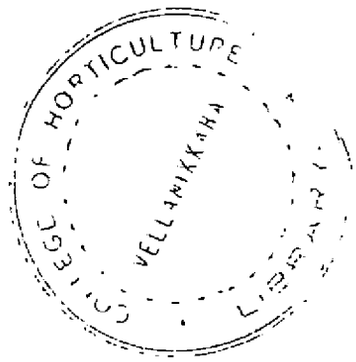
UTILIZATION OF SOIL TEST RECOMMENDATIONS BY THE FARMERS IN TRIVANDRUM DISTRICT



BY

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THESIS

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DEPARTMENT OF AGRICULTURAL EXTENSION

COLLEGE OF AGRICULTURE

VELLAYANI, TRIVANDRUM

1987

DECLARATION

I hereby declare that this thesis entitled "UTILISATION OF SOIL TEST RECOMMENDATIONS BY THE FARMERS IN TRIVANDRUM DISTRICT" is a bonafide record of research work done by me during the course of research and that the thesis has not previously formed the basis for the award to me of any degree, diploma, associateship, fellowship or other similar title of any other University or Society.

Vellayani
1st July 1987

S. BALAN

CERTIFICATE

Certified that this thesis entitled "UTILIZATION OF SOIL TEST RECOMMENDATIONS BY THE FARMERS IN TRIVANDRUM DISTRICT" is a record of research work done independently by Sri S. BALAN under my guidance and supervision and that it has not previously formed the basis for the award of any degree, fellowship or associateship to him.

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S. DAISY

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ABBREVIATIONS USED IN THE STUDY

ADs	:	Agricultural Demonstrators
AE Unit	:	Agricultural Extension Unit
HYV	:	High Yielding Variety
STL	:	Soil Testing Laboratory
T&V	:	Training and Visit

INTRODUCTION

CHAPTER I

INTRODUCTION

Agricultural production depends on a number of factors of which soil fertility is of prime importance. When maximum net returns are aimed at from crop production, use of critical inputs like fertilizers cannot be dispensed with. With the advent of green revolution, the importance of fertilizers in boosting crop production has been well recognised by the farmers. The National Commission on Agriculture (1976) have brought out clearly the vital role of fertilizers and have gone to the extent of stating that major increase of food production in future has to come

mainly through increased yield to be achieved by increased use of plant nutrients.

Soil fertility evaluation for sustained agricultural production is inevitable. Soil testing is regarded as a rapid chemical analysis which can be used to assess the available nutrients status of the soil and to make site-specific fertilizer recommendations. The basic objective of the soil testing programme is to give farmers a service leading to better and more economic use of fertilizer and better soil management practices for increasing agricultural production. Kanwar (1971) had remarked, "Soil testing is a key weapon in the armoury of a soil scientist and an agronomist for advisory work on judicious fertilizer use".

The farmers are now conscious of the cost-benefit ratio of crop production. Hence in the present context of increasing cost of production of crops, it is all the more necessary to ensure judicious and efficient use of fertilizers through soil testing.

Soil testing is not an end in itself, but is a means to an end. A farmer who follows only the soil test recommendation is not assured of a good crop. Good crop yields are the result of the application also of other good management practices. Soil testing is essential, however, as the first step in obtaining high yields and maximising returns from the money invested on fertilizers.

Need for the study

The soil testing service in India started during 1956-57 with the establishment of 15 Soil Testing Laboratories (STL) under the Indo-US co-operation and has completed more than 30 years of operation. During this period, there has been a steady increase in the establishment of soil testing laboratories. According to a report published by Fertilizer Association of India (1991), there are 402 soil testing laboratories in India (330 stationary and 72 mobile) with a capacity to analyse 4 million samples per year.

In Kerala, there are 13 soil testing laboratories (11 stationary and 2 mobile) under the State Department of Agriculture and more than two lakh soil samples are being

tested every year in these laboratories. The target of analysis varies from 10,000 to 20,000 samples per year in each of these laboratories.

There has been a steady increase in the use of fertilizers by the farmers in Kerala, during the last two decades. As against 6264 tonnes of N, 8461 tonnes of P_2O_5 and 2248 tonnes of K_2O used by the farmers during 1961-62, the corresponding figures for 1985-86 were 59263, 34412 and 47655 tonnes, of N, P_2O_5 and K_2O respectively*.

Although the increase in fertiliser use by farmers over the years in quantitative terms is quite impressive, ensuring greater efficiency in the use of fertilizers by the farmers at large is still to be realised.

In view of the above facts, the present research study was undertaken with the following specific objectives.

i) To study the extent of adoption of soil test recommendations by the farmers and to correlate it with their fertiliser use.

ii) To study the perception of the farmers about the utility of soil test recommendations in relation to adoption.

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* Farm Guide, 1987. Farm Information Bureau, Govt. of Kerala.

iii) To correlate personal, socio-economic and socio-psychological characteristics of the farmers with their perception, fertiliser use and adoption.

iv) To study the problems, if any, as perceived by ADs and farmers in the adoption of soil test recommendations and suggest measures to overcome the problems.

Scope and limitations of the study

Efficient use of fertilizer is a major factor in any programme designed to bring about an economic increase in crop production. It is obvious that the fertilizers increase yields and the farmers are quite aware of this. But without a fertilizer recommendation based upon soil testing, a farmer may be applying too much of a little needed plant nutrient or too little of another nutrient which may be needed more. Either way, this results in an uneconomical use of fertilizers by the farmers who are already hardpressed financially. The present study may help to understand the extent of application of fertilizers based on soil test results and also may throw light on the problems in utilization of soil test results. The study may thus help the planners and administrators in devising suitable strategy for effective implementation of the soil testing service.

The importance of the study becomes much more clear when the cost factor is also considered. It is estimated that the cost of analysis worksput to on an average

Rs.13 to 15 per sample, which includes the cost of materials including chemicals, establishment charges of staff etc. But to what extent the expenditure incurred for soil sample analysis can be justified? Here again, one cannot categorically give any definite answer due to lack of empirical evidences. The present study may be of some help in this direction also.

As this study formed only a part of the requirement for M.Sc.(Ag) programme, it was not possible to cover the entire State due to the limited time and other resources available at the disposal of the student investigator. Hence the study was confined to one selected district only, and to that extent the generalisation of the study is likely to be affected. However, those limitations were taken into consideration in deciding the variables, selecting respondents and fixing sample size. Inspite of these limitations, much care has been taken to make the study as objective as possible and it is expected that the results would contribute valuable information to all those engaged in agricultural development.

Organisation of the thesis

The thesis is divided into six chapters. The first chapter deals with introduction, giving the need, objectives, scope and limitations of study. The second chapter presents the theoretical orientation and is related to the review of literature pertaining to the problem. In the third chapter,

the methodology used in the research work including the procedure of sampling, procedures of measuring the variables and statistical procedures used are furnished. The fourth chapter deals with the results based on the statistical analysis. The fifth chapter is devoted to discussion based on the results obtained. The last chapter summarises the results and presents a general conclusion of the study. The references and appendices are given at the end.

THEORETICAL ORIENTATION

CHAPTER II

THEORETICAL ORIENTATION

The main objective of this chapter is to give an orientation to the concepts pertaining to the study and to link different research findings that exist in the area of study with the research problem. For the same, a probe into the past research studies has been attempted with a view to locate the problem on a theoretical perspective.

The literature that appeared relevant is presented under the following heads.

1. Extent of adoption of soil test recommendations.
2. Level of fertilizer use by the farmers.
3. Perception about utility of soil test recommendations.
4. Review of selected variables and their relationship with adoption.
5. Reasons for non adoption.

1. Extent of adoption of soil test recommendations

Only very few studies on adoption of soil testing have been reported. However, the findings of studies on adoption of other improved agricultural practices are expected to be applicable to the present study. Hence studies related to adoption of other improved agricultural practices are also reviewed.

A) Adoption of soil test recommendations

Sohal and Makkar (1972), in their study on adoption of soil testing in Ludhiana block assessed the extent of adoption from the number of soil samples taken per unit area, coverage of the holding and application of the results of soil tests in the farm. The results indicated that the farmers were neither taking adequate number of samples from the entire holding nor applying the results of the soil tests to the fullest extent. It was revealed that there were only 6.50 per cent of the respondents who could be considered to have adopted soil testing as a practice to a fairly reasonable degree.

Srinivasan and Nanjaiyan (1975) reported that among the farmers who had received soil test results, only 39.68 per cent adopted the Soil Testing Laboratory (STL) recommendations. This adoption percentage, was in no way better in the case of respondents who personally approached the STL (34.40%) and got the soil samples tested.

Choudhary and Prasad (1980) in their study on the extent of use of extension facilities for fertiliser adoption indicated that in the case of soil testing, only 28.00 per cent of the farmers under study used this facility out of which 13.50 per cent used only once, 9.00 per cent used twice, 3.50 per cent used thrice, 3.00 per cent used five times and more during the previous two years.

Jayakrishnan (1984) in his study on adoption of low cost technology among paddy growers had reported that 47.50 per cent of the paddy growers had adopted soil test based fertilizer application.

D) Adoption of other improved agricultural practices

Somasunderam (1976) reported that there was a wide variation in the extent of adoption of different practices in paddy except seed rate and area under nursery by the small farmers.

Vijayaraghavan (1977) identified wide variation in the extent of adoption of High Yielding Variety (HYV) paddy for all practices among marginal farmers. He also reported wide variation in the extent of adoption of all practices by small farmers except seed rate.

Rajendran (1978) found that majority of the small farmers were either low or medium adopters of improved rice technology.

Sivaramakrishnan (1981) observed that there was significant difference in the extent of adoption of individual practices within the different crops, viz., paddy, tapioca, coconut and rubber.

Somoria and Sharma (1983) found that majority of the beneficiaries of agricultural development programmes were at medium and high adoption level.

Viju (1985) reported that majority of the tribal farmers were low adopters of improved agricultural practices.

2. Level of fertilizer use by the farmers

Sohal and Shukla (1967) reported that although not very large, some percentage of farmers (6.60% in the case of N and 18.05% in the case of P_2O_5) tend to use quantity of fertilizers in excess of the recommended dose after realising the economic implications of such high doses.

Jati and Tripathy (1972) in their study on adoption of fertilizers in Sambalpur Package District (Orissa) revealed that out of the total number of growers under maize, wheat and paddy, 86.00 per cent, 85.00 per cent and 73.80 per cent of growers respectively utilized fertilizers. 73.30 per cent of the respondents have adopted and 26.70 per cent have not adopted fertilizers.

Janakiram Raju (1978) revealed that adoption of fertilizers for cholam crop in general was more in irrigated area than in non-irrigated area. In the case of top dressing of N, there was almost a total non-adoption in non-irrigated area, whereas more than two third of the farmers in irrigated area adopted the same.

Sen (1981) reported that the extent of adoption of fertilizers varies considerably for state to state. At one end of the spectrum, showing the least adoption is Assam with barely 5 per cent of farms using fertilizers and at the

other end is Punjab, where more than 95 per cent of the cultivators use fertilizers. The adoption rates are higher than the all - India average in seven States including Kerala. The adoption rates also vary from one size group of farms to another. Among all fertilizer users, 46.00 per cent were marginal, 19.00 per cent were small, 18.00 per cent semi-medium, 13.00 per cent medium and only 4.00 per cent were large farmers.

Singh (1981) found that the farmers in general applied lower than the recommended doses of nitrogen, phosphate and potash. In terms of percentage of recommended dose, all the three categories of farmers - marginal, small and medium, applied significantly more amount of nitrogen in comparison to both phosphate and potash and significantly more amount of phosphate than potash.

Bidari (1982) found that majority of the farmers in Dharwad (Karnataka) had used less than the recommended doses of nitrogen, phosphorus and potash for all the three crops considered, viz., jowar, groundnut and potato.

Shivashankara (1986) in a study conducted in Chickmangalur with regard to the adoption of recommended doses of nitrogen, phosphorus and potash to paddy and ragi crops, found that the levels of fertilizers used by all the categories of farmers were much lower than the suggested fertilizer doses of nitrogen, phosphorus and potash.

Srinivasamurthy and Nagaraj (1985) indicated that through fertilizer use is generally accepted for irrigated crops in Karnataka, the recommended levels were not adopted. However, the levels of fertilizers for paddy and sugarcane were found to be nearer the recommended level.

3. Perception about the utility of soil test recommendations

There are no studies on the perception of farmers about the utility of soil testing. However there are studies which reflect the perception of farmers about attributes of other improved farm practices. A review of such studies is attempted.

Jaiswal and Roy (1966) stressed that a farmer does not become interested in any information, if he does not perceive it as relevant to his own farming situations, his resources and his goals. The perception of farmers will depend on his values, beliefs and attitudes. These are likely to differ somewhat from farmer to farmer and between farmers and extension workers.

Rogers and Shoemaker (1971) generalised that relative advantage, compatability, trialability and observability of an innovation as perceived by the members of social system were positively related to its rate of adoption.

Arrifin (1975) from his study with Malay peasants concluded that the farmer is more inclined to accept a

recommended agricultural practice, if he perceives that the practice is relevant to his situation.

Singh and Singh (1980) reported that profitability was the best perceived characteristic of HYV of wheat for both farmers and farm women, whereas cultural compatability, and physical compatability were the least perceived ones for farmers and farm women respectively.

Thiruthuvadas (1981) reported that the attributes of multicrop thresher were perceived better by users than non users. He also indicated that there was significant difference in the perception of all the attributes of sugarcane crusher by users and non users except trialability.

Chakravarthy (1981) reported that small farmers perceived the indigenous farm practices to be more simple, profitable, cheap, physically compatible and flexible than the medium and big farmers.

Muthukrishnan (1981) found that majority of the users (93.00%) of biogas plants had better perception towards the attributes of biogas plants.

Jayakrishnan (1984) indicated that cent per cent of the farmers had reported cost reduction as an important reason for applying fertilisers based on soil test.

4. Review of selected variables and their relationship with adoption

Many of the studies reviewed below pertain to adoption of improved agricultural practices in general, and as such, specific studies on the relationship between adoption of soil testing and various factors are lacking. But it is expected that the studies reviewed here would be applicable to adoption of soil testing also. From among the many variables that were found to have relationship with adoption of farm practices, a manageable number of variables which were adapted to empirical measurements were selected. Some other variables which were found to be important in the case of adoption of soil testing based on the pilot study were also included.

A voluminous body of literature exists concerning the adoption of improved agricultural practices. The literature is too diversified to be reviewed here; therefore, only those studies that relate to the variables of the present study are reviewed. These variables were hypothesised to have relationship with level of fertiliser use and perception about utility of soil testing also. However, no studies have been found reported in this line.

The selected variables are as under,

1. Education
2. Farm size
3. Cropping intensity

4. Irrigation potential
5. Annual income
6. Innovativeness
7. Attitude of farmers towards fertilizer use
8. Economic motivation
9. Risk orientation
10. Extension orientation
11. Personal guidance on better farming
12. Utilization of information sources

Education

Many researches have established a positive relationship between education and adoption of improved agricultural practices by the farmers (Hussain, 1971; Perumal and Duraiswamy, 1972; Ramamurthy, 1973). Similar results were also obtained by Raja (1978), Prasad (1978) and Sinha and Sinha (1980).

However, Nair (1969), Bhaskaran (1978) and Ravi (1979) observed that education had no significant relationship with adoption.

In the present study, a positive relationship between education and adoption was hypothesised.

Farm size

This is an important variable that determines the potentiality for adoption of new practice. Sharma and Nair (1973) found that size of holding was positively and

significantly related to adoption. Anbalagan (1974) reported that farm size had significant association with the adoption of schedule of fertilizers by the farmers. Similar results were also obtained by Srinivasan (1974) and Raju (1973).

But Supe and Salode (1975), Ravi (1979) and Sinha and Sinha (1980) did not find any association between farm size and adoption.

In the present study, it was hypothesised that there will be a positive relationship between farm size and adoption.

Cropping intensity

Shankaraiah (1965) and Kolte (1967) reported that adopters of improved agricultural practices had higher intensity of cropping than nonadopters.

Pathak and Mazumder (1976) and Shukla (1980) reported that cropping intensity is one of the most important variables which influence the adoption behaviour of farmers.

However, Singh and Singh (1970) had indicated that there was no association between cropping intensity and adoption of improved agricultural practices.

In this study, it was assumed that there will be positive relation between cropping intensity and adoption.

Irrigation potential

Nair (1969) and Vyas et al (1969) have established

positive relationship of irrigation facilities in the farm with adoption of HYV of paddy.

Jha and Shaktawat (1972) found that adoption of hybrid bajara depended upon the availability of irrigation facilities. Shukla (1980) also observed that irrigation potential contributed significantly to the prediction of adoption behaviour of small farmers in Western U.P.

Singh and Choubey (1974) found that the level of adoption of HYV wheat technology varied considerably even among farmers with irrigation potential.

In this study, a positive relationship between adoption and irrigation potential was expected.

Annual income

Perumal and Duraiswamy (1972) found that the cultivation of hybrid maize was strongly and positively related to the income of farmers. Chandrakandan (1973) also reported a similar finding.

Ramamurthy (1973) found that gross income was positively associated with adoption of NPK complex fertilisers by farmers. Pillai (1978) also observed a positive and significant relationship between income and adoption of soil conservation measures by farmers.

In the present study, a positive relation between annual income and adoption was expected.

Innovativeness

Rogers (1958) reported a significant relationship between innovativeness and adoption. Moulik (1965) also observed that the individual degree of self rating of innovation proneness contributed positively to the level of adoption. Salunkhe and Thorat (1975) reported a significant association between change proneness and adoption.

Ravi (1979) found that innovativeness and extent of adoption by the tapioca growing farmers were positively and significantly related.

Haque and Ray (1983) had indicated that innovativeness was significantly related with adoption of recommended species of fish in composite culture.

In this study a positive relationship between innovativeness and adoption was postulated.

Attitude of farmers towards fertilizer use

Singh et al (1966) found that attitude of farmers towards package Programme had positive and significant influence on the level of adoption of package of practices recommended in the programme.

Nair (1969) observed a positive relationship between attitude towards high yielding varieties and adoption. Raju (1978) reported that attitude towards fertilizers had

significant relation with the extent of adoption of fertilizers by the farmers in irrigated area.

A positive relationship between attitude of farmers towards fertilizer use and adoption was expected in the present study.

Economic motivation

Nair (1969) revealed that economic motivation was positively and significantly related with adoption of HYV paddy by the farmers, Similar results were obtained by Singh and Singh (1970) and Rajendran (1973).

Sohal and Tyagi (1978) and Haque and Ray (1983) also had reported that economic-motivation was significantly related with adoption of improved practices.

It was hypothasised in this study that there will be positive relationship between economic motivation and adoption.

Risk orientation

Many researchers had established positive and significant association between risk orientation and adoption behaviour of the farmers (Tripathy, 1977; Rajendran, 1978; Binswanger, 1978; Kamarudeen, 1981 and Pillai, 1983).

In this study it was postulated that there will be positive relationship between risk orientation and adoption.

personal guidance on better farming

Singh (1981) had reported that personal guidance on better farming was found to play a crucial role in determining the level of fertilizer use by the farmers and found significant association between personal guidance and adoption.

Desai (1981) had also clearly brought out a positive relationship between extension guidance and adoption of improved cotton practices.

A positive relation between personal guidance and adoption was postulated in the present study.

Extension orientation

Perumal (1970) observed a significant relation between extension contact and adoption of new farm practices. Anbalagan (1974), Sundaraswamy and Duraiswamy (1975), Somasundaram (1976), Ravi (1979) and Kamarudeen (1981) also had reported similar findings.

However, Chandrasekharan (1979) found that contact with extension agency had no relation with adoption of improved practices.

In the present study, it was expected that there will be positive relation between extension orientation and adoption.

Utilization of information sources

Supe (1971) found that the farmers who had used more institutionalised sources of information were higher adopters than those who had used non-institutionalised sources.

Salunkhe and Thorat (1975) reported that adoption behaviour of the farmers was significantly related to their information seeking behaviour.

Prasad (1978) found that there was significant positive relationship between information sources used by the farmers and their adoption behaviour. Prakash (1980) and Kanarudeen (1981) also brought out similar results.

But Ravi (1979) found that mass media exposure and the extent of adoption of improved practices by tapioca growers had non significant relationship.

In this study, it was hypothesised that there will be positive relationship between utilization of information sources and adoption.

5. Reasons for non adoption

Nair (1969) ranked the reasons for non adoption of HYV paddy by the farmers in Kerala as lack of irrigation, high incidence of pests and diseases, lack of conviction about profitability and lack of finance in order of importance.

Srinivasan and Manjeiyan (1975) reported the reasons for non adoption of soil test recommendations as,

(i) The inputs were not available or costly.

(ii) The crops mentioned were not grown, and

(iii) Want of funds.

Pillai (1978) found lack of credit facilities, non-availability of stones in the locality, high initial cost and inadequate financial assistance as the reasons for non-adoption of soil conservation measures.

Raju (1978) mentioned lack of finance and lack of awareness about recommended doses of fertilizers as the two major factors responsible for non adoption of fertilizers.

Manivannan (1980) reported that low seed setting, non remunerative price and damage of seeds by birds were the most important problems faced by the sunflower growers, followed by lack of credit facilities, lack of pest resistant varieties and inadequate transport facilities.

Sinha and Sinha (1980) found that the most important reasons for nonadoption of HYV maize were lack of money (91.50%), nonavailability of fungicides (81.20%), lack of knowledge of improved method of cultivation (77.10%) and lack of proper guidance (72.80%).

Bhaskaran and Praveena (1982) opined that the most common reasons for non adoption of dry farming practices

were lack of knowledge about the practice and lack of proper guidance.

Jayakrishnan (1984) revealed that the reasons for non adoption of fertilizers by the paddy farmers based on soil test were tedious nature of work (52.38%), delay in getting the result (46.03%) and lack of experience (41.28%).

Siddaramaiah and Veerbhadraiah (1986) observed that lack of knowledge about fertilizers and lack of financial resources were the two main reasons for the non adoption of fertilizers as reported by farmers.

The conceptual framework developed for the study based on review of literature is presented in Fig 1.

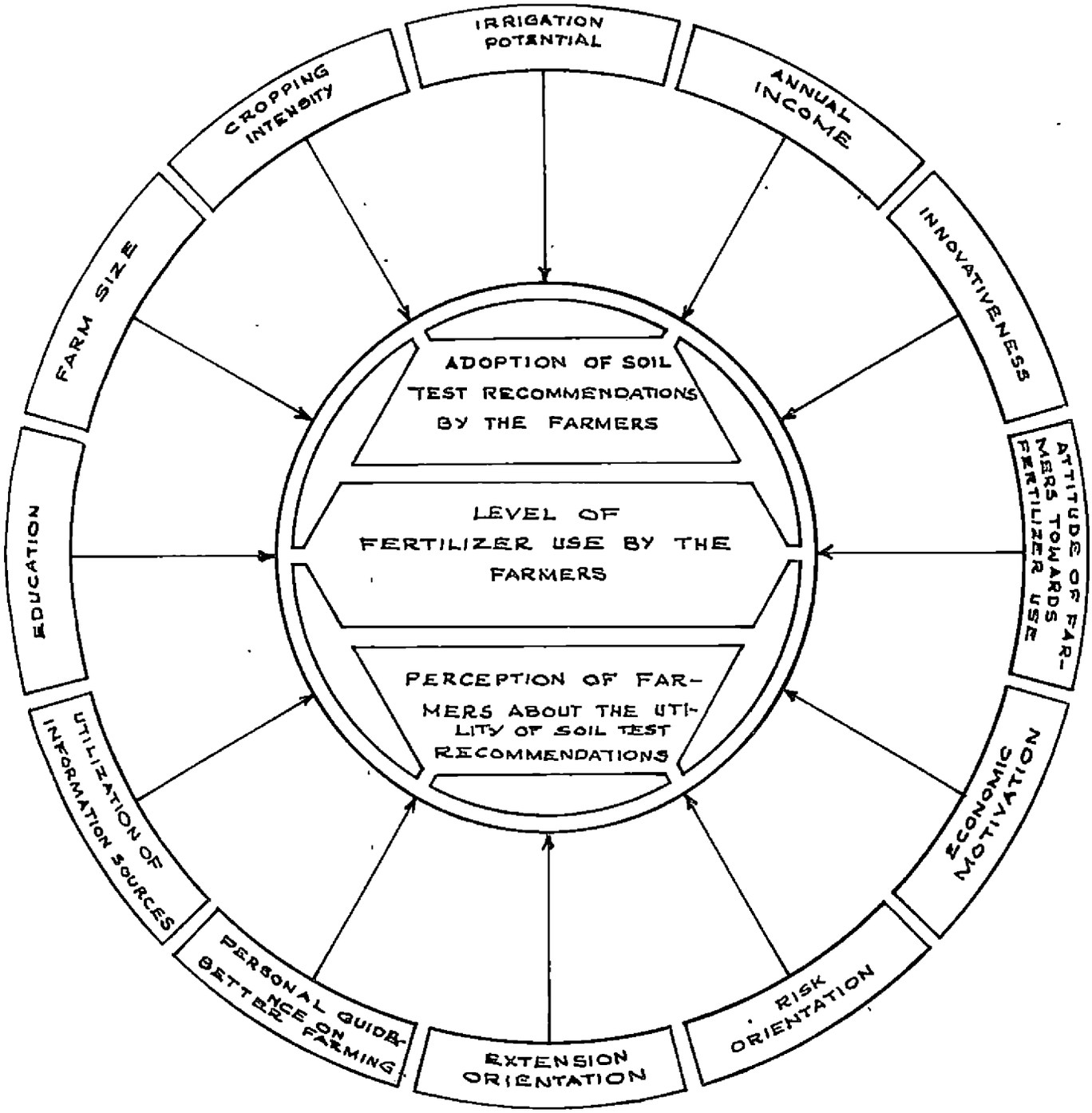


FIG. 1. CONCEPTUAL FRAMEWORK OF THE STUDY

METHODOLOGY

CHAPTER III

METHODOLOGY

This chapter deals with the methods employed in the study which are presented under the following heads.

1. Localeof the study
2. Sampling procedure employed for the study
3. Selection of variables for the study.
4. Operationalisation and measurement of variables included in the study.
5. Procedure of data collection
6. Statistical tools used in the study.

1. Locale of the study

Trivandrum District of Kerala State was purposively selected for the study for the following reasons.

Out of the 24 soil testing laboratories initially started in India, the Soil Testing Laboratory established at Trivandrum was the first of its kind in Kerala. Hence, it is expected that the number of farmers who got their soil tested are likely to be more in Trivandrum than in any other district of Kerala.

Trivandrum district is also one among the three districts where T & V System of Agricultural Extension was initially introduced in the State. This district

consists of three T & V Sub Divisions and farmers from all the Sub Divisions were included in the study (Fig 2).

2. Sampling procedure employed for the study

The method of sampling adopted for the study is described below.

Stratified multistage random sampling design was adopted for the survey, the strata being the different sub divisions of Trivandrum district. The Agricultural Extension Units (A.E. Units) in each stratum represented the primary unit or first stage unit. The Agricultural Demonstrators in each AE Unit represented the second stage unit and all the farmers who had tested their soils constituted the third stage unit.

A proportionate sample of AE Units was randomly selected from each sub division and from each AE unit, a sample of three Agricultural Demonstrator circles was selected randomly. A fixed sample of five farmers who had tested their soils during 1984-85 was selected from the list of farmers obtained from the records maintained in the Agricultural Development Office within the jurisdiction of the selected Agricultural Demonstrators. Thus, 165 (11x3x5) farmers were selected which formed the sample of the study. This sample represents nearly 1 per cent of the total annual target of soil testing Lab of the district

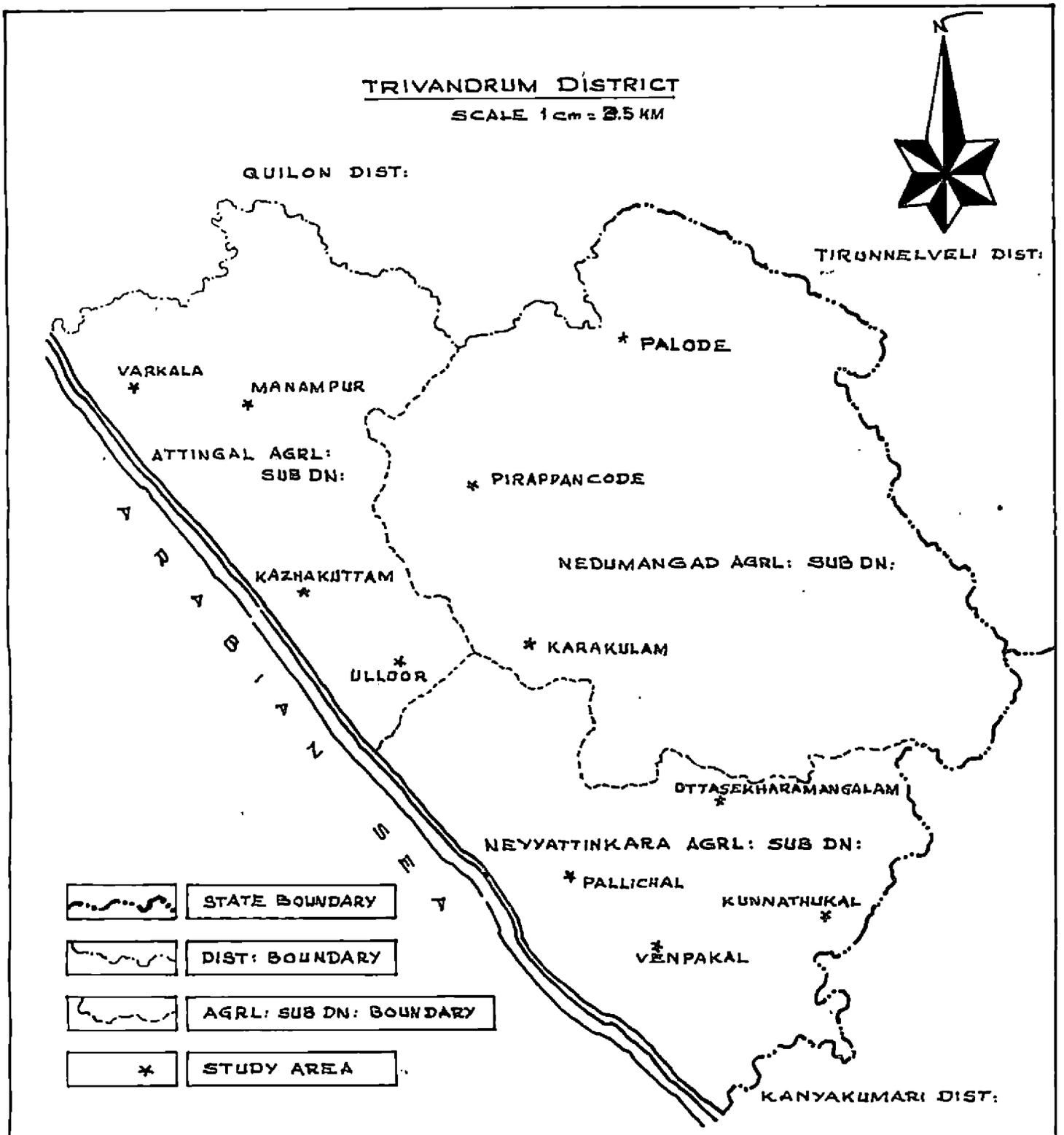


FIG. 2. MAP SHOWING THE LOCATION OF STUDY AREA

which comes within the range of 15,000 and 20,000 . The details of sample size in different Sub Divisions are furnished in Table 1.

Table 1: Details of sample size in different Sub Divisions of Trivandrum District

Sl. No.	Name of the Sub Division	No.of AE units	No.of AE units selected	No.of Agri.Demonstrator circles selected	No.of farmers selected
1.	Neyyattinkara	10	4	12	60
2.	Nedumangad	8	3	9	45
3.	Attingal	10	4	12	60
	Total :	28	11	33	165

The procedure of sampling is diagramatically presented in Fig 3.

Besides farmers, officials, viz. Agricultural Demonstrators (n = 33) also formed another category of respondents in the study.

3. Selection of variables for the study

Based on the objectives of the study, review of relevant literature and discussion with experts both in the Department of Agriculture and in the Kerala Agricultural University, a list of variables was prepared. A pilot study was also conducted on a sample of farmers (outside the sampling frame of the study) which helped the researcher in

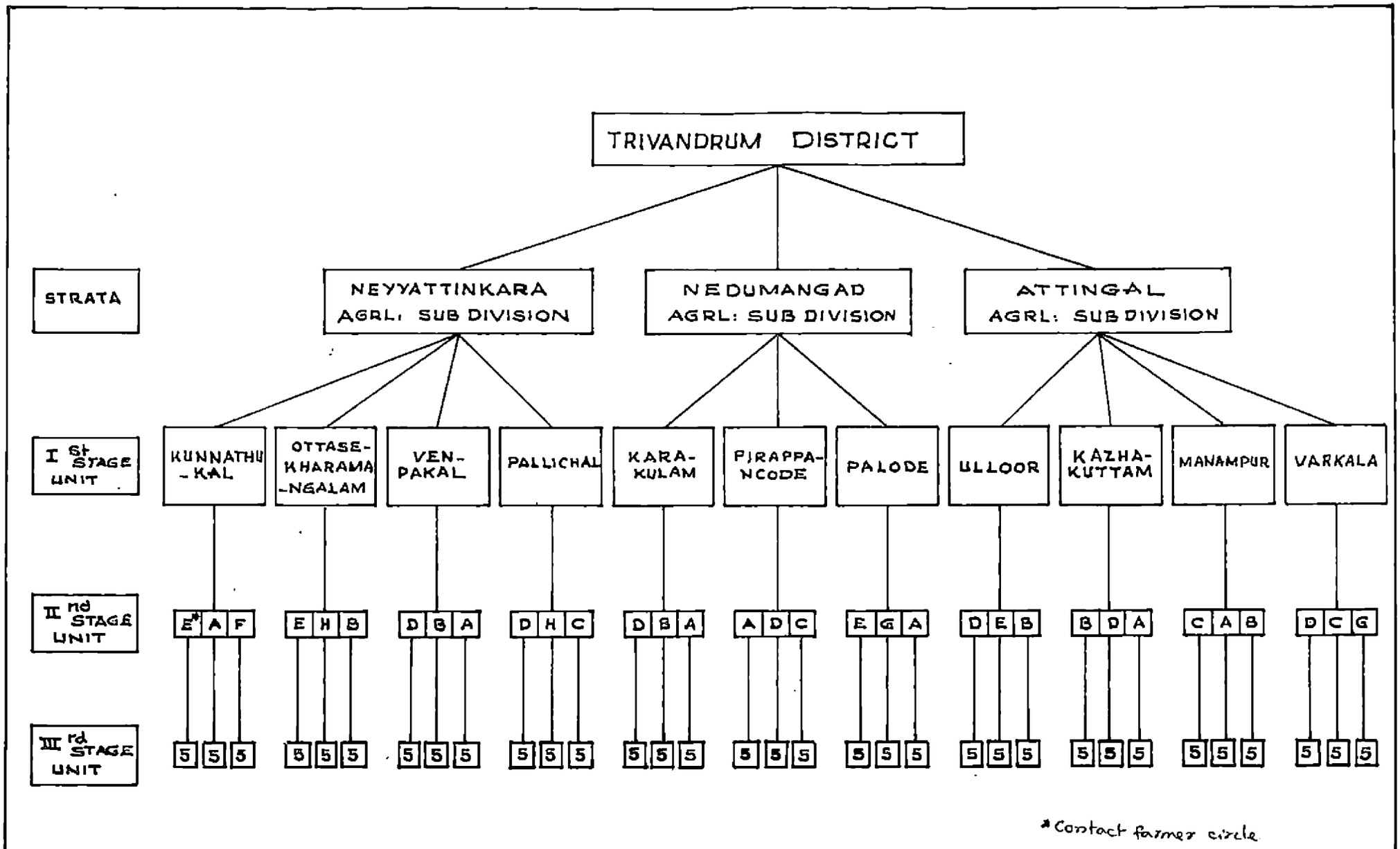


FIG.3 SAMPLING PROCEDURE ADOPTED FOR THE STUDY

4. Operationalization and measurement of variables included in the study

A. Dependent variables

(1) Adoption of soil test recommendation by the farmers

In the field of Agricultural Extension, the term adoption has been applied to the acceptance and use of an improved practice by the farmer. According to Rogers (1962), adoption is a decision to continue full use of an innovation. This definition implies that an adopter is fully satisfied with the innovation.

From the point of view of this study, adoption is operationally defined in terms of the acceptance of soil test recommendation as a basis for the application of fertilisers by the farmers. In this study when a farmer has applied fertilisers based on soil test results, it was considered as a case of adoption and a score of '1' was assigned to such farmers. Farmers who have not followed the soil test recommendation in the application of fertilizers were included in the category of non adopters and score of '0' was assigned to such farmers. Thus here the respondents were dichotomised as either adopters or non adopters of soil test recommendation.

(2) Level of Fertilizer use by the farmers

This is operationally defined as a measure of the quantity of three major plant nutrients applied to the main

crop by the farmer over a period of one year or one season.

The level of fertilizer use was measured by a Standardized Index developed for the purpose. The procedure of Singh (1981) was followed which was suitably modified taking into account the relative importance of the three major nutrients (N, P & K) for different crops by assigning them weights. The weights were assigned based on judges' rating by a panel of experts in Agronomy and Soil Science.

The measurement of the level of fertilizer use of each respondent was calculated using the formula

$$\text{Fertilizer use Index} = \frac{\sum_{i=1}^{k} P_i W_i}{\sum_{i=1}^{k} W_i}$$

where $P_i = \frac{NU_i}{NR_i}$

where NU_i = Level of i^{th} nutrient used

NR_i = Level of i^{th} nutrient recommended

W_i = Weight assigned to the i^{th} nutrient

K = No. of nutrients

(3) Perception of farmers about the Utility of soil test recommendation

Perception about the utility of soil test recommendation is operationally defined as the meaningful sensation of the farmers about the worth or value of the soil

test recommendations as a practice to be adopted by them.

In this study, perception of the farmers about utility of soil test recommendation was measured using an arbitrary scale developed for the purpose. The scale is considered as an arbitrary one since the rigorous procedure of standardization by estimating reliability and validity of the scale was not attempted in the present case.

The procedure of developing the scale is described below:

The first step in the construction of the scale was the preparation of the universe of content. The statements depicting the utility of soil test recommendations were framed based on the review of relevant literature and detailed discussion with officials of the Department of Agriculture including personnel of the soil testing laboratory. Eighteen statements were thus initially prepared and after editing, 14 statements were retained. A pilot study was conducted with these 14 statements and it was found that four statements were not relevant and hence these four statements were discarded. Thus only ten statements were left at the end, and these ten statements formed the scale for measuring perception. These statements were rated on a 4-point continuum with responses as follows:

Response	Score
Very much	4
Much	3
Little	2
Very little	1

The scores thus obtained for each response were added to arrive at the total perception score of a respondent.

B. Independent variables

1. Education

In this study education is operationalised as the number of years of formal education attained by the respondent at the time of investigation.

Education was measured by assigning scores for different levels of education as per the scoring system followed in the socio-economic status scale of Trivedi(1963).

The categorization of respondents and the corresponding scores assigned are given below:

Category	Score
Illiterate	0
Can read only	1
Can read and write	2
Primary school	3
Middle school	4
High school	5
Collegiate	6

2. Farm size

Farm size is defined in terms of the area of land owned and cultivated by a farmer. In this study both wet land and dry (garden) land were taken into account and the total land holding including both wet and dry land was considered for measuring the farm size.

Farm size was recorded in terms of the total land area (both wet and dry) in hectares owned and cultivated by the farmer. Wet land having cultivation more than once was converted to dry land by multiplying by 2 so as to get a standardized estimate.

3. Cropping intensity

Cropping intensity is defined as the number of crops raised in a unit area in an year and is expressed in percentage.

The procedure adopted by Prasad (1978) was used to measure cropping intensity. The farmer was asked to indicate single cropped, double cropped and triple cropped land cultivated by him. He was asked to give the above data for both dry and wet land. Total cropped area per year was obtained by summation of single cropped area, twice, the double cropped area and thrice the triple cropped area. The cropping intensity was then calculated using the formula

$$\text{Cropping intensity} = \frac{\text{Total cropped area}}{\text{Total area cultivated}} \times 100$$

4. Irrigation Potential

Irrigation potential is defined as the presence of source of irrigation water and favourable condition of its availability for irrigating the crops raised by the farmer.

Though this variable was selected considering its importance, there was difficulty in quantifying the variable. The number of irrigations would be meaningless as it would not give the exact quantity of water applied. Even the quantity of water applied would not reveal the true picture, as the timing of irrigation is a crucial factor. The area irrigated also would not yield any significant result. Due to the above limitations inherent in the procedure of measurement and also since it was difficult to get such data from the farmers, the following simple procedure adopted by Nair (1969) was used to quantify irrigation potential.

The respondents were asked to indicate the presence or absence of any irrigation source in his farm. A score of '1' was given for a farmer if he has any irrigation source and a score of '0' if no irrigation sources were available.

5. Annual income

In this study, annual income has been operationally defined as the total earning of the respondent in an year expressed in rupees from both farm and non-farm sources. The farm sources included income obtained from agriculture including the cultivation of owned land or leased-in land, dairy, poultry, etc. and the non-farm sources included income from Government employment, business and such other activities.

This variable was measured by asking the respondent to identify his income range and also to indicate his exact annual income.

The category and scores assigned were as follows:

Category	Score
Upto Rs.1200	1
Between Rs.1201 - 2400	2
Between Rs.2401 - 3600	3
Between Rs.3601 - 4800	4
Between Rs.4801 - 6000	5
Above Rs.6000	6

6. Innovativeness

It is defined as the degree to which an individual is relatively earlier in adopting new ideas than the other members of his system. For the purpose of this study, innovativeness has been treated as a socio-psychological orientation of an individual to get linked with change adopting new ideas and practices. Since it was difficult to measure innovativeness denoting the overt behaviour with the adoption of improved farm practices, it was measured only in terms of covert behaviour closely associated with change

This variable was quantified using the innovativeness scale of Pearter (1968) with the modification as done by Prasad (1983). For the present study, eight statements

were included with three response categories as 'Yes', 'Undecided' and 'No'.

For the first four statements, a score of 2 was assigned to 'Yes' response, a score of 1 for 'Undecided' and '0' score for 'No' response. The scoring procedure was reversed in the case of last four statements. The summation of the scores obtained by a respondent for all the eight statements indicated his innovativeness score. The total score ranged from 0 to 16.

7. Attitude of farmers towards fertilizer use

Allport (1935) has defined attitude as a mental and neural state of readiness organised through experience exerting a directive or dynamic influence upon the individuals response to all objects and situations with which it is related.

In this study, attitude of farmers towards fertiliser use has been operationally defined as the mental state of readiness of the farmer organised through experience exerting influence on his behaviour to respond favourably or unfavourably towards using chemical fertilizers.

In this study, the scale developed by Choudhary and Prasad (1977) was used to measure attitude of farmers towards fertilizer use.

The scale consisted of 9 statements rated on a four point likert continuum ranging from strongly agree, agree,

disagree and strongly disagree with weights 4,3,2 and 1 respectively for positive statements and the weights reversed for negative statements. The scoring was done with the help of the method proposed by Eysenck and Crown (1949). According to this method, the weight of Likert and scale value of Thurstone (See Appendix I) were combined in the form of products for each statement. The total score of a respondent was the sum of such products for all the nine items.

8. Economic motivation

In farming system, economic motivation may be regarded as one indication of the degree of willingness of a farmer for investment of his available potential resources in adopting farm innovations. It is operationally defined in terms of the extent to which a farmer is oriented towards profit maximisation and the relative value placed by him on monetary gains. In this study economic motivation was measured using the scale developed by Moulik (1965).

The scale consisted of three sets of statements, each set having three short statements with weights 3,2 and 1 indicating different intensities of motivation from high to low. The forced choice method was followed to overcome the familiar problems of personal bias and lack of objectivity in self evaluation. This method forced the respondent to choose from a group of three short statements describing

a particular personality characteristic, the one which most accurately described by the respondent himself and also the one which least accurately portrayed himself.

After obtaining the most-least choice for each of the three sets of statements, the scoring was done by summing up the ratios of the weight of most-like statements to the weight of least-like statements.

9. Risk orientation

Risk orientation is defined as the degree to which a farmer is oriented towards risk and uncertainty in farming and also as the courage to face the various problems involved in farming.

To measure risk orientation, the risk preference scale developed by Supe (1969) was followed. This scale consisted of six statements with the first and fifth statements negative and others positive. The statements were rated on a five point continuum ranging from strongly agree, agree, undecided, disagree and strongly disagree with scores 7,5,4,3 and 1 respectively, for the positive items and scores 1,3,4,5 and 7 respectively for the negative items. The scores were added up for all the statements which gave the total score obtained by a respondent for this variable.

10. Extension orientation

Extension orientation refers to the extent of contact of a farmer with different extension agencies and his

participation in various extension activities or programmes like seminars, group discussions, meetings etc.

The extension orientation was measured by summing up the scores for extension contact and extension participation. The extension contact score was obtained by assigning scores 8,4,2,1 and 0 respectively for responses once a week, once a fortnight, once a month, once a year and never, with regard to his contact with different extension personnel. The scores were added up for all the extension personnel for arriving at the total extension contact score.

Extension participation was measured by summing up the scores obtained by a farmer for his participation in various extension activities. This was quantified by assigning the scores 3,2,1 and 0 respectively for the responses whenever conducted, most frequently, sometimes and never. The scores were added up for all the extension activities for arriving at the total extension participation score.

The extension orientation score was obtained by summing up the extension contact score and extension participation score of the respondents.

11. Personal guidance on better farming

Personal guidance is operationally defined as the advice, help and assistance received by a farmer from

different extension personnel for efficient utilisation of the resources and solving farming problems.

The scale developed by Singh (1981) was used to measure personal guidance on better farming. This scale consisted of 12 statements rated on a four point continuum ranging from very much, much, not so much, and very little with scores 4,3,2 and 1. The summation of the scores for different statements gave the total score on personal guidance for a respondent.

12. Utilisation of information sources

In this study utilisation of information sources is operationally defined as the extent of use of different information sources by a farmer with a view to obtain information about improved agricultural practices.

The source of information for obtaining agricultural technology were listed and they were grouped into three categories as done by Nilkening (1962). The three categories are:

1. Mass media
2. Interpersonal cosmopolite sources
3. Interpersonal localite sources.

The procedure followed by Nair (1969) was adopted in the present study to develop an index of use of information sources.

Each respondent was asked to indicate as to how often he got information regarding improved agricultural practices from each of the listed sources. The range of responses and the scoring pattern were as follows:

Item	Score
1) Most often (once a week)	8
2) Often (once in a fortnight)	4
3) Some times (once in a month)	2
4) Rarely (once in an year)	1
5) Never	0

The scores were summed up across each item to form the index of use of information source. The total scores for each of the three categories formed the index of information source use of a farmer.

5. Procedure of Data Collection

The data were collected from the farmers using a structured interview schedule prepared for the purpose which consisted of two parts (Appendix I). A Malayalam version of the same was also prepared for the use of the researcher during data collection.

A questionnaire for Agricultural Demonstrators was also prepared to collect some relevant data about the problems related to soil testing (Appendix II).

The data collection was done during the months of September-November 1986. The farmer respondents were

directly interviewed by the researcher. The respondents were contacted in their respective houses and rapport was established. The questions were put in a conversational manner and responses were transcribed in the schedule itself. In case of responses which were not clear, re-checking was also done.

In the case of Agricultural Demonstrators, the questionnaire in Malayalam were directly administered to them and responses collected. The respondents were contacted during the fortnightly trainings conducted at the subdivisional level and AE Unit level.

6. Statistical tools used in the study

The following statistical tests were employed to analyse the data, besides the percentage analysis.

1. Product moment correlation

This is defined as the degree of relationship between two variables. The formula used to compute the simple correlation was

$$r_{xy} = \frac{P_{xy}}{\sigma x . \sigma y}$$

where r_{xy} = correlation between x and y

P_{xy} = Product moment of x and y

$\sigma x, \sigma y$ = standard deviation of x and y

2. Path analysis

Path analysis explains the cause and effect relationship

between dependent and independent variables. If the cause and effect are well defined, it is possible to represent the whole system of variables in the form of a diagram known as "path diagram".

Path analysis was carried out following the matrix method as given by Singh and Choudhari (1979), which gives the path coefficients of the independent variables. Path coefficient can be defined as the ratio of the standard deviation of the effect due to a given cause to the total standard deviation of the effect.

i.e., if Y is the effect and X_1 is the cause, the path coefficient for the path from cause X_1 to the effect Y is $\sigma x_1 / \sigma y$.

The statistical analysis was done using the computer facility available in the Department of Agricultural Statistics, College of Agriculture, Vellayani.

RESULTS

CHAPTER IV

RESULTS

Keeping in view the objectives of the study, the results are presented under the following heads.

1. Extent of adoption of soil test recommendations by the farmers.
2. Level of fertilizer use by the farmers.
3. Perception of the farmers about utility of soil test recommendations.
4. Correlation between adoption of soil test recommendations by the farmers and their selected personal, socio-economic and socio-psychological characteristics.
5. Correlation between level of fertilizer use of the farmers and their selected personal, socio-economic and socio-psychological characteristics.
6. Correlation between perception of farmers about utility of soil test recommendations and their selected personal socio-economic and socio-psychological characteristics.
7. Path analysis of level of fertilizer use with selected personal, socio-economic and socio-psychological characteristics.
8. path analysis of perception about utility of soil test recommendations with selected personal, socio-economic and socio-psychological characteristics.
9. Reasons for non adoption of soil test recommendations as perceived by the farmers and Agricultural Demonstrators.
10. Related findings.

1. Extent of adoption of soil test recommendations by the farmers

The distribution of the respondents in broad categories formed for the study is furnished in Table 2.

It could be seen from the table that only 67.87 per cent of the respondents were aware of samples collected from their fields for soil testing. It is also seen that soil test recommendations were communicated to only 63.03 per cent of the respondents of the study. Out of 165 respondent farmers, only 106 (64.24%) respondents were found to apply fertilizers as a practice. Interestingly, it was revealed that only 8.65 percent (9 out of 104) of the farmer respondents had applied fertilizers based on soil test recommendations.

Table 2. Distribution of the respondents in broad categories formed for the study. (N = 165)

Sl. No.	Category	Frequency	Percentage
1.	Farmers who were aware of soil samples collected from their fields for soil testing	112	67.87
2.	Farmers who had followed fertilizer application as a practice	106	64.24
3.	Farmers who had obtained soil test recommendations	104	63.03
4.	Farmers who had adopted fertilizers application based on soil test recommendations	9	8.65*

(* Calculation is based upon the group of 104 farmers who had obtained soil test results)

The distribution of the respondents based on adoption of soil test recommendation, both land-wise and crop-wise is presented in Table 2A.

It could be observed from the table that majority of the soil samples were collected from the garden land than from wet land though the percentage of adoption of soil test recommendations is more in the case of wet land (66.66%) than in garden land (5.10%).

Table 2A Distribution of the respondents based on adoption of soil test recommendations (Land-wise and crop-wise)

(n = 165)

Sl. No.	Item	Frequency				Percentage of adoption
		Soil test conducted	Soil test result received	Adopted	Not adopted	
1.	Type of land					
a)	Garden land	155	99	5	93	5.10
b)	Wet land	10	6	4	2	66.66
	Total :	165	104	9	95	—
2.	Crop					
a)	Paddy	10	6	4	2	66.66
b)	Coconut	122	83	4	79	4.82
c)	Tapioca	22	9	-	9	—
d)	Banana	8	3	-	3	—
e)	Other crops	3	3	1	2	33.33
	Total :	165	104	9	95	—

Table 2A also reveals that crop-wise, though maximum number of soil samples were collected from coconut gardens,

the number of farmers who had adopted soil test recommendation in the case of this crop were very low (4.82%). Though soil samples collected from paddy fields were only 10 out of the total 165 samples, the adoption of soil test recommendations in this case was comparatively higher (66.66%).

2. Level of fertilizer use by the farmers

Table 3 presents the distribution of respondents based on their level of fertilizer use.

It could be seen from the table that majority (64.15%) of the respondents had fertilizer use index between 0.71 and 1.10. Only 10.38 per cent of the farmers were found to have low level of fertilizer use.

Majority (77.78%) of the farmers who had adopted soil test recommendations were found to have fertilizer use index between 0.91 and 1.10, which is considered to be the optimum. While there were no adopters who have low fertilizer use index. Over twenty two per cent of the adopters were found to use higher dosage of fertilizers.

Table 3 Distribution of the respondents based on their level of fertilizer use.

Index of fertilizer use	Farmers who had adopted fertilizers as a practice (n = 106)		Adopters of fertilizers based on soil test results (n = 9)	
	Frequency	Percentage	Frequency	Percentage
0.50 and below	11	10.38	-	-
0.51 - 0.70	17	16.03	-	-
0.71 - 0.90	33	31.13	-	-
0.91 - 1.10	35	33.02	7	77.78
1.11 - 1.30	8	7.55	2	22.22
1.31 - 1.50	2	1.89	-	-
above 1.50	0	0	-	-
Total :	106	100.00	9	100.00

3. Perception of the farmers about the utility of soil test recommendations

The distribution of farmer respondents based on perception about utility of soil test recommendations is presented in Table 4.

Table 4 Distribution of the respondents based on their perception about utility of soil test recommendations. (n = 165)

Category	Perception score	Frequency	Percentage
Low (Below $\bar{X}$ - 1SD)	Below 20	27	16.36
Medium(Between $\bar{X}$ ± 1SD)	Between 20 & 34	120	72.73
High (Above $\bar{X}$ + 1SD)	Above 34	18	10.91
	Total	165	100.00

$\bar{X}$ = 27.09 SD = 7.06

A perusal of the table reveals that majority (72.73%) of the respondents had medium level of perception about utility of soil test recommendations. Over sixteen per cent of the farmers were found to have low level of perception, whereas only 10.91 per cent had high level of perception.

Table 5 presents the distribution of respondents on perception in relation to fertilizer use and adoption of soil test recommendations.

Table 5 Distribution of the respondents based on their perception in relation to fertilizer use and adoption of soil test recommendations.

(n = 165)

Category	Level of perception					
	Low		Medium		High	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
I. Farmers based on their level of fertilizer use						
A) Below mean	2	15.38	9	13.63	0	0
B) Mean and above	11	84.62	57	86.37	27	100.00
Total :	13	100.00	66	100.00	27	100.00
II. Farmers based on their adoption of soil test recommendations						
A) Adopted	0	0	1	1.50	8	29.63
B) Not adopted	13	100.00	65	98.50	19	70.37
Total :	13	100.00	66	100.00	27	100.00

It could be inferred from the table that majority of the farmers with low and medium level of perception (84.62% and 86.37% respectively) and all the farmers with high level of perception had a level of fertilizer use above the mean.

The table also makes it clear that almost all the farmers who had adopted soil test results were found to have a high level of perception about its utility.

4. Correlation between adoption of soil test recommendations by the farmers and their selected personal, socio-economic and socio-psychological characteristics

The results of the correlation analysis between adoption of soil test results by the farmers and the selected independent variables are presented in Table 6.

Table 6 Correlation between adoption of soil test recommendations and the selected independent variables.

(n = 165)

Variable No.	Name of the Independent variable	Coefficient of correlation(r)
X_1	Education	0.1624
X_2	Farm size	0.0840
X_3	Cropping intensity	0.1228
X_4	Irrigation potential	0.1498
X_5	Annual income	0.1713
X_6	Innovativeness	0.1399
X_7	Attitude of farmers towards fertilizer use	0.2001*
X_8	Economic motivation	0.2121*
X_9	Risk orientation	0.1071
X_{10}	Extension orientation	0.0820
X_{11}	Personal guidance on better farming	0.1782
X_{12}	Utilization of information source	0.2063*

* Significant at 0.05 level.

The table reveals that out of the 12 independent variables included in the study, only three variables, viz., attitude of farmers towards fertilizer use, economic motivation and utilization of information sources were found to be significantly correlated with adoption at 5 per cent level of significance.

5. Correlation between level of fertilizer use of the farmers and their selected personal, socio-economic and socio-psychological characteristics

Table 7 depicts the results of correlation analysis of the level of fertilizer use with the selected independent variables. It could be seen from the table that all the variables, except irrigation potential, were significantly correlated with level of fertilizer use.

Table 7 Correlation between fertilizer use of farmers and the selected independent variables (n = 165)

Variable No.	Name of the independent variable	Coefficient of correlation (r)
X_1	Education	0.3933**
X_2	Farm size	0.4386**
X_3	Cropping intensity	0.6968**
X_4	Irrigation potential	0.1221
X_5	Annual income	0.4758**
X_6	Innovativeness	0.2215*
X_7	Attitude of farmers towards fertilizer use	0.5583**
X_8	Economic motivation	0.4986**
X_9	Risk orientation	0.2418*
X_{10}	Extension orientation	0.3241**
X_{11}	Personal guidance on better farming	0.4766**
X_{12}	Utilization of information sources	0.3755**

** Significant at 0.01 level. * Significant at 0.05 level.

Education, farm size, cropping intensity, annual income, attitude of farmers towards fertilizer use, economic motivation, risk orientation, extension orientation, personal guidance on better farming and utilization of information sources were significantly correlated with level of fertilizer use at 1 per cent level of significance, while innovativeness was significantly correlated at 5 per cent level only.

6. Correlation between perception of farmers about utility of soil test recommendations and their selected personal, socio-economic and socio-psychological characteristics

The results of correlation analysis between perception about utility of soil test recommendation and the selected independent variables is furnished in Table 8.

Table 8 Correlation between perception of farmers about utility of soil test recommendations and the selected independent variables (n = 165)

Variable No.	Name of the independent variable	Coefficient of correlation(r)
X_1	Education	0.4252**
X_2	Farm size	0.3320**
X_3	Cropping intensity	0.3600**
X_4	Irrigation potential	0.1763
X_5	Annual income	0.3304**
X_6	Innovativeness	0.4529**
X_7	Attitude of farmers towards fertilizer use	0.6196**
X_8	Economic motivation	0.4576**
X_9	Risk orientation	0.3509**
X_{10}	Extension orientation	0.4169**
X_{11}	Personal guidance on better farming	0.5866**
X_{12}	Utilization of information sources	0.4227**

** Significant at 0.01 level.

The results indicate that all the variables, except irrigation potential, were significantly related with perception at 1 per cent level of significance.

The results of intercorrelation between the different independent variables are furnished in Table 9.

It could be seen from the table that personal guidance on better farming was significantly correlated with all the other independent variables. Education, cropping intensity and utilisation of information sources were found significantly correlated with all but one independent variable. Farm size, attitude of farmers towards fertiliser use and extension orientation were also found significantly correlated with many of the other independent variables.

Path analysis: The results of correlation analysis revealed that in the case of adoption of soil test recommendations by the farmers, only three independent variables were significantly correlated, while in the case of level of fertiliser-use and perception about utility of soil test recommendations all the independent variables, except irrigation potential, were found to be significantly correlated. In the case of the latter two dependent variables, the multivariate path model was employed to study the existence of confounding principle, if any. According to this principle, an independent variable (X_1) that has a net relationship to the dependent variable (Y) that is determined, need not be by this variable

Table 9 Inter correlation between different independent variables (n = 165)

	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}	X_{11}	X_{12}
X_1	1.0000	0.2399*	0.3409**	0.1275	0.4296**	0.2056*	0.2980**	0.3830**	0.3106**	0.2085**	0.4005**	0.4480**
X_2		1.0000	0.1967*	0.1433	0.5603**	0.1740	0.4358**	0.4546**	0.1458	0.3043**	0.3919**	0.3464**
X_3			1.0000	0.0048	0.3114**	0.1696	0.3460**	0.2996**	0.2304*	0.2875**	0.3341**	0.3464**
X_4				1.0000	0.1563	0.1908	0.0639	0.1793	0.0730	0.1812	0.1971*	0.1268
X_5					1.0000	0.1303	0.3921**	0.3846**	0.2294*	0.1649	0.3911**	0.2754**
X_6						1.0000	0.3819**	0.1881	0.3032**	0.3440**	0.3438**	0.2279**
X_7							1.0000	0.4512**	0.2066*	0.3600**	0.5276**	0.3623**
X_8								1.0000	0.1952	0.4313**	0.5628**	0.4896**
X_9									1.0000	0.2572**	0.3772**	0.3250**
X_{10}										1.0000	0.6742**	0.7217**
X_{11}											1.0000	0.7003**
X_{12}												1.0000

* Significant at 0.05 level; ** Significant at 0.01 level.

(X_1) own impact on Y, but also by the impact of other variables (X_2, X_3, etc.,) that tend to be correlated with Y. The results of path analysis yield such data.

The results of path analysis of selected independent variables on level of fertilizer-use and perception about utility of soil test recommendations are presented below.

7. Path analysis of level of fertilizer-use with selected personal, socio-economic and socio-psychological characteristics

It is revealed from Table 11 that the independent variables cropping intensity, attitude of farmers towards fertilizer-use, economic motivation and farm size exerted the first four maximum direct effects on the level of fertilizer-use in the descending order (0.52308, 0.21227, 0.14504 and 0.12217 respectively). Annual income, personal guidance on better farming and utilization of information sources also had relatively higher values, while the remaining variables registered comparatively smaller effects on the level of fertilizer-use. The results of path analysis are diagramatically presented in Fig. 4

The variable-wise results of path analysis are given below:

Education: Though this variable was found to be significantly correlated (0.39330) with the level of fertilizer-use as indicated by its r value in Table 10, its direct effect was

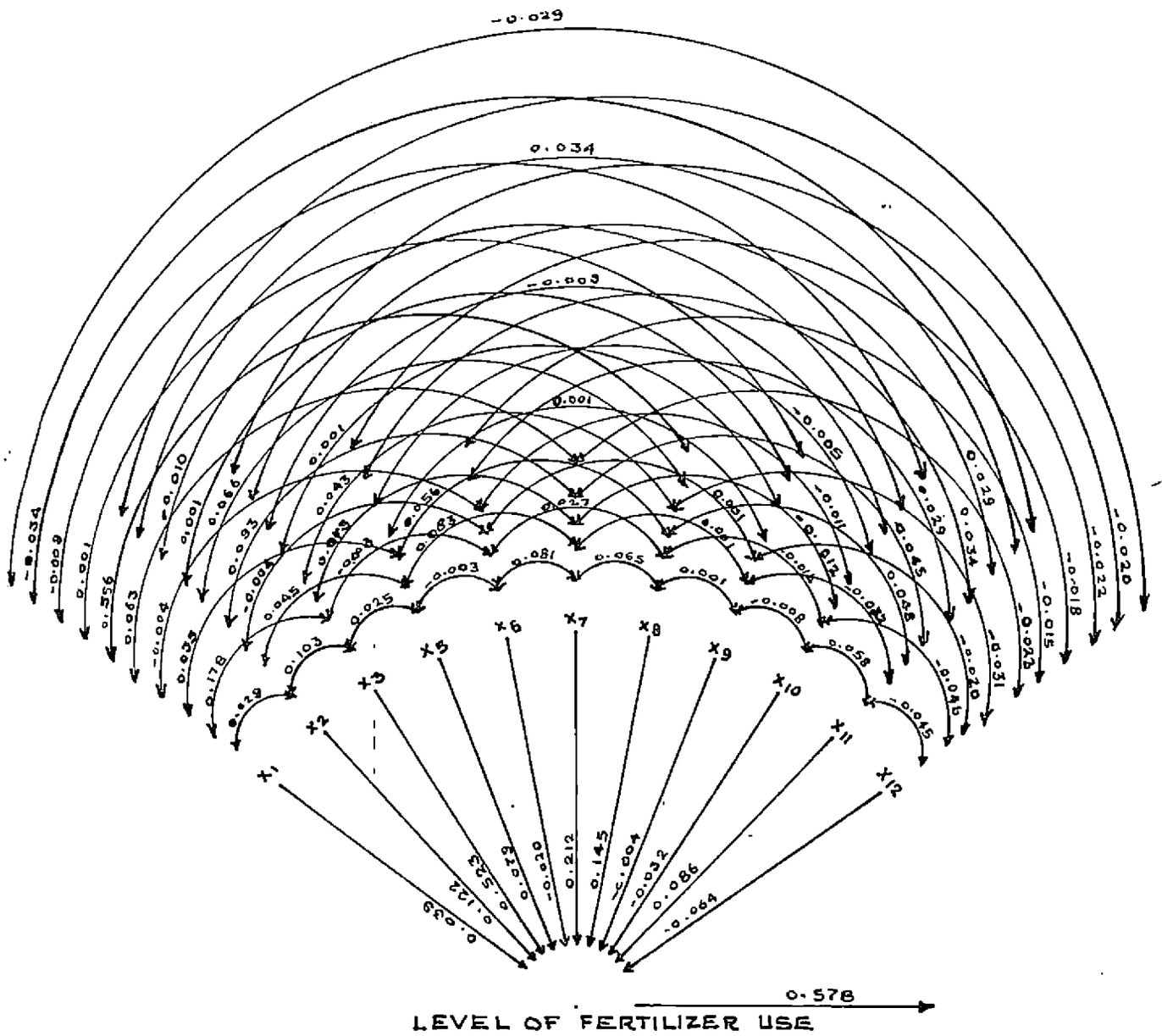
Table 10 Path analysis showing thedirect and indirect effects of the selected independent variables on level of fertilizer use by the farmers

X_1	X_2	X_3	X_5	X_6	X_7	X_8	X_9	X_{10}	X_{11}	X_{12}	Correlation coefficient
0.03932	0.02931	0.17832	0.03529	-0.00416	0.06326	0.05555	0.00117	-0.00937	0.03430	-0.02869	0.39330
0.00943	0.12217	0.10289	0.04473	-0.00354	0.09251	0.06594	0.00055	-0.00988	0.03357	-0.01975	0.43862
0.01341	0.02403	0.52308	0.02406	-0.00343	0.07345	0.04345	0.00087	-0.00934	0.02862	-0.02219	0.69681
0.01689	0.06845	0.16289	0.07982	-0.00264	0.08323	0.05578	0.00097	-0.00535	0.03350	-0.01764	0.47580
0.00808	0.02137	0.08871	0.01040	-0.02024	0.08107	0.02728	0.00114	-0.01117	0.02945	-0.01460	0.22149
0.01172	0.05324	0.18098	0.03130	-0.00773	0.21227	0.06544	0.00078	-0.01169	0.03519	-0.02321	0.55829
0.01506	0.05554	0.15671	0.03070	-0.00381	0.09578	0.14504	0.00074	-0.01401	0.04821	-0.03136	0.49860
0.01221	0.01781	0.12052	0.01831	-0.00614	0.04385	0.02831	0.00378	-0.00835	0.03291	-0.02082	0.24179
0.01134	0.03717	0.15038	0.01316	-0.00696	0.07642	0.00256	0.00097	-0.03247	0.05775	-0.04622	0.32410
0.01575	0.04788	0.17476	0.03122	-0.00696	0.11199	0.08163	0.00142	-0.02189	0.08565	-0.04485	0.47660
0.01762	0.03768	0.18119	0.02198	-0.00461	0.07691	0.07101	0.00123	-0.02344	0.05998	-0.06405	0.37550

Table 11 Summary of the path analysis showing the direct, total indirect and substantial indirect effects of selected independent variables on level of fertilizer use by the Farmers.

Variable No.	Name of the variable	Direct effect	Total indirect effect	Variables through which substantial indirect effects are channelled		
				I	II	III
X_1	Education	0.03932	0.35398	X_3(0.17832)	X_7(0.06326)	X_8 (0.05555)
X_2	Farmsize	0.12217	0.31645	X_3(0.10289)	X_7(0.09251)	X_8 (0.06594)
X_3	Cropping intensity	0.52308	0.17373	X_7(0.07345)	X_8(0.04345)	X_{11}(0.02862)
X_5	Annual income	0.07982	0.39598	X_3(0.16289)	X_7(0.08323)	X_2 (0.06845)
X_6	Innovativeness	-0.02024	0.20125	X_3(0.08871)	X_7(0.08107)	X_{11}(0.02945)
X_7	Attitude of farmers towards fertilizer use	0.21227	0.34602	X_3(0.18098)	X_8(0.06544)	X_{11}(0.04519)
X_8	Economic motivation	0.14504	0.35356	X_3(0.15671)	X_7(0.09578)	X_{11}(0.04821)
X_9	Risk orientation	-0.00378	0.23801	X_3(0.12052)	X_7(0.04385)	X_{11}(0.03231)
X_{10}	Extension Orientation	-0.03247	0.29163	X_3(0.15638)	X_7(0.07642)	X_8 (0.06256)
X_{11}	Personal guidance on better farming	0.08565	0.39095	X_3(0.17476)	X_7(0.11199)	X_8 (0.08163)
X_{12}	Utilisation of information sources	-0.06405	0.31145	X_3(0.18119)	X_7(0.07691)	X_8 (0.07101)

Residue = 0.5788



1. EDUCATION	8. ECONOMIC MOTIVATION
2. FARM SIZE	9. RISK ORIENTATION
3. CROPPING INTENSITY	10. EXTENSION ORIENTATION
5. ANNUAL INCOME	11. PERSONAL GUIDANCE ON BETTER FARMING
6. INNOVATIVENESS	12. UTILIZATION OF INFORMATION SOURCES
7. ATTITUDE OF FARMERS TOWARDS FERTILIZER USE	

FIG. 4. PATH DIAGRAM SHOWING THE DIRECT AND INDIRECT EFFECTS OF INDEPENDENT VARIABLES ON LEVEL OF FERTILIZER USE

only 0.03932, the total indirect effect being 0.35398. The substantial indirect effect was channelled through cropping intensity (0.17832), followed by attitude of farmers towards fertilizer-use (0.06326) and economic motivation (0.05555).

Farm size: The direct effect of this variable on the level of fertilizer use was 0.12217, while the total indirect effect was 0.31645. The substantial indirect effects were channeled through cropping intensity (0.10289), attitude of farmers towards fertilizer-use (0.09251) and economic motivation (0.06594) in the descending order.

Cropping intensity: The direct effect of cropping intensity on level of fertilizer-use was substantially higher (0.52309) than its total indirect effect (0.17373). The fact that many of the indirect effects of other variables on the level of fertilizer-use were channelled through this variable projects its importance. The indirect effect was mainly channelled through attitude of farmers towards fertilizer-use (0.07345).

Annual income: The direct effect of this variable on the level of fertilizer use was low (0.07982) compared to its total indirect effect of 0.39598. The substantial indirect effects were routed through cropping intensity (0.16289), attitude of farmers towards fertilizer-use (0.08323) and farm size (0.06845) in the descending order.

Innovativeness: While the total indirect effect of innovativeness on the level of fertilizer use was 0.20125, its

direct effect was only 0.02024, which is very low. The substential indirect effects were exercised through cropping cropping intensity (0.08871) and attitude of farmers towards fertilizer-use (0.08107).

Attitude of farmers towards fertilizer-use: The direct and total indirect effects of this variable on the level of fertilizer use were substential being 0.21227 and 0.36602 respectively. The indirect effect was mainly channelled through cropping intensity (0.18098). It could be seen from Table 11 that this variable exercised substantial indirect effects on almost all the other variables.

Economic motivation: The direct effect of economic motivation on the level of fertilizer use was 0.14504, while the total indirect effect was 0.35356. The indirect effects were mainly channelled through cropping intensity (0.15671) and attitude of farmers towards fertilizer-use (0.09578).

Risk Orientation: The direct effect of this variable on the level of fertilizer use was very low (0.00378), while the total indirect effect was relatively high (0.23801). It is also seen that cropping intensity (0.12052) and attitude of farmers towards fertilizer-use (0.04385) and substantial indirect effects even higher than the direct effect of this variable on the level of fertilizer-use.

Extension orientation: The total indirect effect of extension orientation on the level of fertilizer-use was 0.29163, with

three variables, viz., cropping intensity, attitude of farmers towards fertilizer-use and economic motivation contributing substantial indirect effects with values of 0.15638, 0.07642, and 0.06256, respectively. The individual indirect effect of these three variables was higher than the direct effect of extension orientation on the level of fertilizer-use (0.03247).

Personal guidance on better farming: While the total indirect effect of this variable on the level of fertilizer-use was 0.39095, its direct effect was only 0.08565. The substantial indirect effects were channelled through cropping intensity (0.17476), attitude of farmers towards fertilizer-use (0.11199) and economic motivation (0.08163).

Utilization of information sources: Though the 'r' value (0.37550) of this variable was high as seen from Table 10, its direct effect on the level of fertiliser-use was only -0.06405, the rest being explained by indirect effect. The total indirect effect of this variable was 0.31145, with the substantial indirect effects channelled through cropping intensity (0.13119), attitude of farmers towards fertilizer-use (0.07591) and economic motivation(0.07101) in the descending order.

8. Path analysis of perception about utility of soil test results with selected personal, socio-economic and socio-psychological characteristics

A perusal of Table 12 reveals that attitude of farmers towards fertilizer use had the highest direct effect(Pij=0.33102)

Table 12 Path analysis showing the direct and indirect effect of the selected independent variables on perception of farmers about utility of soil test recommendations

X_1	X_2	X_3	X_4	X_6	X_7	X_8	X_9	X_{10}	X_{11}	X_{12}	Correlation coefficient
0.13085	-0.00959	0.01993	0.02107	0.03693	0.09864	0.03208	0.02520	0.00483	0.08965	-0.02438	0.42521
0.03139	-0.03998	0.01150	0.02748	0.03141	0.14426	0.03807	0.01183	0.00509	0.08772	-0.01678	0.33199
0.04461	-0.00786	0.05846	0.01527	0.03046	0.11453	0.02509	0.01869	0.00481	0.07479	-0.01885	0.36000
0.05621	-0.02240	0.01820	0.04905	0.02340	0.12979	0.03221	0.01861	0.00276	0.08754	-0.01499	0.38038
0.02690	-0.00699	0.00991	0.00639	0.17950	0.12642	0.01575	0.02460	0.00576	0.07696	-0.01240	0.45290
0.03899	-0.01742	0.02023	0.01923	0.06859	0.33102	0.03779	0.01676	0.00603	0.11810	-0.01972	0.61960
0.05011	-0.01818	0.01751	0.01886	0.03378	0.14936	0.08375	0.02460	0.00576	0.07696	-0.01240	0.45290
0.04064	-0.00583	0.01347	0.01125	0.05446	0.06839	0.01635	0.09112	0.00431	0.08443	-0.01769	0.35090
0.03775	-0.01217	0.01601	0.00809	0.06178	0.11917	0.03612	0.02086	0.01674	0.15091	-0.03929	0.41677
0.05240	-0.01567	0.01953	0.01918	0.06175	0.17465	0.04713	0.03060	0.01129	0.22348	-0.03811	0.58659
0.05862	-0.01233	0.02025	0.01351	0.04093	0.11993	0.04100	0.02636	0.01208	0.15676	-0.05442	0.42269

on perception followed by personal guidance on better farming (Pij=0.22384), innovativeness (Pij=0.17960) and education (Pij=0.13085) in the descending order. Extension orientation (Pij=0.01674) and farm size (Pij=-0.03998) had low direct effect on perception. The results of path analysis are diagramatical presented in fig. 5.

The variable-wise results of path analysis on perception is presented below:

Education: The direct effect of this variable on perception was only 0.13085, while the total indirect effect was 0.29436 (Table 13). Attitude of farmers towards fertilizer-use and personal guidance on better farming were found to contribute substantially to the total indirect effect (0.09864 and 0.08965, respectively).

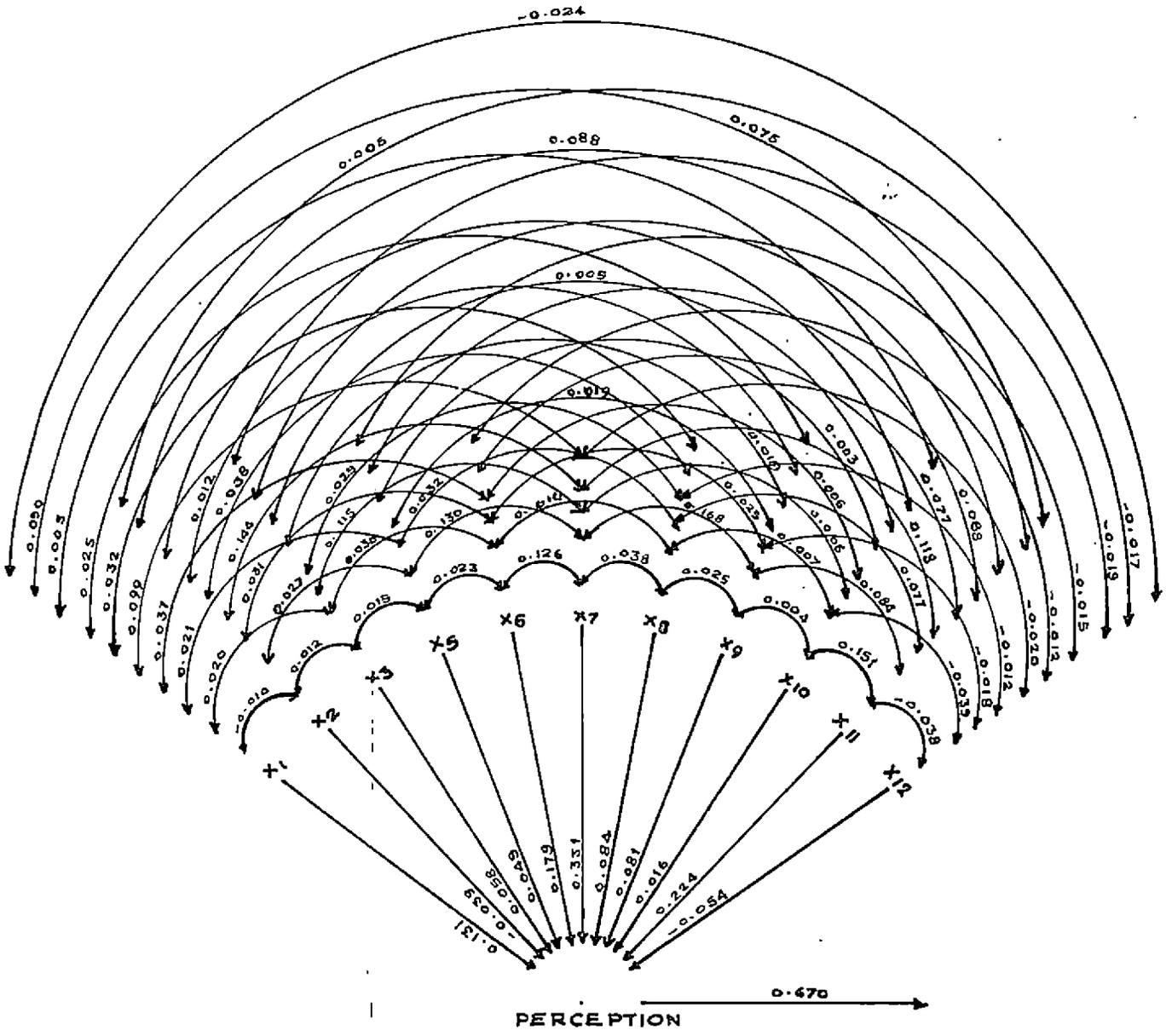
Farm size: The direct effect of farm size on perception was -0.03998, while the total indirect effect was 0.29201 with two variables viz., attitude of farmers towards fertilizer-use (0.14426), and personal guidance on better farming (0.09772) having much indirect effect, even higher than the direct effect.

Cropping intensity: This variable had a direct effect of only 0.05846 on perception, while total indirect effect was 0.30154. The indirect effects were channelled through attitude of farmers towards fertilizer-use (0.11453), personal guidance on better farming (0.07479) and education (0.04461) in the descending order.

Table 13 Summary of the path analysis showing the direct, total indirect and substantial indirect effect of selected independent variables on perception of farmers about utility of soil test recommendations

Variable No.	Name of variable	Direct effect	Total indirect effect	Variables through which substantial indirect effects are channelled		
				I	II	III
X_1	Education	0.13085	0.29436	X_7 (0.09864)	X_{11}(0.08965)	X_6(0.03693)
X_2	Farm size	-0.03998	0.29201	X_7 (0.14426)	X_{11}(0.08772)	X_8(0.03807)
X_3	Cropping intensity	0.05846	0.30154	X_7 (0.11453)	X_{11}(0.07479)	X_1(0.04461)
X_5	Annual income	0.04905	0.33133	X_7 (0.12979)	X_{11}(0.08754)	X_1(0.05621)
X_6	Innovativeness	0.17960	0.27330	X_7 (0.12642)	X_{11}(0.07696)	X_1(0.02690)
X_7	Attitude of farmers towards fertilizer use	0.33102	0.28858	X_{11}(0.11810)	X_6 (0.06859)	X_1(0.03899)
X_8	Economic motivation	0.08375	0.37388	X_7 (0.14936)	X_{11}(0.12598)	X_1(0.05011)
X_9	Risk orientation	0.08112	0.26978	X_{11}(0.08443)	X_7 (0.06839)	X_6(0.05446)
X_{10}	Extension orientation	0.01574	0.40003	X_{11}(0.15091)	X_7 (0.11917)	X_6(0.06178)
X_{11}	Personal guidance on better farming	0.22384	0.36275	X_7 (0.17455)	X_6 (0.06175)	X_1(0.05240)
X_{12}	Utilization of information source	-0.05442	0.36827	X_{11}(0.15676)	X_7 (0.11993)	X_1(0.05862)

Residure = 0.6704



1. EDUCATION
2. FARM SIZE
3. CROPPING INTENSITY
5. ANNUAL INCOME
6. INNOVATIVENESS
7. ATTITUDE OF FARMERS TOWARDS FERTILIZER USE
8. ECONOMIC MOTIVATION
9. RISK ORIENTATION
10. EXTENSION ORIENTATION
11. PERSONAL GUIDANCE ON BETTER FARMING
12. UTILIZATION OF INFORMATION SOURCES

FIG. 5. PATH DIAGRAM SHOWING THE DIRECT AND INDIRECT EFFECTS OF INDEPENDENT VARIABLES ON PERCEPTION ABOUT UTILITY OF SOIL TEST RECOMMENDATIONS

Annual income: Like cropping intensity, the direct effect of this variable on perception was low (0.04905), while its total indirect effect was relatively high (0.33133). Attitude of farmers towards fertilizer use, personal guidance on better farming and education had substantial indirect effects on perception with values 0.12979, 0.08754 and 0.05621 respectively.

Innovativeness: This variable had a direct effect of 0.17960 on perception with a total indirect effect of 0.27330. Attitude of farmers towards fertilizer use and personal guidance on better farming were the two variables through which substantial indirect effects were channelled (0.12642 and 0.07696 respectively).

Attitude of farmers towards fertilizer use: The direct effect of attitude towards fertilizer use on perception was quite high (0.33102), with a total indirect effect of 0.28858. The substantial indirect effects of many of the other variables were also channelled through attitude towards fertilizers (Table 13). The substantial indirect effect of attitude towards fertilizers were mainly channelled through personal guidance on better farming (0.11810) and innovativeness(0.06859).

Economic motivation: Though the direct effect of economic motivation on perception was low (0.08375), its total indirect effect was of the order 0.37388. It was revealed that substantial indirect effects were channelled through the two

variables - attitude of farmers towards fertilizer use (0.014936) and personal guidance on better farming (0.12598).

Risk orientation: The direct and the total indirect effect of risk orientation on perception were 0.08112 and 0.27978 respectively. The substantial indirect effects were mainly channelled through personal guidance on better farming(0.08443), attitude of farmers towards fertilizer use (0.06839) and innovativeness (0.05446) in the descending order.

Extension orientation: The total indirect effect of extension orientation on perception was quite high (0.40003), while its direct effect was only 0.01674. The substantial indirect effects were routed through the variables personal guidance on better farming (0.15091), attitude of farmers towards fertilizer use (0.11917) and innovativeness (0.06178). These variables exerted indirect effects even higher than the direct effect.

Personal guidance on better farming: The high direct effect (0.22384) and equally high total indirect effect (0.36276) of personal guidance on perception reveal the importance of this variable. The indirect effect was mainly routed through attitude of farmers towards fertilizer use (0.17465). This variable was also found to have substantial indirect contribution on many other variables as revealed from Table 13.

Utilization of information sources: The total indirect effect of utilization of information sources on perception was 0.36827, while the direct effect was only -0.05442. Personal guidance on better farming (0.15676), attitude of farmers towards fertilizer use (0.11993) and education (0.05862) were the variables through which substantial indirect effects were channelled.

9. Reasons for non adoption of soil test recommendation as perceived by the farmers and Agricultural Demonstrators

The problems as perceived by the farmers in relation to non adoption of soil test recommendation is presented in Table 14.

The major problem as indicated by more than 50 per cent of the respondents was that soil test recommendation was not communicated to them in time. 28.21 per cent of the respondents had indicated the problem "soil testing was not done for the paddy fields" as the reason for non adoption. 14.10 per cent of the respondents expressed the reason "soil samples were collected simply to satisfy the extension personnel" for their non adoption of soil test recommendation, while 13.46 per cent of the respondents had indicated "Lack of confidence in soil testing results" as the reason for non adoption.

The other reasons were soil samples were collected from the field in the absence of the farmer (12.18%), do not possess adequate land for scientific cultivation (9.62%),

Table 14 Reasons for non-adoption of soil test recommendations as perceived by the farmers.

(N = 156)

Sl. No.	Reasons	Frequency	Percentage*
1.	Soil test result was not communicated in time	81	51.92
2.	Soil Testing was not done for the paddy fields	44	28.21
3.	Soil samples were collected simply to satisfy the extension personnel	22	14.10
4.	Lack of confidence in soil test results	21	13.46
5.	Soil samples were collected from the field in the absence of the farmer and hence did not care about the result	19	12.19
6.	Do not possess enough land for Scientific cultivation	15	9.62
7.	Result not interpreted in an understandable manner	14	8.97
8.	High cost of fertilizers	14	8.97
9.	Not included in T&V messages	11	7.05
10.	Recommendation for coconut was very low	9	5.77
11.	Quantity and type of fertilizer mixture was not recommended	8	5.13
12.	Non availability of straight fertilizers	7	4.49
13.	Procedure of soil sample collection for coconut is not correct	5	3.21
14.	Unfavourable weather condition	4	2.56
15.	The date of analysis was not indicated	4	2.56
16.	Intention was to know only about the soil problem	3	1.92

* The percentages exceed 100 since multiple responses were permited.

result not interpreted in an understandable manner (8.97%), high cost of fertilizers (8.97%), not included in T & V messages (7.05%), recommendation for coconut was very low (5.77%), quantity and type of fertilizer mixture was not recommended (5.13%) non availability of straight fertilizers (4.49%), procedure of soil sample collection for coconut is not correct (3.21%), unfavourable weather condition (2.56%), the date of analysis was not indicated in the result (2.56%) an intention was to know only about the soil problems (1.92%). The reasons for non adoption of soil test recommendations as perceived by Agricultural Demonstrators is presented in Table 15.

Table 15 Reasons for non adoption of soil test recommendations as perceived by Agricultural Demonstrators (n = 33)

Sl. No.	Reason	Frequency	Percentage*
1.	High cost of fertilizers	16	53.33
2.	Lack of confidence in soil testing	14	46.66
3.	Result not obtained during crop season	12	40.00
4.	T&V messages are considered more credible than soil test recommendations	6	20.00
5.	Lack of knowledge about usefulness of soil test results	6	20.00
6.	Non availability of straight fertilizers	5	16.66
7.	Lack of irrigation facilities	3	10.00
8.	Lack of interest in scientific cultivation	3	10.00

* The percentages exceed 100 since multiple responses were permitted.

It is seen from the table that the main reason for non adoption of soil test recommendation as perceived by more than 50 per cent of the respondents is high cost of fertilizers. A good percentage (46.66%) of the respondents had indicated lack of confidence in soil test results among the farmers as a reason for non adoption. 40 per cent of the respondents had reported 'results not obtained during the crop season' as the reason for non adoption.

The other reasons as perceived by Agricultural Demonstrators were - T & V messages are considered more credible than soil test recommendations (20.00%), lack of knowledge about usefulness of soil test results (20.00%), non availability of straight fertilizers (16.66%), lack of irrigation facilities (10.00%) and lack of interest in scientific cultivation (10.00%).

10. Related findings:

The distribution of the farmer-respondents based on the source of introduction to soil testing is furnished in Table 16. It is evident from the table that for a vast majority (87.88%) of farmers, extension personnel formed the main source of information about soil testing. Fertilizer dealers were not found to have any role as a source of information.

Table 17 gives the distribution of respondents based on source of collection of soil samples. It is seen from

the table that in nearly 50 per cent of the cases, samples were collected by the farmers themselves including family members, followed by extension personnel of the Department of Agriculture in 44.25 per cent of the cases. Only in 6.06 per cent of the cases, soil samples were collected by other agencies such as Mahilasamajam and Youth Clubs.

Table 16 Distribution of the respondents based on source of introduction to soil testing. (n = 165)

Source	Frequency	Percentage
a) Extension personnel	145	87.88
b) Voluntary agencies	6	3.64
c) Neighbour farmers	5	3.03
d) Fertilizer dealers	-	-
e) Other sources	9	5.45
Total :	165	100.00

Table 17 Distribution of the respondents based on source of collection of soil samples (n = 165)

Source	Frequency	Percentage
a) By farmers themselves	82	49.69
b) By Extension personnel of Department of Agriculture	73	44.25
c) By others	10	6.06
Total :	165	100.00

Regarding knowledge about the procedure of soil sample collection, though a sizeable number (56.96%) of the farmers

have reported that they knew about the procedure of soil sample collection, a good number of farmers (43.04%) had indicated that they do not know the procedure.

Table 18 presents the data on distribution of respondents on the basis of duration in obtaining soil test recommendations. It is seen from the table that more than one-third of the respondents (36.96%) had not at all received the soil test results. Only 7.89 per cent of the respondents had reported that they had received the results within one month. Nearly 30 per cent of the respondents had received the results within three months, while about 10 per cent of them had received the results within six months from the date of sample collection.

Table 18 Distribution of respondents based on time taken in obtaining soil test recommendation

(n = 165)

Item	Frequency	Percentage
a) Not received	61	36.96
b) Within one month	13	7.89
c) Within three months	48	29.09
d) Within six months	31	18.79
e) Within an year	12	7.28
Total :	165	100.00

The analysis of data collected from the Agricultural Demonstrators revealed the following.

a) It was reported that the target of soil samples fixed during 1984-85 for each Agricultural Demonstrator was 100. All the Agricultural Demonstrators had indicated that they had collected 100 samples and had sent all the 100 samples to the soil testing laboratory. More than 90 per cent of the Agricultural Demonstrators had obtained results of all the 100 samples. All of them had reported that they had communicated to the farmers the results of all the soil samples received from the laboratory.

b) All the Agricultural Demonstrators reported that in most cases, soil samples were collected by them and in some cases by the farmers themselves either in their presence or in their absence.

c) All the Agricultural Demonstrators reported that the details regarding area, type of soil and crop for which soil test was done were also gathered by them from the farmers along with the soil samples. However, details about the previous crop grown in the field were not collected by majority (80 %) of the Agricultural Demonstrators.

d) The average time taken at various stages of soil testing as revealed by the Agricultural Demonstrators is presented in Table 19.

Table 19 Average time taken at various stages of soil testing as reported by the Agricultural Demonstrators (n = 33)

Sl. No.	Stage	DURATION							
		30 days		31-90 days		91-150 days		151 days	
		Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
1.	Between collecting soil sample and sending to STL	14	42.42	15	45.45	4	12.13	-	-
2.	Between sending to STL and obtaining results	2	6.07	5	15.15	15	45.45	11	33.33
3.	Between obtaining results and communicating the result to farmers	12	36.37	16	48.48	5	15.15	-	-

It could be seen from the table that while majority of the Agricultural Demonstrators had reported the average time between collection of soil sample and sending to laboratories and also between obtaining results and communicating the results to farmers as falling within 90 days, a good percentage of them had reported the average time as more than 5 months between sending to laboratory and obtaining results.

e) All the Agricultural Demonstrators reported that they have knowledge about the procedure of soil sample collection. However, none of them had obtained any specific training on soil testing.

f) More than 90 per cent of the Agricultural Demonstrators had indicated that it is essential to have specialised training on soil testing.

g) The benefits of soil testing to farmers as perceived by the Agricultural Demonstrators is presented in Table 20. Out of the 33 Agricultural Demonstrators, only two of them had opined that the farmers were not benefitted by soil testing.

It could be seen from the table that quite a large number of Agricultural Demonstrators had perceived that soil testing is beneficial to farmers to correct the acidic/alkaline condition of the soil (38.71%) and to apply correct quantity of fertilizers (35.48%). 29.03 per cent of the Agricultural Demonstrators had perceived that soil testing is useful to the farmers in increasing the yield of crops, while 19.35 per cent of them opined that soil testing is useful to reduce cost of cultivation.

Table 20 Benefits of soil testing to farmers as perceived by the Agricultural Demonstrators

(n = 31)

Sl.No.	Item	Frequency	Percentage
1.	To correct the acidic/alkaline condition of the soil	12	38.71
2.	To apply correct quantity of fertilizers	11	35.48
3.	To increase the yield of crops	9	29.03
4.	To reduce cost of cultivation	6	19.35
5.	To prevent the occurrence of pests and diseases due to excess application of fertilizers	2	6.45

DISCUSSION

CHAPTER V

DISCUSSION

In this chapter, a detailed discussion of the results of the study presented under the same heads as given in the chapter on Results:

1. Extent of adoption of soil test recommendations by the farmers

A perusal of Table 2 revealed that nearly one-third of the respondents were not aware of the soil samples collected already from their fields for testing. One could infer from this that in a large number of cases, soil samples were collected by the field staff only to achieve their physical targets. They might have collected soil samples from areas of their convenience or in bulk and randomly allotted names of farmers to such cooked-up samples.

It was also revealed from Table 2 that about two-third of the respondents only had received soil test recommendations. The field staff who are quite aware of the non-genuinty of the samples collected by them might have hesitated to communicate the results to those farmers in whose address the soil samples were sent to the laboratory. This could also be due to the non-receipt of results in time from the laboratory by the extension personnel. Srinivasan and Manjaiyan (1975) in their study also had reported that only 31.5 per cent of the respondents had received the STL results.

Table 1 also indicated that about one-tenth of the farmers who had obtained soil test results only applied fertilizers based on soil test recommendations, though others also applied fertilizers, but based on blanket recommendations of the extension personnel or based on their own judgments. This is quite unfortunate since the very purpose of soil testing is defeated by such actions and hence an investigation into the reasons for non adoption has to be done, which has been attempted in the present study, the results of which are discussed in Table 14.

Srinivasan and Nanjaiyan (1975) had also indicated that among those who had received the STL results, only two-fifths adopted the recommendation.

The theory of social constraint proposed by Warner and Lefleur (1973) could probably be used to explain the observed results of non adoption of soil test recommendation by a vast majority of farmers in the present study. Social constraint refers to potential influences on behaviour which are introduced into a situation of action because the nature of that behaviour is likely to be known to others whose opinion and reactions are important to the actor. The farmers at large do not have much opinion about soil testing and this might have influenced those who had done soil testing and obtained results leading to their non-adoption.

The normative type of social influence as given by Deutsch and Gerard (1955) which operates when an individual's

responses are largely determined by a tendency to conform with the positive expectation of another could be another possible reason for the observed result.

It was revealed from Table 2 that though more than 90 per cent of the soil samples were collected from garden lands, the extent of adoption of soil test recommendation in garden lands was low. However, the percentage of adoption of soil test recommendations in the case of wet land was relatively high (though numerically low).

These results pinpoint the fact that extension personnel by themselves try to collect more samples from garden lands than from wetlands since it is relatively easier compared to the process of collection and drying of samples from paddy fields, which is quite time consuming. Moreover, most of the paddy fields become fallow or crop-free only during March-April, by which time the target of soil sample collection would have been achieved. However, the higher percentage of adoption of soil test results in the case of paddy is a clear indication of the willingness on the part of farmers to apply fertilizers for short duration crops which give immediate returns.

2. Level of fertilizer use by the farmers

It would be inferred from Table 2 that nearly 80 per cent of the farmers who had adopted soil test recommendations were found to use optimum doses of fertilizers.

This clearly brings into focus the utility aspect of soil testing, wherein one can achieve balanced application of the major plant nutrients and also can avoid inadequate or excess application of the same.

Singh (1981) had reported that lack of soil testing facility is one of the important problems in fertilizer use as perceived by all categories of farmers.

3. Perception of the farmers about utility of soil test recommendations

Table 4 makes it very clear that the respondents are normally distributed on their perception about utility of soil test recommendations. The fact that majority of the farmers had only medium level of perception highlights the need for extension efforts to enhance their level of perception. It is necessary that farmers in low and medium perception categories be pushed to high perception category so that the distribution becomes skewed towards that end.

The same table also projected that out of nine respondents who had adopted soil test results, eight of them were found to have a high level of perception about its utility. This is quite logical since only those who perceive the utility of an innovation would come forward to adopt the same. This is in conformity the findings of Arrifin(1975).

4. Correlation between adoption of soil test recommendations by the farmers and their selected personal, socio-economic and socio-psychological characteristics.

The point-biserial correlation analysis is used to

correlate a dichotomous variable with a continuous variable. In the case of dependent variable viz. adoption of soil test recommendation, a bi-fold classification as adopters and non-adopters only were considered for the study. Thus actually, artificial dichotomy was imposed upon the truly continuous variable.

It was seen from Table 6, that out of the 12 independent variables, only three variables viz., attitude of farmers towards fertilizer use, economic motivation and utilization of information sources were significantly correlated with adoption. The non-significant relation of other independent variables with adoption could probably be attributed to the low number of adopters (n = 9) compared to their non adopter counterparts whose number is quite high (n = 156).

Soil testing is done mainly to obtain fertilizer recommendation based on the fertility status of the soils. Fertilizer recommendation based on soil test result is definitely superior to the general recommendations. It is quite natural that only those farmers who have favourable attitude towards fertilizers adopt soil testing and hence the significant relation between attitude and adoption. Raju (1978) had reported that attitude towards fertilizers had significant relation with extent of adoption of fertilizers.

Economic motivation indicates that an individual is oriented towards achievement of maximum economic ends, such as realisation of maximum profits from the farm. The farmers

who possess this value are likely to utilise the resources efficiently. Viewed in this angle, the significant relationship between economic motivation and adoption of soil test results could be justified. The present finding is in agreement with the findings of Singh and Singh (1970), Sahai and Tyagi (1978) and Haque and Ray (1983).

There are different sources of information available which can cater to the needs of farmers in providing information about improved farm technology. The farmers who are interested in improving his farming conditions may naturally utilise more number of sources as a part of their activity to gather information about new ideas, and such ideas they may also put into practice. A positive relationship between utilisation of information sources and adoption of soil test results is, therefore, quite obvious. This is in agreement with the findings of Prasad (1978) and Prakash (1980).

5. Correlation between level of fertiliser use of the farmers and their selected personal, socio-economic and socio-psychological characteristics

It could be seen from Table 7 that all the variables except irrigation potential were significantly correlated with level of fertiliser use. This may be due to the predominance of rainfed crops and also the prevalent use of fertilisers to these crops, which indicate that there is much potential for promoting fertiliser use for rainfed crops.

The significant relationship of the different independent

variables with level of fertilizer use is discussed below.

Education: Education widens the vision and minds of people and orients them to new experiences for betterment of their life and vocation. As a result, the educated farmers might have realised the importance of fertilizers in crop production and also the need for soil-test based fertilizer application.

Farm size: As the farm size increases, the farmer will have more agricultural needs in respect of physical inputs particularly, than holders of small farms. Hence farmers with large farm size are likely to use more inputs in their farms. In this way, they might have used a high level of fertilizers also for better crop yield.

Cropping intensity: This denotes the intensity of farm operations. In the process of trying to attain maximum profit from the farm through intensive cultivation, the farmers might also have used higher level of inputs including fertilizers. Thus cropping intensity and level of fertilizer use might have got themselves related.

Annual income: When the income of a farmer is more, it is possible that he will be in a position to expend more in his farm in the form of different inputs. Fertilizer being a costly input, it could be expected that its level of use depends on the financial capacity of a farmer. Viewed in this angle, it is logical that annual income and level of fertilizer use obtained significant relationship.

Innovativeness

An innovative farmer is likely to be more receptive to innovations and improved techniques in farming. The use of chemical fertilizer is considered as an improved method of crop production, and hence it is probable that innovativeness and fertilizer use were related.

Attitude of farmers towards fertilizer use:

The relationship between benefits which an individual associates with an object and the attitude towards the object had been set forth in several versions of attitude consistency. (Fishbein and Raven, 1962; McGuire, 1969). If an individual has a favourable attitude towards an object, naturally that may reflect in his response towards the object and hence the obtained result. Singh and Ray (1985) had also reported significant relation between attitude towards fertilizer use and its level of use of small, medium and pooled sample of farmers.

Economic motivation

Fertilizer being a costly input, its level of use depends on how the farmers view the application of fertilizers in attaining higher profits. Those farmers with the desire to maximise their profit from crop production naturally may use fertilizers. The farmers get additional profit by the use of fertilizers and they get a remunerative price for their produce to compensate the increased cost of fertilizer

application, which might have economically motivated them to use high level of fertilizers.

Risk orientation

There is logical reason to believe that those farmers who are more adverse to risk take up cultivation of more crops in his farm. In doing so, they may have to use more inputs, fertilizers being one among them. The significant relation between risk orientation and level of fertilizer use thus can be justified.

Extension orientation

The farmers who come in contact with different extension agencies are likely to receive messages related to the package of practices to be followed for increased crop production. Application of fertilizers being considered a vital practice for increased yields, these farmers might have absorbed this important message of the extension agencies and hence the present result.

Personal guidance on better farming

The guidance provided to the farmers with respect to specific farming situations for efficiently utilizing the existing resources and in solving their field problems might have helped the farmers to increase the level of fertilizer use. Singh (1981) also reported a significant association between personal guidance and level of fertilizer use.

Utilization of information sources

When a farmer utilizes more number of sources, it is quite probable that he may come across different kinds of information aimed at increased crop production. The more the number of information sources used, the more would be the reinforcement of the information through repeated messages. The present result could be justified on this ground.

6. Correlation between perception of farmers about utility of soil test recommendations and their selected personal socio-economic and socio-psychological characteristics

The results presented in Table 8 revealed that all the variables except irrigation potential were significantly related with perception of farmers about utility of soil test results. The non-significant relationship of irrigation potential with perception might be due to the application of fertilizers to rainfed crops, wherein irrigation does not come as a limiting factor.

The significant relationship of the different independent variables with perception about utility of soil test results is discussed below.

Education

The significance of education in relation to perception lies in the essence of the learning process that unlocks the mental apathy of the farmers to admit 'new' ideas and practices

so that they could perceive these ideas in their proper perspective.

Farm size

The size of holding may be an indicator of the level of assets and a higher level of assets implies a willingness for adopting new ideas by the farmers which in turn is reflected in their better perception of the innovations. Hence the observed result.

Cropping intensity

When the cropping intensity of a farm is high, it is an indication that the farmer attempts to get maximum profits from his farm through intensive cultivation. The resources of the farmer have to be efficiently utilised towards this end. The fertiliser application based on soil test is definitely superior to the generalised recommendation and a farmer with high cropping intensity might have realised this fact. The theory of instrumental activity of Coughenour (1976), which focuses on the concept of enterprise commitment might have operated in the minds of such farmers resulting in a better perception.

Annual income

Though strictly speaking there is no immediate or direct relevance of annual income on perception, there could be its indirect significance. It may be argued that a family composed of members with diversified occupations is likely

to have more income and the educated family members might have created a better perception about soil testing in the mind of the head of the household.

Innovativeness

The significant relation between innovativeness and perception could be explained using Bem's (1972) theory of self perception, which states that people come to know their own attitudes, emotions and other internal states partially by inferring them from their overt behaviour and the context in which this behaviour occurs. Thus, the innovative farmers might have developed a better perception about soil testing.

Attitude of farmers towards fertiliser use

According to the theory of attitude consistency, if an individual perceives that benefits are associated with an object or situation, or that the characteristic of the object or situation will help him in his endeavour, he is likely to develop a favourable attitude towards that object or situation, and hence the observed result.

Economic motivation

A farmer with high economic motivation will be keen adopting the various package of practices in his farm including the techniques of efficient resource utilisation. Consequent to this, he might have perceived the benefit of soil testing as a result of which fertilizers can be used more efficiently.

Risk orientation

Risk is positively associated with performance and it has always been closely associated with innovations. A risk averse farmer may operate in a different information system and in an environment that shapes his perception towards the innovations and hence the present result.

Extension orientation

The influence of extension orientation on perception could probably be explained using Ross's (1977) principle of 'false consensus bias', which suggests that people tend to see their own behaviour as relatively moderate and appropriate to the circumstances. The farmers who are

exposed to different extension agencies and who participate in various extension activities might have overcome this problem and developed a better perception.

Personal guidance on better farming

Each farmer and his farming conditions are unique and it is, therefore, necessary that the extension workers contact each farmer, understand his problems and give necessary guidance to utilize his resources efficiently. During these contacts, the extension workers might have tried to make the farmers perceive the benefits of improved practices to suit to their settings. Viewed in this perspective, it is quite natural that perception and personal guidance get themselves related.