations in the dependent variable was explained by the variables included in the function. The price of pesticides (X_1), the area under cotton (X_2) and the quality of pesticides used (X_3) were found to be highly significant at one per cent level and to influence significantly the promotional methods of dealers. Since, cotton invites large number of pests and diseases, it warrants a large quantity of pesticides throughout the crop duration. If the area under cotton is increased means naturally the quantity of pesticides applied must also increase proportionately in order to prevent and control the pests and diseases infesting the crop.

The price of pesticides (X_1) was significant and this indicated that one rupee increase in the price per 10 ml **Ceterius Paribus** would decrease the quantity of pesticide use by 0.299 ml. So the price of pesticides had a significant but negative influence on the promotion of pesticides. The area under cotton (X_2) was significant and one hectare increase in the area under cotton would increase the pesticide use by 0.621 ml, when all other factors were held at mean level.

The promotional index (X_4) was significant at 5

per cent level which indicated the fact that the extent and intensity of promotional efforts were significant enough to influence the pesticide use by the farmers. The promotional index was developed by assigning scores to different promotional efforts and the scores given by the farmers were summed up and divided by total score and expressed in percentage. The price of output (X_5) had a positive sign but it was not significant, indicating that the price of output had not significantly influenced the use of pesticides by the farmers which would have been due to wide fluctuations observed in output prices since most of the farmers sold their produces immediately after harvest.

vi. Problems of farmers in purchase of pesticides

The nature and degree of problems faced by farmers in the purchase of pesticides from various agencies have a significant bearing on the buying behaviour of the farmers. The major problems as perceived by the farmers were identified and also they were ranked based on the scores assigned by the farmers using Garrett's ranking technique.

Private dealers : The details on the nature and extent of the problems faced by the farmers in the study area while purchasing pesticides from private dealers are presented in Table 37.

Table 37. Problems of farmers while purchasing pesticides from private dealers.

Problems	Anaimalai		Udumalpet		Pollachi (South)	
	Mean score	Rank	Mean score	Rank	Mean score	Rank
Credit with high interest	60.82	I	57.40	I	62.78	I
High price	53.65	II	54.25	II	46.48	V
Preferred brand not available	51.65	III	49.35	IV	47.62	IV
Adulteration	42.35	VI	50.70	III	56.73	III
Poor quality products	49.43	IV	47.83	V	59.45	II
No discount	43.68	V	41.22	VI	40.68	VI

It could be seen from the table, that the major problems faced by the Anaimalai farmers among the private dealers were credit sales with high interest and high price. Non-availability of preferred brand, poor quality products, no discounts and adulteration of pesticides were the other problems in the order by importance. The foremost problem faced by the Udumalpet farmers was credit sales with high interest. High price of pesticides, adulteration of pesticides, non-availability of preferred brand, poor quality of the products and no discounts were the other problems faced by the farmers in the order of importance.

The major problems faced by Pollachi (South) farmers from private dealers were credit sales with high interest followed by poor quality products, adulteration of pesticides, non-availability of preferred brand, high price and no discounts.

Department depot

The details on the problems faced by farmers in purchase of pesticides from department depots are presented in Table 38.

Table 38. Problems of farmers while purchasing pesticides from department depots

Problems	Anaimalai		Udumalpet		Pollachi (South)	
	Mean score	Rank	Mean score	Rank	Mean score	Rank
No credit sales	45.75	II	40.25	III	54.24	I
Preferred brand not available	52.20	I	51.57	I	37.62	V
Poor quality products	32.44	V	43.65	II	41.22	III
Untimely supply	36.07	IV	39.72	IV	39.36	IV
Old stock	42.85	III	32.35	V	45.74	II

The major problems faced by Anaimalai farmers in the purchase of pesticides from department depots were non-availability of preferred brand and lack of credit sales. The other problems in the order of importance were sale of old stocks of pesticides, untimely supply and poor quality products. The farmers in Udumalpet block also opined that non-availability of preferred brand as a major problem while purchasing from department depots. Poor quality products, lack of credit sales, untimely supply and old stock of products were the other problems faced by farmers in the order of importance. The Pollachi (South) farmers revealed that lack of credit sales was the major problem for them while purchasing from department depots, sale of old stocks, poor quality products, untimely supply and non-availability of preferred brand were the other problems in the order of importance.

Co-operative societies : The problems expressed by the farmers of the three blocks while purchasing pesticides from co-operative societies are presented in Table 39.

The major problems faced by the farmers in Anaimalai block were availability of pesticides only to the members and only when crop loan was provided. Untimely supply of pesticides, non-availability of preferred brand, poor quality products and adulteration of pesticides were the other problems.

Table 39. Problems of farmers while purchasing pesticides from co-operative societies.

Problems	Anaimalai		Udumalpet		Pollachi (South)	
	Mean score	Rank	Mean score	Rank	Mean score	Rank
Available only to members	53.25	I	65.35	I	53.35	II
Only if loan is available	51.80	II	61.80	II	59.75	I
Untimely supply	49.88	III	41.66	V	39.42	V
Preferred brand not available	48.25	IV	51.30	III	31.56	VI
Poor quality products	31.75	V	49.28	IV	47.98	III
Adulteration	41.33	VI	40.43	VI	41.26	IV

The Udumalpet farmers also opined that the availability of pesticides only to members as the major problem and other problems were available to member provided if they had obtained crop loan, non-availability of preferred brand, poor quality products, untimely supply and adulteration. In Pollachi (South) block, the major problem as perceived by the farmers was that the pesticides were supplied to those who availed crop loan. The other problems were availability of pesticides only to the members, sale of

poor quality products, adulteration of pesticides, untimely supply i.e., not given in the season and non-availability of preferred brand in the co-operative societies, in the order of importance.

SUMMARY AND CONCLUSIONS

CHAPTER VI

SUMMARY AND CONCLUSIONS

A study on the farmers buying behaviour towards pesticides in Coimbatore district was undertaken during the year 1992-93. The specific objectives of the study were (i) to study the pesticide use pattern at farm level (ii) to study the pesticide buying behaviour of farmers (iii) to study the effectiveness of promotional methods on farmers buying behaviour and (iv) to identify the problems faced by farmers in purchasing pesticides and suggest suitable remedial measures.

Coimbatore district was purposively selected since it is one of the developed district and formed as the universe of the study. Multistage random sampling technique was followed in the selection of study area and sample respondents. First, three blocks viz., Anaimalai, Udumalpet and Pollachi (South) were selected at random, secondly, four villages from each of these blocks were selected at random. Then from the twelve selected villages, ten farmers were selected at random from each village. Apart from this, 30 pesticides dealers were also selected at random from the three blocks. Thus 120 sample farmers and 30 pesticide dealers formed the total sample for the study. The salient agro-climatic features of the study area which had

significant bearing on the farmers buying behaviour and pesticide use pattern were briefly discussed.

The collected data were subjected to both percentage and functional analyses. Linear multiple regression models were specified and estimated in order to study the various factors influencing the brand loyalty, dealer loyalty and effectiveness of promotional methods employed by the pesticide firms and to analyse their relative importance in the study area.

i. General characteristics of the sample farmers

The literacy level of the sample farmers in the study area was 80.82 per cent and it was maximum among Udumalpet farmers. The farmers with farming experience of over 20 years were observed maximum in all the three blocks (42.50 per cent) and among the blocks, the maximum was in Udumalpet block (50 per cent). The maximum average size of holding was 2.74 ha, in Anaimalai block and the maximum area under wetland (1.61 ha) was also in Anaimalai block, the maximum area under gardenland (1.82 ha) was in Udumalpet block and the maximum area under dryland (0.72 ha) was in Pollachi (South) block. Of the sample respondents only 17.50 per cent owned sprayers and it was maximum (20 per cent) in Anaimalai block. The cropping pattern of the sample farms varied and the major crops grown in the study

area were paddy, cotton, groundnut and coconut. The cropping intensity was maximum (178.21 per cent) in Anaimalai block followed by Udumalpet block (144.62 per cent) and Pollachi (South) block (140.25 per cent).

ii. General characteristics of the sample dealers

The sample dealers were dealing not only pesticides but also fertilizers, seeds and agricultural implements and the study revealed that 93.44 per cent of the dealers are dealing with two or more product lines. The dealers with business experience in pesticide sales of over 20 years were found to be maximum (40 per cent) in Pollachi (South) block. Dimecron, Nuvacron, Rogor and Ekalux were some of the most common brands dealt by the sample dealers. The most common promotional strategies employed by the dealers were credit sales (70 per cent), personal contact (66.66 per cent), slide/film shows (60 per cent) and leaflets (56.66 per cent).

iii. Pesticide use pattern

The pesticide use by the farmers in the three blocks depends on various factors. Comparatively, Udumalpet block farmers had higher level of knowledge on the quantity of pesticide use (67.50 per cent) and time of spraying (47.50 per cent) of the chemicals. On the whole, 29.17 per cent of the farmers possessed knowledge about the

compatibility of chemicals. The quantity of pesticides used by farmers depended on dealer's recommendation (76.67 per cent), intensity of pest and diseases (65.83 per cent) and so on. The maximum quantity of pesticides was applied for cotton crop in the sample farms particularly in Udumalpet block. The share of the expenditure on plant protection measures to total cost of cultivation was maximum for cotton in Udumalpet block (37.98 per cent) for groundnut in Pollachi (South) block (13.50 per cent) and for paddy in Anaimalai block (13.43 per cent). On an average, eight rounds were sprayed by the sample farmers for cotton and three rounds each for groundnut and paddy. The number of sprays was maximum (11 rounds) for cotton in Udumalpet block and for paddy and groundnut the maximum sprays of four rounds was given in Anaimalai and Pollachi (South) blocks, respectively.

iv. Buying behaviour of farmers

The purchase of pesticides from single source, particularly private dealers was more pronounced among the sample farmers (44.17 per cent) and only 30.83 per cent of the sample farmers purchased from two sources. On the whole, purchase of pesticides by means of cash and credit was maximum (55.83 per cent) among the farmers. Among the blocks, the purchase by means of cash and credit was maximum

in both Pollachi (South) and Udumalpet blocks (57.50 per cent) followed by Anaimalai block (52.50 per cent). Purchases by means of credit was maximum in Anaimalai block (32.50 per cent) followed by Udumalpet block (22.50 per cent) and Pollachi (South) block (20 per cent) farmers. Purchase by means of cash was maximum in Pollachi (South) block (22.50 per cent) followed by Udumalpet block (20.00 per cent) and Anaimalai block (15.00 per cent) farmers. If credit facilities were not available with a dealer, 60 per cent of the sample farmers opined to switch over to a dealer who provided credit. The same trend was also observed among the farmers in different blocks.

The extension workers and private dealers were the major sources of information for the selection of brands by the sample farmers and they influenced the farmers' choice of brand. Most of the farmers in all the blocks (54.17 per cent) preferred to use the same brand and same quantity even if the price of the same was increased and this was higher in Anaimalai block (67.50 per cent). Among the sample farmers, 49.17 per cent were loyal to their dealers, 25 per cent were brand loyal, 17.5 per cent had both dealer and brand loyalty in common and 8.33 per cent were neither loyal to brand nor loyal to dealers. Farmers dealer loyalty was found to be maximum in both Anaimalai and Pollachi (South) blocks (50 per cent) whereas the brand loyalty was maximum

in Udumalpet block (27.50 per cent). Farmers with brand and dealer loyalty was maximum in Anaimalai block (22.50 per cent). Farmers neither loyal to the brand nor to dealer was maximum in Udumalpet and Pollachi (South) blocks (10 per cent).

Multiple regression analyses were carried out to study the contribution of different factors to the brand loyalty and dealer loyalty. The coefficient of multiple determination for brand loyalty was 0.51 indicating that the included variables explained 51 per cent of variation in brand loyalty among the sample farmers. Price of the preferred brand (X_1), efficiency of the preferred brand (X_2) and advertisements about the preferred brand (X_3) influenced the brand loyalty among the sample farmers. The package of the brand (x_4) peer group influence (X_5) and availability of the preferred brand (X_6) did not significantly influence the brand loyalty of the farmers.

The coefficient of multiple determination for dealer loyalty was 0.62 indicating that the included variables explained 62 per cent of variation in dealer loyalty among the sample farmers. Credit availability (X_1), quality of the products (X_2), availability of preferred brand (X_3), price of various products offered at dealers point (X_4) and malpractices prevailing at retail outlets

(X_6) were the factors that significantly contributed to the dealer loyalty among the farmers. Customer service (X_5), peer group influence (X_7) and dealers advertisements (X_8) did not influence significantly the dealer loyalty of the farmers.

v. Effectiveness of promotional methods

The effectiveness of different promotional methods adopted by pesticide firms on the farmers pesticide usage was estimated by a linear multiple regression model. The coefficient of multiple determination for effectiveness of promotional methods was 0.56 indicating that the included variables explained 56 per cent of variation in the pesticide use among the sample farmers. Among the five variables included in the model, the variable price of pesticide (X_1), area under cotton (X_2) and quality of pesticide (X_3) were significantly influenced the quantity of pesticide applied by the farmers. These were significant at one per cent level. The variable, promotional index (X_4) was also significant at five per cent level. This indicated that the extent and intensity of promotional efforts influences the pesticide use by the farmers. The variable, price of output (X_5) had a positive sign but was not significant which may be due to wide fluctuations observed in output prices as most of the farmers sold their produce immediately after harvest.

vi. Problems of farmers in purchase of pesticides

Garrett's ranking technique was used to rank the problems faced by farmers in purchasing pesticides from various agencies viz., private dealers, department depots and co-operative societies.

Private dealers

The farmers of all the blocks revealed that the credit sales with high interest, higher price for products offered at retail outlets were the major problems in purchasing of pesticides from private dealers. The other problems in the order of importance were, poor quality products, non-availability of preferred brand, adulteration and no discounts.

Department depots

The non-availability of preferred brand was the major problem considered by the sample farmers on a whole while purchasing from agriculture department depots. Other problems revealed by them were lack of credit sales, poor quality products, untimely supply and old stocks.

Co-operative societies

The primary problem as revealed by the farmers on a whole, while purchasing pesticides from co-operative societies was the availability of pesticides only to members

and to those who availed crop loans. The other problems faced by farmers were untimely supply, non-availability of preferred brand, sale of poor quality products and adulteration of products.

Conclusions

Among the sample farmers 80.82 per cent were literates and 42.50 per cent had a farming experience of over twenty years. The gardenland area was higher than dry land area in all the sample farms. Paddy, cotton and groundnut are the major crops grown in all the blocks. The cropping intensity (178.21 per cent) was maximum in Anaimalai block. Only 17.50 per cent of the farmers owned sprayers and the farmers owning sprayers was highest in Anaimalai block.(20 per cent).

The sample dealers dealt more product lines and 43.33 per cent of dealers have 11-20 years of business experience in pesticide sales. They maintained numerous brands in order to satisfy the farmers requirements. They employed credit sales and personal contact as the most effective promotional methods.

The use of pesticides among the farmers was found to be higher for commercial crops than for other crops. The farmers possessed adequate knowledge on time of spraying (43.33 per cent) and quantity of pesticides for spraying

(62.50 per cent).Dealers recommendations (76.67 per cent) and intensity of pest and diseases (65.83 per cent) were the major factors that influences the quantity of pesticides sprayed by farmers. Normally, a large quantum of various pesticides were sprayed for cotton in the sample farms followed by groundnut, paddy and pulses. Of the total cost of cultivation, 34.19 per cent was spent on plant protection for cotton, 11.19 per cent for groundnut and 10.93 per cent for paddy. On an average, eight rounds of pesticides were sprayed for cotton, the maximum was observed in Udumalpet block (11 rounds) three rounds each for paddy and groundnut, the maximum in Anaimalai (4 rounds) and Pollachi (South) blocks (4 rounds) respectively. 44.17 per cent of farmers purchased pesticides from private dealers as a single source and 25.83 per cent purchased from private dealers and department depots as double source and regarding mode of purchases, purchase by means of cash and credit (56.6 per cent) was predominant in the sample farms. In case of non-availability of credit with the dealer, 60 per cent of the farmers preferred to change the dealer. Extension workers (46.67 per cent) and private dealers (43.33 per cent) were the major sources and guides for selection of brand by the farmers. Further, 54.17 per cent of the farmers tend to use their preferred brand with same quantity, even if the price of the same was increased.

Multiple regression analysis pertaining to brand loyalty revealed that the price of the preferred brand (X_1), its efficiency (X_2) and advertisements (X_3) had significantly influenced the brand loyalty among the farmers. Credit availability (X_1), quality of the products available with the dealer (X_2), preferred brand availability (X_3), price of the products available with the dealer (X_4) were the factors that significantly influenced the dealer loyalty. Malpractices (X_6) followed by dealers also influences significantly with negative coefficient.

Multiple regression analysis pertaining to effectiveness of promotional methods has revealed that the extent and intensity of promotional methods significantly influences the farmers pesticide use. Price of pesticides (X_1), area under cotton (X_2) and quality of pesticides (X_3) also significantly influenced the pesticide use by the farmers.

The most important problems faced by the farmers in purchasing pesticides from private dealers was the credit sales with higher interest and high price. The major problems in purchasing pesticides from department depots were non-availability of preferred brand and lack of credit sales. In the case of co-operative societies, the

availability of pesticides only to members and to those who availed crop loans were the major problems.

Policy framework

Considering the findings of the study, the following measures are suggested for policy considerations.

1. The study showed that the knowledge of pesticide use by farmers was not adequate for all crops. Hence, pesticide marketing firms and agricultural departments should take up demonstrations to explain the correct way of using these chemicals in order to have effective control on the pests so as to avoid loss due to pest and diseases.
2. Private dealers were the major source for purchase of pesticides. Non-availability of preferred brand made the farmers to switch over to other brands. Hence, the dealers should assess well in advance and stock the needed quantity in each brand so as to make the farmers brand loyal. The pesticide firms can provide higher commission rebates and credit extension to their dealers so that the dealers can extend credit facilities to their customers.
3. The farmers as a whole, felt that the prices of the pesticide products was very high and the pesticide firms should fix a reasonable price for their products

in order to increase their sales and market share.

4. The pesticide firms should have to concentrate more on the promotional methods such as demonstration, field visits and advertisements. The extent and intensity of usage of mass media has to be increased in order to help to build a better product image among the target group.
5. The literacy level among the farmers being fair, leaflets distribution may be strengthened.
6. Credit availability with the dealer is of vital importance to farmers. The dealers, therefore should entertain credit sales with nominal interest rate. Apart from this, the dealers should maintain a cordial relationship with farmers and provide correct solutions to the plant protection problems faced by the farmers in the cultivation of various crops. To serve the farmers in a better way, the dealers should possess adequate knowledge of the plant protection measures. The pesticide firms can conduct dealers meeting and train them in periodic interval to educate them on various technical aspects of plant protection.
7. The agricultural extension officers being the most common source of information on brand, the technical guidance by these extension workers must further increase.

9. The malpractices prevailing at the retail outlets like sale of ill-filled containers, sale of expired chemicals, adulteration of products, sale of duplicate products, etc., should be curbed by rigidly enforcing the rules and regulations meant for maintaining the quality of the products.

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APPENDIX

Appendix 1

Consumption of Pesticides in Various States

State/Union Territory	Consumption of Pesticides (Technical Grade 1974-75)		Consumption of Pesticides (Technical Grade 1986-87)		Percentage increase	
	Total (tonnes)	Per acre (kg)	Total (tonnes)	Per acre (kg)	Total (tonnes)	Per acre (kg)
Andhra Pradesh	10030.00	0.70	12000.00	0.83	119.64	118.57
Assam	155.00	0.10	650.00	0.42	419.35	420.00
Bihar	3000.00	0.30	3000.00	0.30	100.00	100.00
Gujarat	800.00	0.10	5000.00	0.63	625.00	630.00
Haryana	2400.00	0.50	3800.00	0.30	158.33	60.00
Himachal Pradesh	315.00	0.30	300.00	0.30	95.24	100.00
Jammu and Kashmir	78.00	0.10	500.00	0.64	641.03	640.00
Karnataka	2472.00	0.20	4200.00	0.34	169.90	170.00
Kerala	586.00	0.20	1200.00	0.40	204.78	200.00
Madhya Pradesh	3422.00	0.20	4000.00	0.23	116.89	115.00
Maharashtra	3500.00	0.20	4100.00	0.23	117.14	115.00
Manipur	17.00	0.10	48.00	0.28	282.35	280.00
Meghalaya	15.00	0.10	50.00	0.33	333.33	330.00
Nagaland	6.00	0.10	20.00	0.33	333.33	330.00
Orissa	1000.00	0.10	1600.00	0.16	160.00	160.00
Punjab	3300.00	0.60	4800.00	0.87	145.45	145.00
Rajasthan	1000.00	0.10	2600.00	0.26	260.00	260.00
Tamil Nadu	1070.00	0.20	11600.00	1.80	1084.11	900.00
Tripura	20.00	0.10	120.00	0.60	600.00	600.00
Uttar Pradesh	6000.00	0.30	7000.00	0.35	116.67	116.67
West Bengal	1800.00	0.20	5000.00	0.56	277.78	280.00

Source : Quoted by Vijayalakshmi Ingalagi and K.R.Babu in ***Yojana****, 35(7): 12, 1991.*