THRESHOLD IN INNOVATION-DECISION ON SUGARCANE VARIETIES

THESIS SUBMITTED IN PART FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE
OF DOCTOR OF PHILOSOPHY IN AGRICULTURAL EXTENSION
TO THE TAMIL NADU AGRICULTURAL UNIVERSITY
COIMBATORE

By

S. ARULRAJ, M Sc (Ag)

DEPARTMENT OF AGRICULTURAL EXTENSION AND RURAL SOCIOLOGY
CENTRE FOR AGRICULTURAL AND RURAL DEVELOPMENT STUDIES
TAMIL NADU AGRICULTURAL UNIVERSITY
COIMBATORE-641 003

1984

Certificate

This is to certify that the thesis entitled "THRESHOLD IN INNOVATION - DECISION ON SUGARCANE VARIETIES" submitted in part fulfilment of the requirements for the degree of DOCTOR OF PHILOSOPHY IN AGRICULTURAL EXTENSION to the Tamil Nadu Agricultural University, Coimbatore, is a record of **bona fide** research work carried out by Thiru S. ARULRAJ under my supervision and guidance and that no part of this thesis has been submitted for the award of any other degree, diploma, fellowship or other similar titles or prizes and that the work has not been published in part or full in any scientific or popular journal or magazine.

(Dr G PERUMAL)
Chairman

Date :

Place : Coimbatore-3

APPROVED

Chairman.

(Dr. G PERUMAL)

Members

(Dr A JOHN KNIGHT)

(Dr. S R. SUBRAMANIAN)

(Dr C SUYAMBULINGOM)

Abstract

ABSTRACT

THRESHOLD IN INNOVATION-DECISION ON SUGARCANE VARIETIES

By

S.ARULRAJ, M.Sc.(Ag)

Degree : DOCTOR OF PHILOSOPHY IN AGRICULTURAL EXTENSION

Chairman : DR. G.PERUMAL, Ph.D., Professor and Head,
Krishi Vigyan Kendra,
Agricultural College and
Research Institute,
Madurai 625 104.

Year : 1984

Threshold is the point from which an individual is pressurised to adopt an innovation. When sum of the effects of positive factors of an innovation exceeds sum of the effects of negative factors, the individual is assumed to have reached the threshold level and is expected to adopt the innovation. This research project entitled, "Threshold in innovation-decision on sugarcane varieties" is an attempt to utilise the threshold concept in improving sugarcane research and development strategies.

Two preliminary projects on farm practice-attributes and stages in innovation-decision process were conducted and the results were utilised in further analysis of the problem. A 'Sugarcane Variety Acceptability Index' consisting of weightages for 202 positive and negative aspects influencing the acceptance of a new sugarcane variety was developed based on the responses given by 20 senior cane development personnel and 20 sugarcane growers. The major project was conducted

among 200 sugarcane growers selected by a multistage random sampling with probability proportion to size in South Arcot district of Tamil Nadu.

Critical threshold level and the critical level for positive perception score along with the Sugarcane Variety Acceptability Index may form the basis for future release of new sugarcane varieties. Adopters and non-adopters of CoC 671 sugarcane variety had different perceptions on the performance of the variety. Of the sixtyone variables studied, only eleven variables yielded substantial direct path coefficients with the extent of adoption. Ratoon crop cane yield, performance of the variety in fellow farmers' fields, flexibility of the variety to enable the farmer to grow the variety under varying conditions and priority given in issuing cutting orders for factory supply explained 55.27 per cent of variation in the extent of adoption. Innovation-decision process consisted of availability and information stages occurring simultaneously followed by decision, adoption and integration. Exploration, evaluation, rejection and reinforcement stages were found to occur throughout the process. A threshold typology consisting of low, middle and high threshold adopters and threshold laggards has been evolved. These categories differed with reference to a number of bio-socio-agro-economic characters as well as stages in innovation-decision process, sources of information at different stages and the innovation-decision period.

Acknowledgement

ACKNOWLEDGEMENT

I wish to record my deep sense of gratitude and indebtedness to Dr. G. Perumal, Professor and Head, Krishi Vigyan Kendra, Madurai and Chairman, Advisory Committee for his valuable guidance and constant encouragement evinced during the course of this study.

I humbly express my gratefulness to Dr. A.John Knight, Director of Extension Education, Tamil Nadu Agricultural University and Chairman, Advisory Committee during the earlier part of this investigation and an Advisory Committee member at the later part. His guidance has been an inspiration to me at all the stages of my study period.

I acknowledge with gratitude the valuable suggestions given by Dr. S.N.Subramanian, Professor, Department of Agricultural Economics and Dr. C.Muyambulingam, Professor, Department of Mathematics, Tamil Nadu Agricultural University as Members, Advisory Committee.

I wish to acknowledge a deep intellectual debt to Dr. V.P.Singh, Head, Division of Agricultural Extension, Indian Agricultural Research Institute, New Delhi for helping me in developing the concept of threshold as applicable to Indian conditions and evolving a suitable research methodology. I also thank other scientists in his Division for their valuable suggestions.

A special mention of my gratitude and thanks is due to Dr. Mark Granovetter, Professor, State University of New York at Stoney Brook, U.S.A., for kindly obliging me with a set of publications on threshold concept and offering valuable suggestions for the successful conduct of this study.

I express my sincere gratitude to Dr. V. Mohan Naidu, Director, Sugarcane Breeding Institute, Coimbatore for evincing keen interest throughout the study period and providing me all the necessary facilities.

I thank Dr. T.R. Srinivasan, Head, Division of Agronomy, Sugarcane Breeding Institute for his encouragement and help in completing this study as per schedule.

I record my immense heartfelt thanks to Shri S. Shunmugasundaram, Scientist, S-2 (Statistics), Shri R. Jayaraman, Computer Assistant, Shri S. Subramanian, Senior Artist-cum-photographer and S/Shri T. Rakkiyappan, B. Sundara, R. Dhanapal, K. Vasanthakumar, S. Ashok Kumar, R. Jaganathan and R. Balraj of Sugarcane Breeding Institute, for their help at various stages of this study.

My sincere thanks are due to the scientists working at the Computer Centre, Indian Agricultural Statistics Research Institute, New Delhi for helping me to carry out the multivariate analysis.

I am grateful to the Librarians of Indian Agricultural Research Institute, New Delhi; G.B.Pant University of Agriculture and Technology, Pantnagar; Haryana Agricultural University, Hissar; Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur; Madras University, Madras; Bharathiyar University, Coimbatore and Tamil Nadu Agricultural University for permitting me to use the library facilities and providing me all the required help.

I thank Dr. V.S.Subramanian, Professor and Head, Dr. U.A. Balasubramanian, Assistant Professor and other staff members in the Department of Agricultural Extension and Rural Sociology as well as Directorate of Extension Education, Tamil Nadu Agricultural University, Coimbatore for their kind help and suggestions at various stages of the investigation.

I thank Shri R.Thiyagarajan and other colleagues of my Ph.D. programme for their encouragement and assistance.

I owe a great deal to Chief Cane Officer, Kallakurichi Cooperative Sugar Mills Limited and his staff as well as Chief Cane Officer, Vellore Cooperative Sugar Mills Limited and his staff for their help in data collection.

I thank the Chief Cane Officers and senior Cane Development Officers who spared their valuable time and helped me in developing the Sugarcane Variety Acceptability Index.

I acknowledge with gratitude the response and cooperation rendered by the sugarcane growers who formed the respondents of this study.

Sincere thanks are due to Shri V.Joseph, for neat and efficient typing of this thesis.

I wish to place it on record my gratitude and indebtedness to all my family members for their encouragement and assistance throughout the study period.

I am dedicating this dissertation to my beloved mother Late. Smt. S.Anthoniammal, whose incessant efforts and encouragement enabled me to attain academic and professional achievements.

31-8-84

(S.ARULRAJ)

CONTENTS

LIST OF TABLES

LIST OF TABLES (CONTD.)

LIST OF FIGURES

LIST OF FIGURES (CONTD.)

Introduction

CHAPTER I

INTRODUCTION

1.1. Prelude

> Change is not made without inconvenience
> even from the worse to better
>
> -RICHARD HOOKER (1554-1600)

All the living organisms in general and human beings in particular resist changes as a mechanism for avoiding inconvenience. These resisting forces may be grouped as physiological, psychological and social.

Cannon (1932), the Harvard physiologist, coined the term homeostasis to describe the steady state attained at any particular moment by the physiological processes at work in living organisms. The concept of physiological homeostasis conceives the organism as an open biological system, in contact with its external environment, but maintaining relatively stable states of material and process within its own internal environment. The 'self regulatory' apparatus is considered to operate automatically and in response to a specific signal (signals) within the system being regulated. If a state remains steady it does so because any tendency towards change is automatically met by increased effectiveness of the factor or factors which resist the change.

Fletcher (1938) is credited as being the first psychologist to ask directly if psychology could not take over the principle of homeostasis as its own. As Cofer and Appley (1980) pointed out, there is a considerable body of evidence from a variety of sources and of a number of types, suggesting the existence of equilibrating (i.e. balance seeking, stabilising or constancy seeking) processes in behaviour. The existence of such constancies may be interpreted as illustrating (and/or supporting) a psychological homeostatic theory. Common to all instances of psychological homeostasis, is the assumption that the "steady state" incorporates the effects of experience, thus representing a new equilibrium point on successive occasions. However, the environmental forces which threaten this steady state is resisted with, in the beginning, by the individual in his anxiety to maintain the steady state.

The concept of homeostasis has been extended to the study of social units in recent times. Community maintains a certain balance, establishes a biotic border, and has a certain unity paralleling the dynamic equilibrium and organisation of other living systems. Such an equilibrium is maintained at intraspecies and interspecies levels as well.

1.2. <u>The problem</u>

It is observed that all these systems (and each of their sub systems) tend to resist changes that are of a magnitude large enough to upset its equilibrium or threaten its survival as a stable system.

When a technology is introduced in a social system, it is perceived as a threat to physiological, psychological and social homeostasis and considerable amount of resistance is shown at intra-organic, organic and community levels. If the technology is able to overcome these resistance forces by its inherent advantages, then the technology will be accepted by the system resulting in a new state of equilibrium. Thus the quantity of resistance exhibited by the system (and each of its sub systems) and the quantity of allurement exhibited by the technology are the vital points that determine the acceptance or otherwise of the technology.

1.3. Questions to be answered

Keeping in view the concept of homeostasis as the basis, the questions that were arising at the commencement of the research project concerning the acceptance of innovations were:

1. Why do certain innovations are accepted quickly while a few other innovations record very low levels of acceptance?
2. What are all the relative degrees of influence of the determinants of acceptability of an innovation?
3. At what levels of positive and negative perception about an innovation, an individual accepts the new idea?

4. What are all the critical levels of positive and negative factors of an innovation that determine its acceptance among the members of a social system?

5. How do the individuals with different resistance levels differ in their bio-socio-agro-economic characters?

6. How do the individuals with different resistance levels differ in the stages passed in innovation-decision process?

In order to answer these basic questions, a recently released early maturing and high sucrose containing sugarcane variety Co6 671 was chosen as the innovation for this research project which was conducted in Tamil Nadu state.

1.4. Objectives

The specific objectives of the study were as follows:

1. To develop a Sugarcane Variety Acceptability Index
2. To measure individual threshold levels of innovation-decision on sugarcane varieties
3. To compute a critical threshold level for a given social system
4. To identify positive and negative factors influencing innovation-decision

5. To evolve a threshold typology and study its characteristics

6. To analyse the relationship between threshold categories and stages in innovation-decision process.

1.5. Hypotheses

For the objectives mentioned above, the following hypotheses were tested:

1. There will be no difference between adopters and non-adopters in their perception of the innovation-attributes

2. Innovation-decision is a snap decision and no intermediary stage exists between the awareness and final decision about the new idea

3. Different determinants of sugarcane variety acceptability possess the same degree of influence on the innovation-decision

4. There will be no difference between adopters and non-adopters in the perception of positive and negative factors influencing the innovation-decision

5. Positive and negative factors will have the same level of direct and indirect influence on the extent of adoption of the variety

6. The threshold categories will not differ in their bio-socio-agro-economic characters

7. There will be no difference between the different threshold categories regarding the stages passed in innovation-decision process

8. Innovation-decision period of different threshold categories will remain the same

9. Individuals belonging to different threshold categories will seek identical sources of information at different stages of innovation-decision process.

1.6. Scope of the study

Sugarcane Breeding Institute and various State Sugarcane Research Stations have been releasing a number of sugarcane varieties. Many of them become very popular and are under cultivation in various regions of the country for a number of years. On the other hand, a few others disappear from the commercial scene within a few seasons or even fail to appear in the commercial scene. If we are able to identify the key threshold forces influencing the decision on the acceptance or otherwise of these varieties and the cut off point between them, it may help in suitably formulating/modifying the varietal selection, release and promotional strategies to bring about better acceptability to the varieties.

A number of studies on the measurement of threshold levels are in progress in various biological and management sciences. Though similar type of situations do occur to any individual or social system in the process of acceptance of innovations, no study has been undertaken to work out the threshold levels in the acceptance of innovations under Indian conditions. The present study represents the first effort to apply a new threshold model to the empirical data collected from a typical rural situation in India. As such, the present study required new ground to be broken on different fronts. Thus the study will also be a fore-runner in formulating a suitable research methodology for measuring thresholds for various categories of innovations under Indian conditions.

1.7. Limitations

Due care has been taken in planning the study on the basis of scientifically established norms for a sound social science research. However, the present investigation has obvious limitations as regards time, study area, sample and other research facilities usually faced by a single student investigator. Limitation of time had set up a barrier for probing into many more dimensions of research. However, considerable care and thought have been exercised in making the measurement of different variables as objective and systematic as possible.

It may also be recognised that the investigation was conducted in a limited geographical area of one state under

a particular environmental situation. Obviously, the findings emanating from the study would be readily applicable in areas which offer similar conditions while the general conclusion arrived at may be of value in other spheres, subject to local adjustments.

1.8. Operational definition of concepts used

The operationalisation of the different concepts used in the study is explicated here. The individual concepts selected for examination were chosen on the basis of prior research in the area of diffusion of innovations.

Threshold: In the field of diffusion and adoption of innovations, a threshold may be defined as a point where the relatively continuous input of information into a system exceeds a cut-off point, such that the system initiates some new action in response to the input. In this study, threshold is defined as the point from which the individual is pressurised to adopt an innovation. When the sum of the effects of positive factors of an innovation exceeds the sum of the effects of negative factors, the individual is assumed to have reached the threshold level and he is expected to adopt the innovation.

Positive factor: Any factor perceived by a sugarcane grower that actually motivates him to adopt the new sugarcane variety.

LIST OF FIGURES

LIST OF FIGURES (CONTD.)

Inhibitive factor: Any factor perceived by a sugarcane grower that actually inhibits him from adopting the new sugarcane variety.

Perception: The meaning a person has for a person, place, event or message.

Adopters: Individuals who currently and actively utilised or practised the innovation of interest at the time of data collection.

Non-adopters: Individuals who were aware of the practice but did not actively utilise or practise the innovation of interest at the time of data collection.

Threshold typology: It is a scheme for the classification of adopters and non-adopters into mutually exclusive and exhaustive groups, based on the threshold distribution.

1.9. Layout of the dissertation

The dissertation is divided into five chapters. Following the introductory portion, four more chapters, each dealing with a separate aspect, have been presented in a logical sequence. As there is a general lack of literature directly relevant to the problem under study, it was felt that a separate chapter on review of literature would not be very meaningful. Therefore, the relevant literature has been incorporated as the conceptual framework and is

presented in the form of theoretical orientation in the second chapter. The research methods adopted in the study are described in the next chapter. The fourth chapter presents the findings and discussion. Summary of the study with its major findings and implications have been given in the last chapter.

Theoretical Orientation

CHAPTER II

THEORETICAL ORIENTATION

The main purpose of this chapter is to systematically portray the relevant aspects of the study into a theoretical framework in order to provide a theoretical base for the empirical investigation as well as to arrive at a set of working hypotheses. Available literature indicated that certain dimensions of the present study had limited scope for giving review of research studies. An attempt has therefore been made to use the literature which are meaningful and have direct relevance to the present study to develop a theoretical orientation with the following headings.

2.1. Threshold concept
2.2. Threshold constituents
2.3. Threshold typologies, adopter categories and their characteristics
2.4. Stages in innovation-decision process
2.5. Summary

2.1. Threshold concept

Purpose of the present dissertation is to examine the utility of a threshold model of decision-making in understanding the innovation-decision on sugarcane varieties.

The Reader's Digest Great Encyclopedic Dictionary (1964) defined threshold as the point at which effect begins

to be produced, idea enters consciousness. Webster's New Twentieth Century Dictionary (1978) defined threshold as applied to psychology and physiology as the point at which a stimulus is just strong enough to be perceived or to produce a response; as the threshold of pain.

In the field of diffusion and adoption of innovations, a threshold may be defined as a point where the relatively continuous input of information into a system exceeds a cut-off point, such that the system initiates new action in response to the input (Taylor, 1978). An example may serve to clarify the meaning of this rather abstract definition. The thermostat which controls the heating and cooling in a building is based on the threshold concept. Continuous temperature readings are taken at one or more locations in the building. This incoming information does not cause the system to initiate new action until a certain threshold temperature is reached. Once the threshold is reached, the system initiates new action by either turning on or turning off a heating or cooling unit.

2.1.1. Human decision-making and thresholds

The decision-making behaviour of people in a social system may be regarded as a threshold phenomenon. The individual receives a relatively continuous flow of information from the social environment, some of which are relevant to a given decision-making process. The individual may decide to adopt the innovation. The individual is said to have reached his or her threshold (for the sake of convenience, only

the male gender terminologies will be used hereafter, but it may be taken as to include both genders), as the individual has initiated new action in response to the incoming stream of information.

The threshold model developed by Granovetter (1977) posits that the individual engages in a subjective cost-benefit analysis with regard to a binary decision where the individual has two distinct and mutually exclusive behavioural alternatives. In other words, the decision to act or not to act is evaluated in terms of its subjective costs and benefits to the individual. According to this formulation, the individual acts when subjective benefits exceed subjective costs. Each individual possesses a threshold with regard to any particular decision, and these thresholds are expected to vary from individual to individual. Some people will be relatively eager to adopt new practices and therefore may take greater risks to engage in such activities. Others may be more cautious and may adopt the new practices only at a later stage to reduce the probable losses.

Threshold concept is widely used in biological as well as social sciences. In Agricultural Entomology, Summers, Orsenigo and Kidder (1976) defined the threshold level of economic loss due to sugarcane borer is one at which the lossess caused by a particular level of borer population exceeds the cost of plant protection operation to control the borer. At this threshold level, it is recommended that the farmer takes up

the plant protection operation. Granovetter (1973) suggested a catalogue of binary-choice situations wherein threshold models could be applied. The situations include riot situation, diffusion of innovations, strikes, voting, educational attainment, leaving social occasions, migration, rumours and diseases and experimental social psychology.

According to the Granovetter model (1977), any number of factors may set an individual's threshold, but the key behavioural indicator of that threshold level is the number of other people in a social system who have acted in a particular manner, prior to the adoption of that activity by the individual. Rogers (1978) also used this definition in his study on communication networks and the role of thresholds in the adoption of innovations. Later, Granovetter and Soong (1981) developed a number of threshold models based on this.

2.1.2. An historical context of the threshold concept

The concept of behavioural thresholds is not new to social sciences, though the Granovetter explication of the concept in his model (1977) and the modification of that model in the present dissertation represent a departure from earlier conceptualisations.

In the earlier studies, threshold is viewed as a sub set of a line of social enquiry which focusses on 'system effects'. The influences exerted by social structure upon

the individuals within a social system provide an important key to understanding the process of the diffusion of innovations, as well as other forms of human behaviour.

Another line of enquiry which has utilised the concept of thresholds involves computer simulation of the diffusion process. In specifying the rules which the computer uses to simulate a diffusion process, researchers such as Deutschmann (1962) and Hagerstrand (1967) have incorporated procedures which simulate threshold of adoption phenomenon.

While the Granovetter model of thresholds (1977) assumes that the individual engages in a subjective cost-benefit analysis of an adoption decision, alternative formulations have been developed in Psychology. Specifically, Asch's (1956) formulation of social conformity and Wheeler's (1966) formulation of social contagion contain an implicit assumption of individual thresholds which are affected by the behaviour of other people. Social contagion occurs when the individual's internalised inhibitions to act in a certain manner are overcome by observing another person (or persons) engage in the same behaviour. This assumption was also followed by Grodzins (1957) and Schelling (1972) in their research on residential segregation. Each of these lines of inquiry are considered below, and related to the threshold concept which occupies the attention of the present dissertation.

2.1.3. System effects

The interest in the system is as old as the science of

sociology itself. This interest rests on the assumption that understanding the social environment or context of the individual is important in understanding the behaviour of the individual. The system effect view point is perhaps best summarised in the principle of general system theory which holds that the whole of a complex system is greater than the sum of its parts (Bateo, 1973).

The system effect view point is forcefully argued by Rogers with Shoemaker (1971) within the diffusion of innovations tradition by stating that the norms of a social system may be as important in explaining the individual innovativeness as such individual characters as education, cosmopoliteness and so on.

System effect is the influence external to the individual which may affect the individual's behaviour. By acknowledging the role of system effect in determining behaviour, social science departs from the longstanding tradition in psychological and communication research of blaming the individual as the cause of social problems (Coulen and Nelson, 1973).

2.1.4. Simulation of the diffusion of innovations

'Simulation' is often regarded as synonymous with 'computer simulation', but the digital computer is not an essential element of simulation, only a formidable expediter. One of the early pioneers of simulation of diffusion processes was the Swedish researcher Hagerstrand, who laboured over

simulations of diffusion processes prior to the widespread use of computers (Hagerstrand, 1967). Like Deutschmann (1962), Hagerstrand utilised the concept of thresholds in his innovation-adoption model.

Hagerstrand (1967) studied the diffusion of innovations over wide geographical areas, such that physical maps of the diffusion process were generated as a sequence of his models. Hagerstrand noted that information about an innovation generally diffuses faster than the rate of adoption. In order to account for this factor, Hagerstrand developed the concept of "resistance".

In a composite simulation model which incorporated information, attitude and behavioural parameters, Deutschmann (1962) incorporated the concept of thresholds to account for the lag between awareness of an innovation and adoption. The Deutschmann simulation model assumed that each individual had a change orientation score. This was the individual's predisposition toward innovations in general and this score varied from person to person. Each favourable message about a particular innovation moved the individual's attitude a single unit's increment toward the adoption threshold, defined as a specific level of "attitudinal favourableness" towards the innovation. Because some people start out with relatively unfavourable attitude toward innovations in general, they may require a greater number of favourable messages about the innovation before adopting than do others.

Neither Hagerstrand nor Deutschmann were interested in thresholds and their distributions per se. Rather, threshold or resistance rules were required in their simulation models in order to account for differences in the diffusion of innovation information and the rate of adoption itself. Nonetheless, their formulations of thresholds and resistances provide an historical context from which the present threshold formulation has been evolved.

The concept of subjective cost-benefit, as defined by Granovetter (1978) and Dasier (1978) assumes that the individual weighs the subjectively perceived costs and subjectively perceived benefits of behavioural alternatives and acts in a manner which maximises benefits and minimises costs. The concept subsumes the influences of social conformity, behavioural or social contagion and social facilitation under a single conceptual umbrella.

2.1.5. Threshold defined

In the present study, threshold is defined as the point from which the individual is pressurised to adopt an innovation. When the sum of the effects of perceived positive factors of the innovation exceeds the sum of the effects of negative factors, the individual is assumed to have reached the threshold level and he is expected to adopt the innovation.

Identification of number and kind of positive and negative factors contributing to adoption behaviour is

important, but it is inadequate since each positive or negative factor varies in its intensity in influencing the farmer's behaviour. But ultimately it is the differential cumulative effect of positive and negative factors that determine the adoption behaviour. In short, it can be said that if the cumulative effect of all the perceived positive factors taken together is greater than that of the total cumulative effect of negative factors, a farmer is likely to adopt the innovation.

2.1.6. Contribution of the present dissertation

The present dissertation rests largely on the threshold model developed for this study but borrows from the research of Deutschmann (1962), Hagerstrand (1967), Rogers (1975), Lee (1977), Rozier (1979) and Granovetter (1979) as well. The present dissertation represents the first effort to apply the new threshold model to the observed, empirical data from typical Indian rural situation. As such, the present dissertation required that new ground be broken on several different fronts. In addition, the present dissertation attempts to express the threshold model in a manner consistent with the diffusion of innovation-tradition.

2.2. Threshold constituents

Rogers with Shoemaker (1971) generalised that the rate of adoption of innovation is influenced by perceived attributes of innovation, type of innovation-decision, communication

channels, nature of social system and extent of change agents' promotional efforts. Relevant literature related to these five items as applicable to the acceptance of the new sugarcane varieties in the study area are presented under the following headings.

2.2.1. Attributes of innovation

2.2.2. Extension system's promotional efforts

2.2.3. Social factors

These aspects were utilized while formulating the Sugarcane Variety Acceptability Index in the study which was later used in the measurement of threshold in innovation-decision.

It is to be mentioned here that, conceptually, a threshold is an initial resistance to an innovation, characteristic of an individual in a social system, which must be overcome before the individual will adopt the innovation. A myriad of factors cause some individuals to have high initial resistance to the innovations, while other individuals have relatively less resistance (Bohlen, 1970). These factors (constituents) of threshold were identified from the available studies in diffusion and adoption of innovations.

2.2.1. <u>Attributes of innovation</u>

All innovations can not be regarded as similar or equivalent in their capacity to induce change in the potential

adopting units. Any given innovation in some manner includes an ideational attribute with or without a material component (Barnett, 1953 and Coughenour, 1965). Barnett (1953) in this connection stated, "the reception given to a new idea is not so fortuitous and unpredictable as it sometimes appears to be. The character of the idea is itself an important determinant. The properties of a given idea act as stimuli and their perception by an individual influences his behaviour (Rogers, 1962). Bohlen and Beal (1960) postulated that an individual's response or action is the result of the reception and interpretation of the stimulus which implies the behaviour as motivated by a stimulus.

Diffusion researchers have so far studied a number of attributes of farm innovations. A brief review of studies conducted on this aspect along with the attributes found to be significantly related to rate of adoption is presented here.

S.No.	Author	Year	Attributes of innovations found to be significantly related to rate of adoption
1.	Barnett	1953	Cost; financial return; compatibility and saving in time and labour
2.	Hess and Miller	1954	Initial cost
3.	Beal and Bohlen	1957	Cost
4.	Hoffer and Dale	1953	Compatibility (with type of soil)

S.No.	Author	Year	Attributes of innovations found to be significantly related to rate of adoption
5.	Lindstorm	1953	Cost and relative advantage
6.	Kivlin	1960	Relative advantage; compatibility and complexity
7.	Lionberger	1960	Complexity
8.	Rogers	1960	Compatibility and complexity
9.	Roy	1960	Taste; less preference by labourers; need for more fertilizers and poor net returns (for hybrid maize)
10.	Fliegel and Kivlin	1962	Saving of time; compatibility and complexity
11.	Oppenfeld and Florentino	1962	Higher yield; income or profit; unfavourable experience; extra time and effort
12.	Reddy	1962	Superiority of the new variety; cost; non-availability of seed; use complexity (for hybrid bajra)
13.	Brandner and Kearl	1964	Compatibility (for hybrid sorghum)
14.	Choudhary	1965	Superiority of the recommended practice
15.	Kelkar and Sohani	1965	High cost - either initial or recurring; major change in the existing practices; simple to work with; compatible with past experience; risk; higher financial returns; needs constant technical guidance and skill in its management and compatibility with the existing structure of farming and family
16.	Palvi and Pawar	1966	Profitability; compatibility; efficiency and feasibility

S.No.	Author	Year	Attributes of innovations found to be significantly related to rate of adoption
17.	Desai and Narayanan	1967	Heavy capital investment for inputs (for high yielding varieties)
18.	Prasad	1967	High cost of seeds and non-availability
19.	Vidyarthi	1967	Increase in production; more profit; better price; more efficiency; availability of credit and inputs; gain in social status and prestige; lack of irrigation and farm power; complicated procedure of granting loans; non-availability of inputs and lack of knowledge and skill
20.	Agro-economic Research Centre	1968	Unsuitability of land; untimely supply of fertilisers; less profitability and cultural incompatibility (for high yielding varieties of rice)
21.	Clark and Akinbode	1968	Economic gain, adoption by neighbours; encouragement by salesman or dealer; lack of information; lack of credit facilities and lack of necessary equipments
22.	Desai and Desai	1968	Longer duration of crop; low quality of straw; fear of failure of rain; high cost of seed and poor quality of grain
23.	Gupta	1968a	Low fodder output and inferior taste of grain (for I R 8 rice)
24.	Gupta	1968b	Lack of irrigation facilities (for Mexican wheat)
25.	Jaiswal and Roy	1968	Profitability; cost; physical compatibility; cultural compatibility; complexity and communicability

S.No.	Author	Year	Attributes of innovations found to be significantly related to rate of adoption
26.	Mitra	1969	Profitability; compatibility; feasibility and cost
27.	Maley and Roy	1969	Simplicity - complexity; cost of innovation; profitability; communicability; physical compatibility and divisibility (for high yielding varieties of wheat)
28.	Reddy	1968	Lack of conviction; high cost; lack of technical assistance and lack of supplies in time
29.	Singh and Babu	1968	Profitability (for fertilizers)
30.	Sinha and Ghosh	1969	Lack of irrigation facilities and higher cost
31.	Sohoni	1969	High initial cost
32.	Subramanyam	1968	Profitability; efficiency; compatibility; cost; feasibility and communicability
33.	Ghosh	1969	Inadequate irrigation; soil not suitable; not convinced about the yield; need for a large quantity of fertilizers and fragmentation of holdings
34.	Ojha	1969	High cost and non-availability of fertilizers in time (for fertilizers)
35.	Programme Evaluation Organisation	1969	High cost of inputs; difficulty in processing seeds; inadequate irrigation facilities and non-availability of fertilizers and pesticides (for wheat and rice practices)
36.	Sharma	1969	Poor output; lower price; susceptibility to pests and diseases; longer duration of the crop; inferior grain quality; difficulty in threshing; poor quality of straw and need for extra labour (for HYV rice)

S.No.	Author	Year	Attributes of innovations found to be significantly related to rate of adoption
37.	Singh	1969	Rate of cost recovery; financial returns; divisibility for trial; communicability; initial cost; operating cost and complexity (for hybrid maize)
38.	Vannasilpa	1969	Not superior to local varieties; low marketability; non-availability of seeds; high cost of seeds and lack of irrigation facilities
39.	Das and Sarkar	1970	Economic gain
40.	Joon, Singh and Rana	1970	Greater capital investment and not good for consumption
41.	Kulkarni	1970	Non-availability of seeds; high cost of seeds; lack of irrigation facilities; poor quality of rice; greater care needed to control pests and diseases; lack of conviction about the performance of new varieties and inadequate finance to purchase fertilisers and chemicals (for high yielding varieties of rice)
42.	Perumal	1970	Low cost of cultivation; high profitability and ease of cultivation (for hybrid maize cultivation)
43.	Rao	1970	Profitability; compatibility and complexity
44.	Singh	1970	Divisibility and high marginal returns
45.	Singh and Haque	1970	Lack of availability of quality seeds; inadequate availability or non-availability of fertilisers; low market price; low level of consumer demand; high cost of inputs; high incidence of pests and diseases and lack of sufficient irrigation

S.No.	Author	Year	Attributes of innovations found to be significantly related to rate of adoption
46.	Rao, Singh and Pal	1971	Economic motivation (for high yielding varieties of wheat)
47.	Rogers with Shoemaker	1971	Relative advantage; compatibility; trialability; observability and complexity
48.	Choukidar and George	1972	Taste; keeping quality and cooking quality of high yielding varieties of rice
49.	Viswanathan	1972	Compatibility with traditional methods; high cost; more technical skill and more labour
50.	Parameswaran	1973	Unfavourable yield and price and unsuitability to soil (for improved varieties of cotton)
51.	Anbalagan	1974	High yield and more net profit; risk involved; high cost of cultivation and non-availability of fertilisers and plant protection chemicals (for high yielding varieties of rice)
52.	Banarjee	1974	Lack of resources; non-availability of required inputs; high cost of cultivation; high risk and uncertainty
53.	Gowda and Jalihal	1974	Lack of conviction about their superiority and unsuitability of these varieties for late planting
54.	Sharma and Nair	1974	Complexity; cost of innovation; profitability; suitability and labour need
55.	Singh	1974	Complexity; poor taste; non-availability of seeds and fertilizers (for high yielding varieties of rice)
56.	Momi and Sohal	1975	Risk; non-compatibility and complexity

S.No.	Author	Year	Attributes of innovations found to be significantly related to rate of adoption
57.	Arulraj	1976	Profitability; physical compatibility; cost; complexity and feasibility (for high yielding varieties of rice)
58.	Pande	1976	Increase in yield; easy availability of seeds; better quality of seeds; availability of irrigation facilities; timely availability of inputs; support from government officials; resistance to pests and diseases and resistance to lodging (for high yielding varieties of wheat)
59.	Arulraj and Knight	1977	Cost and profitability for small and marginal farmers and profitability alone for large farmers (for high yielding varieties of rice)
60.	Vijayaraghavan	1977	Inadequate irrigation facilities (for IR 20 rice)
61.	Giriappa	1978	High cost of cultivation and more incidence of pests and diseases (for high yielding varieties)
62.	Mencher	1978	Complexity of post-harvest operations and poor taste (for IR 8 rice variety)
63.	Palaniswamy	1978	Less water requirement; assured daily income and higher net profit
64.	Rochin	1978	High returns over costs; divisibility; complexity; communicability; compatibility; technical appropriateness and uncertainty
65.	Zuckerman	1978	Threshold level of cash returns above which he finds each 'useful' and below which he finds it unproductive

S.No.	Author	Year	Attributes of innovation found to be significantly related to rate of adoption
66.	Shyagarajan	1979	Increase in yield; adoption by neighbours; not risky; availability of irrigation and better quality of grains (for 17 29 wise)
67.	Winkelman and Moscardi	1979	Increased yield; low risk and consistent with the farmers' situation
68.	Ramiyannan	1980	Low seed rating; non-remunerative price; damage of seeds by birds; lack of pest resistant varieties; lack of credit facilities and inadequate transport facilities (for sunflower cultivation)
69.	Sharma	1980	Expected yield
70.	Alcobor	1981	Ignorance of the advantages of the practice; not certain of its success; lack of money for inputs and lack of how to do knowledge (for improved practices of coconut)
71.	Brady	1981	Economic or social benefit (for new wheat and rice varieties)
72.	Harwood	1981	Suited to physical and biological environment; relevant to type of farming system; low requirement of resources and profitability
73.	Hildebrand	1981	Appropriate to the farmers' situations
74.	Ashby	1982	Suitability of technology to different types of farms
75.	Mohamed	1982	Less deviation from the established systems of farming and ways of life

S.No.	Author	Year	Attributes of innovations found to be significantly related to rate of adoption
76.	Subramani	1982	High yield; suitability to farmers' requirements; non-lodging; better germination and better juice content of the variety (for sugarcane varieties)
77.	Tripathy, Singh and Shahoo	1982	Low germination; low purity; high varietal mixture and not suited to par-boiling because of low recovery and high breakage in milling (for high yielding rice varieties)
78.	Rajathurai	1983	High yield; resistance to adverse conditions; non-lodging character; subsidy offered; juice quality; availability of setts; high cost; lack of credit; non-availability of labour; loss profit; more pest and disease incidence and unsuitable to the soil type available (for sugar-cane varieties)

As Rogers (1983) pointed out a controversy regarding the relative importance of profitability versus other perceived attributes of innovations can be traced through the diffusion literature. For some innovations and for some farmers economic aspects of relative advantage may even be the most important single predictor of rate of adoption. But to argue that the economic factors are the sole predictors of rate of adoption may be ridiculous. Hence in the present study, equal importance is given to various types of characteristics of innovation.

2.2.2. Extension system's promotional efforts

Caldwell (1971) opined that subsidies induced small farmers to participate in various developmental activities.

Rogers (1979) on the basis of his research and experience with family planning innovations drew the following conclusions: (1) incentives increase the rate of adoption of an innovation, (2) adopter incentives lead to adoption of an innovation by individuals different from those who would otherwise adopt and (3) although incentives increase the quantity of adopters of an innovation, the quality of such adoption decisions may be relatively low, leading to limitations in the intended consequences of adoption.

Ukeje (1976) reported that the most critical incentives influencing farmers in the adoption of agricultural innovations were the availability of technical guidance and credit. Major disincentives were poor keeping quality, more labour requirement, lack of technical guidance and lack of production inputs.

Nwoke and Akortha (1983) recommended that the transfer of technology programmes should have a credit component if the technology involves purchased inputs and such inputs should be made readily available.

Rogers (1983) classified the incentives into five types: (1) adopter versus diffusor incentives, (2) individual versus system incentives, (3) positive versus negative

incentives, (4) monetary versus non-monetary incentives and (5) immediate versus delayed incentives.

Shivlch et al. (1983) observed that the basic issues with regard to delivery of seeds related to production, certification and distribution. As the varietal change has been the centre of the green revolution, special attention has to be bestowed upon improving the delivery system of this vital input. Among the difficulties experienced by the respondents, 'high cost' accounted for nearly 33 per cent in aggregate.

2.2.3. Social factors

Smith (1913) and Gonsales (1963) identified the significance of the family as a critical reference group in Caribbean society and culture.

Marsh, Coleman and Coleman (1956) concluded that neighbourhood norms accelerated or retarded adoption among a sample of Kentucky farmers.

Van den Ban (1960) and Rogers (1971) observed that the theoretical reasoning and direct observation suggested that diffusion of innovations does not occur in vacuum and the kind of social structure in which an actor operates is important in affecting adoption behaviour.

Terasart (1977) listed out the incentives for behavioural change by farmers related to adoption of dry season cropping as use by neighbours, desire for more income and availability of water and the disincentives as no neighbour doing it, low water and not sure about water.

Henderson and Gomes (1982) analysed the data on opinion sources for farm planning decisions or about new varieties and practices which revealed the importance placed by small farmers on the views of their spouses and other family members. They recommended that the sociological significance of this role played by the interaction within the family structure of farmers should therefore be understood and effectively used in transferring new technology.

Pachico and Ashby (1983) found that the farmers who run short of rice seed or seedlings at planting time traditionally borrowed from others to make up their deficit. The traditional obligation to lend or exchange stocks of seed meant that as the proportion of high yielding variety adopters in the community increased, local seed multiplication could supply the needs of farmers. In addition, farmers decided which varieties to grow on which fields in consultation with cultivators of neighbouring plots.

2.3. Threshold typologies, adopter categories and their characteristics

A typology is an idealisation of some characteristics which is used to distinguish or typify one group of objects

from another group of objects. The utility of typologies is that they permit one to distinguish groups of objects from an otherwise undifferentiated mass, but without the need to consider every object as unique and separate from the others.

2.3.1. Threshold typologies

Hagerstrand (1967) categorised his respondents based on resistance levels. He posited five levels of resistance within a population of geographically separated, if not isolated, individuals. The most populous category was the middle resistance category, with the number of 'high' and 'low' resisters decreasing toward the upper and lower limits of the distribution.

Dozier (1978) investigated the characteristics of observed threshold distributions, with the intent of using such observed threshold distributions to generate adopter typologies. An observed threshold distribution is the set of all individual thresholds of adoption for members of a social system. As such, an observed threshold distribution is a characteristic of the social system, at the system level of analysis. An individual threshold of adoption, on the other hand, is a characteristic of the individual, at the individual level of analysis. Inflection points in the frequency distribution of thresholds were used as the basis for the classification of adopters into a threshold typology.

Dozier (1979) distinguished three distinct clusters by utilising inflection points in the frequency distribution

curve. One cluster, ranging from zero per cent to around 20 per cent, constituted individual thresholds for relatively innovative respondents. Another cluster ranges in the 20 to 58 per cent zone, peaking at around 55 per cent. This cluster was categorised as the middle threshold adopters. As non-adopters are dumped arbitrarily into the 100 per cent category, that category should be treated, for analytic purposes, as the laggards category (with thresholds greater than 58 per cent including non-adopters with thresholds of 100 per cent). About 24.6, 29.0 and 46.4 per cent of the respondents belonged to these three categories respectively.

Bosler (1978) compared the characteristics of the threshold categories with that of the formulation of adopter categories as proposed by Rogers with Shoemaker (1971).

For the purposes of comparison, a few other attempts on categorisation of adopters is presented here.

2.3.2. Adopter categories

Almost since the beginning of adoption research, attention has been given to the pattern of adoption of practices over time. All individuals in a social system do not adopt an innovation at the same time, rather they adopt in an ordered time-sequence. In a hybrid seed corn study, Ryan and Gross (1943) discussed the bell shaped pattern of adoption and cumulative S-curve. Investigations have shown that adoption of most of the practices tends to approximate

a normal distribution curve (Wilkening, 1952; Rogers, 1958; Rogers and Beal, 1958; Beal and Rogers, 1960; Rogers and Svenning, 1969 and Rogers with Shoemaker, 1971). This generalisation is true for both the adoption of an individual farm practice and for adoption scores or scales based upon the adoption of number of practices (Rogers, 1958). This recognition of adoption-distribution has led to the categorisation of farmers on the basis of time they take to adopt new practices.

The inability of adoption-researchers to agree on common semantic ground in assigning terminology has led to a plethora of adopter-descriptions (Rogers with Shoemaker, 1971). North Central Regional Rural Sociology Sub-committee (1955) had proposed the titles of 'innovators, community adoption leaders, local adoption leaders and later adopters'. Other terms such as, 'early adopters, informal leaders, non-adopters, progressists, conservatives, traditionalists and diehards' were utilised by various research workers. This disarray of adopter-categories and methods of categorisation motivated Rogers (1958) to work for standardisation using the two parameters of normal distribution, namely, the mean and standard deviation. Using this method, the adopters were classified into innovators (2.5 per cent), early adopters (13.5 per cent), early majority (34.0 per cent), late majority (34.0 per cent) and laggards (16.0 per cent).

Lionberger (1960), however, divided the adopters of agricultural practices into early, late and majority categories to describe their characteristic differences.

Bose and Gupta (1962) and Gupta (1963) in their studies classified the adopters into three categories-innovators (5.7 per cent), early adopters (9.6 per cent) and late adopters or ordinary farmers (85.7 per cent) which according to them appeared to be a simple and reasonably precise classification for conducting similar studies in other parts of India.

Rohlen (1965) in his analysis on "The Changing Rural Society, its Perspectives and Trends", classified the adopters into six categories, namely, innovators, early adopters, early majority, majority, late majority and laggards.

Chand and Gupta (1966) in their study classified the adopters into innovators (7.8 per cent), early adopters (26.6 per cent) and laggards (65.6 per cent).

Deb and Sharma (1969) categorized the adopters into innovators (6.7 per cent), early adopters (33.3 per cent) and late adopters (60.0 per cent).

Wahbubani (1972) categorised the adopters on the basis of date of adoption of an innovation into the following four groups-innovators, early majority, late majority and laggards.

Brown, Edward and Spector (1976) while analysing the adopter categories in a spatial context, categorised the

adopters into three groups, namely, innovator-early adopters, early majority and late majority-laggards.

Based on the degree of innovativeness expressed by the respondents, Jetley (1977) classified the adopters of agricultural innovations into five groups, namely, innovators, early adopters, early majority, late majority and laggards. Balasubramanian (1979) also followed a similar categorisation.

2.3.3. Characteristics of adopter categories

Dresser (1969) pointed out the absence of a sound theoretical basis for either awarding or discriminating adopter categories and suggested for a common basis of classification that would facilitate the comparisons being made. However, there do appear to be some generalisations that could be made about the different characteristics of the various adopter categories.

Studies conducted by Wilkening (1953) and Gupta (1963) revealed that earlier adopters of improved agricultural practices were better educated. Jones (1960) observed that innovators had large farms, more wealth and high income. Rogers (1961) while analysing the characteristics of agricultural innovators and other adopter categories indicated that innovators had more education, greater formal participation, higher social status, younger age, high gross farm-income, more direct contact with agricultural scientists and county extension agents, greater mass media exposure and

required shorter adoption period.

The generalisations made by Bohlen (1965) are quoted below:

> "The innovators and early adopters have high ability to deal with abstractions, are more willing to take risk, adopt a practice much sooner than they become aware of it, tend to process different kinds of information, are more cosmopolites and lesser secular oriented than late adopters and laggards. Further the innovators and early adopters are more ends-oriented while those slowest to adopt tend to be more means-oriented".

Chand and Gupta (1966) reported that innovators and early adopters, in general, were better educated, enjoyed better economic status, had more social participation with larger holdings than laggards.

Desai and Patel (1967) in their study on Hybrid Bajra Programme in Gujarat state pointed out that the early adopters of technological change were bigger farmers.

Curcharan and Harold (1968) while dealing with the factors of adoption concluded that under Indian situations, those who adopt new ideas earlier than others in a social system could not be called as deviants because the farmers live in closely-knit village systems and they further reported that the innovators, in terms of socio-economic characters, were not significantly different from early adopters.

Rajendra (1968) while analysing the characteristics that distinguished the adopter categories, found that age,

caste and size of holding did not play important role in the differentiation between early adopters and late adopters whereas economic status, social participation and literacy distinguished them.

Deb and Sharma (1969) in their study on 'characteristics of adopters of improved farm practices' concluded that innovators and to some extent early adopters were more literate, had more income, managed larger size holdings and had more contacts with extension agencies than late adopters.

Rogers and Svenning (1969) compared the five adopter categories in three modern and two traditional Columbian villages and concluded that the innovators scored consistently higher on most of the modernization-variables, namely, literacy, aspiration, cosmopoliteness, mass media exposure and so forth, than respondents of other adopter categories in both modern and traditional villages.

Rogers with Shoemaker (1971) based on the content analysis of research publications in the Diffusion Documents Centre at Michigan State University made the following generalisations:

> "The relatively early adopters in a social system tend to have more education, a higher social status, more upward social mobility, larger units, a commercial rather than a subsistence orientation, a favourable attitude towards credit and more specialised operations. Early adopter also has empathy, less dogmatism, greater ability to deal with abstractions, greater rationality and more favourable attitude towards change, risk,

> education and science ..... They have higher aspiration scores. Early adopters have more social participation, are more integrated to the system, are more cosmopolites, have more change agent contact, have more exposure to mass media and interpersonal channels, seek more information and have more opinion leadership".

Sundaram and Chandrakandan (1975) concluded that the innovators were mostly middle aged, literate, holding medium to large sized farms with medium or high income. All innovators were found to be members of one or more institutions, mostly originators who took information directly from research stations and through governmental extension agency or through literature. They further reported that innovators, in general, were more cosmopolite and hence had more contact with outside their social system.

Jetley (1977) in her study on "Modernising Indian Peasants" characterised the innovators as middle aged, mature minded in decision making, prepared to take up new experiences, more educated and leading an extended family system. It was further revealed that they had more contact with extension agency and their desire for increased income was more even if it meant them extra labour and working with lower castes.

Rogers (1973) derived the following generalisations from his analysis of a number of research results on the direction in which the independent variables are related to innovativeness. Percentage of research studies supporting the respective generalisations is also given.

I. Socio-economic characters

1.	Age (not related)	48
2.	Education (positive)	74
3.	Literacy (positive)	63
4.	Higher social status (positive)	68
5.	Upward social mobility (positive)	100
6.	Larger sized units (positive)	67
7.	A commercial, rather than a subsistence economic orientation (positive)	71
8.	A more favourable attitude toward credit (positive)	76
9.	More specialised operations (positive)	60

II. Personality variables

1.	Empathy (positive)	64
2.	Dogmatism (negative)	47
3.	Ability to deal with abstractions (positive)	63
4.	Rationality (positive)	79
5.	Intelligence (positive)	100
6.	A more favourable attitude toward change (positive)	75
7.	Ability to cope with uncertainty (positive)	75
8.	A more favourable attitude toward education (positive)	81
9.	A more favourable attitude toward science (positive)	74
10.	Fatalism (negative)	82
11.	Achievement motivation (positive)	61
12.	Higher aspirations for education, occupation etc. (positive)	74

III. Communication behaviour

1.	Social participation (positive)	74
2.	Interconnectedness with the social system (positive)	100
3.	Cosmopoliteness (positive)	76
4.	Change agent contact (positive)	87
5.	Mass media exposure (positive)	69
6.	Exposure to interpersonal communication channels (positive)	77
7.	More active information seeking (positive)	86
8.	Knowledge of innovations (positive)	76
9.	Opinion leadership (positive)	76
10.	Belonging to highly interconnected system (positive)	53

The fact that a number of generalisations have been evolved for different adopter categories motivated the researcher to analyse how the different threshold categories differed with reference to certain bio-socio-agro-economic characters.

2.4. Stages in innovation-decision process

Researches on adoption of a new idea by individuals or group of individuals have shown that adoption of a new idea is not a snap decision but a mental process on the part of an individual or group of individuals over a period of time. One of the important contributions made by adoption researchers is the concept of sequential nature of adoption. Rural

Sociologists have come out with a number of conceptual propositions regarding the stages of adoption of farm innovations.

Rogers (1983) generalised that stages existed in innovation-decision process. Of the 13 research studies he analysed, all the studies supported this generalisation.

Stage concept in adoption of an innovation is now a well recognised proposition with some disagreement especially on the number and sequence of stages involved therein.

Dewey (1910) was probably the first who used the concept of stages for reflective thinking comprising seven stages. This stage concept is also recognised in the areas of decision making and problem solving.

A brief review of stages passed by the decision makers in their innovation-decision process as identified by different researchers is presented here.

S.No.	Author	Year	Stages in innovation-decision process
1.	Ryan and Gross	1943	Awareness, acceptance and complete adoption
2.	Lewin	1947	Unfreezing, moving and freezing
3.	Wilkening	1953	Learning, deciding and acting

S.No.	Author	Year	Stages in innovation-decision process
4.	North Central Regional Rural Sociology Sub-committee	1955	Awareness, interest, evaluation, trial and adoption
5.	Wilson and Gallup	1955	Attention, interest, desire, conviction, action and satisfaction
6.	Cherry and Coser	1958	Information, decision and action
7.	Bill	1958	Pre-awareness, awareness, interest, acceptance, trial and adoption
8.	Holmberg	1960	Availability of innovation to the individual, awareness, interest, trial, evaluation, adoption and integration of innovation into individual's routine
9.	Rahim	1961	Awareness, information, trial and adoption
10.	Bose and Gupta	1962	Awareness, interest, trial, evaluation and adoption
11.	Mason	1964	Adoption was not the terminal stage, interest and information seeking items appeared before and after the adoption stage
12.	Zaltman	1964	Awareness, interest, desire and action
13.	Brim	1965	Initial exposure and early trials, continued trials and trial commitment
14.	Fliegel, Kivlin and Sen	1966	Awareness, trial and adoption
15.	Sharma	1966	Awareness, interest, evaluation, trial and adoption

S.No.	Author	Year	Stages in innovation-decision process
16.	Singh and Pareek	1968	Need, awareness, interest deliberation, trial, evaluation and adoption; a five stage paradigm of awareness, information, trial, evaluation and adoption for simpler practices
17.	Gaikwad, Verma and Raju	1969	Awareness, trial and adoption
18.	Rogers with Shoemaker	1971	Knowledge, persuasion, decision and confirmation
19.	Sinha and Sinha	1974	Awareness, interest, trial, evaluation and adoption
20.	Prabhakumar	1976	Awareness, evaluation I, interest, evaluation II, adoption and evaluation III/ satisfaction/dissatisfaction
21.	Sen	1980	Knowledge, acculation, symbolic adoption, use adoption, confirmation, symbolic rejection, late use adoption and continued rejection
22.	Nagill and Rogers	1981	For some individuals and for some innovations, the trial of a new idea by a peer like themselves can substitute, atleast in part, for their own trial of an innovation
23.	Nowak	1989	Gaining knowledge, acting on this knowledge to varying degrees by using the technology and adapting either one's operation, the technology or both to increase overall utility
24.	Rogers	1995	Knowledge, persuasion, decision, implementation and confirmation

The research studies mentioned here proved the existence of stages in innovation-decision process. However, the scientists differed widely in their inferences on the occurrence/sequence of various specific stages. This type of variations in the conclusions drawn might be due to the differences that might have existed between the respondents of different studies, innovations studied, progressiveness of the study area and the methodology followed in the identification of stages.

In this study, an attempt has been made to identify the stages involved in innovation-decision process as applicable to the innovation-decision on Co6 671 sugarcane variety. The relationship between threshold categories and stages in innovation-decision process was also analysed.

2.5. Summary

In this chapter, various dimensions of the threshold concept have been explained along with an historical context of the threshold concept. This helped us to arrive at an operational definition for threshold as applied to the present study and evolve a suitable methodology for the scientific measurement of this aspect. In the present study, threshold is defined as the point from which the individual is pressurised to adopt an innovation. When the sum of the effects of perceived positive factors of the innovation exceeds the sum of the effects of perceived negative factors,

the individual is assumed to have reached the threshold level and he is expected to adopt the innovation.

For the identification of number and kind of positive and negative factors contributing to threshold, a detailed review of research studies on innovation attributes, extension system's promotional efforts and social factors has been carried out. Based on the conclusions arrived at these studies, the researcher could list out a total number of 202 aspects which might influence the acceptance of a new sugarcane variety.

Various systems of classification of adopters into threshold categories (based on threshold scores) or adopter categories (based on innovativeness) along with the characteristics of different categories of farmers were also presented in this chapter. This was followed by explication of different models on the stages in innovation-decision process and their relative merits.

This chapter on theoretical orientation presented the theory which explained why the problem under study existed. The theoretical framework helped the researcher to identify the variables to be measured. It also produced a general framework which guided in the data analysis as explained in the subsequent chapters.

CHAPTER III

RESEARCH METHODOLOGY

The present investigation is an attempt to analyse threshold in innovation-decision on sugarcane varieties. The study was conducted by using the descriptive type of research design, applying ex-post-facto approach. The research methods adopted in this study are presented under the following headings.

3.1. Preliminary projects
3.2. Sugarcane Variety Acceptability Index
3.3. Major project

3.1. Preliminary projects

3.1.1. Purpose of preliminary projects

Two preliminary projects on (i) the farm practice-attributes influencing the innovation-decision on sugarcane varieties and (ii) the stages in innovation-decision process were undertaken as a preliminary step for further analysis of the problem under investigation.

3.1.2. Sampling procedure

A multistage random sampling with probability proportion to size was followed in the selection of respondents for the preliminary projects.

3.1.2.1. Selection of district

North Arcot district of Tamil Nadu state was purposively selected for the preliminary projects. Its very presence near the South Arcot district (locale of major project) prompted the researcher to opt for this district for preliminary projects. This ensured to a greater extent the similarity of socio-economic conditions of the people as well as sugarcane crop cultivation methods.

3.1.2.2. Selection of block and villages

North Arcot district has four agricultural divisions and of them one agricultural division (Ranipet) was selected randomly. Of the seven blocks in this division, one block (Sholingar) was selected randomly. Sholingar block has 50 revenue villages. Those villages were arranged in the descending order based on their area under sugarcane. Five villages from the top ten ranked villages were picked up randomly for undertaking the preliminary projects (Fig. 3.1).

3.1.2.3. The sample

It was decided to study the perceived attributes influencing innovation-decision with a sample of 35 adopters and 35 non-adopters of Coc 671 sugarcane variety. To satisfy the requirement of a large sample, the minimum needed is 30. Taking into consideration the time needed and facilities available, it was decided to take 35 adopters and 35 non-adopters as the sample. The 35 adopters were again considered

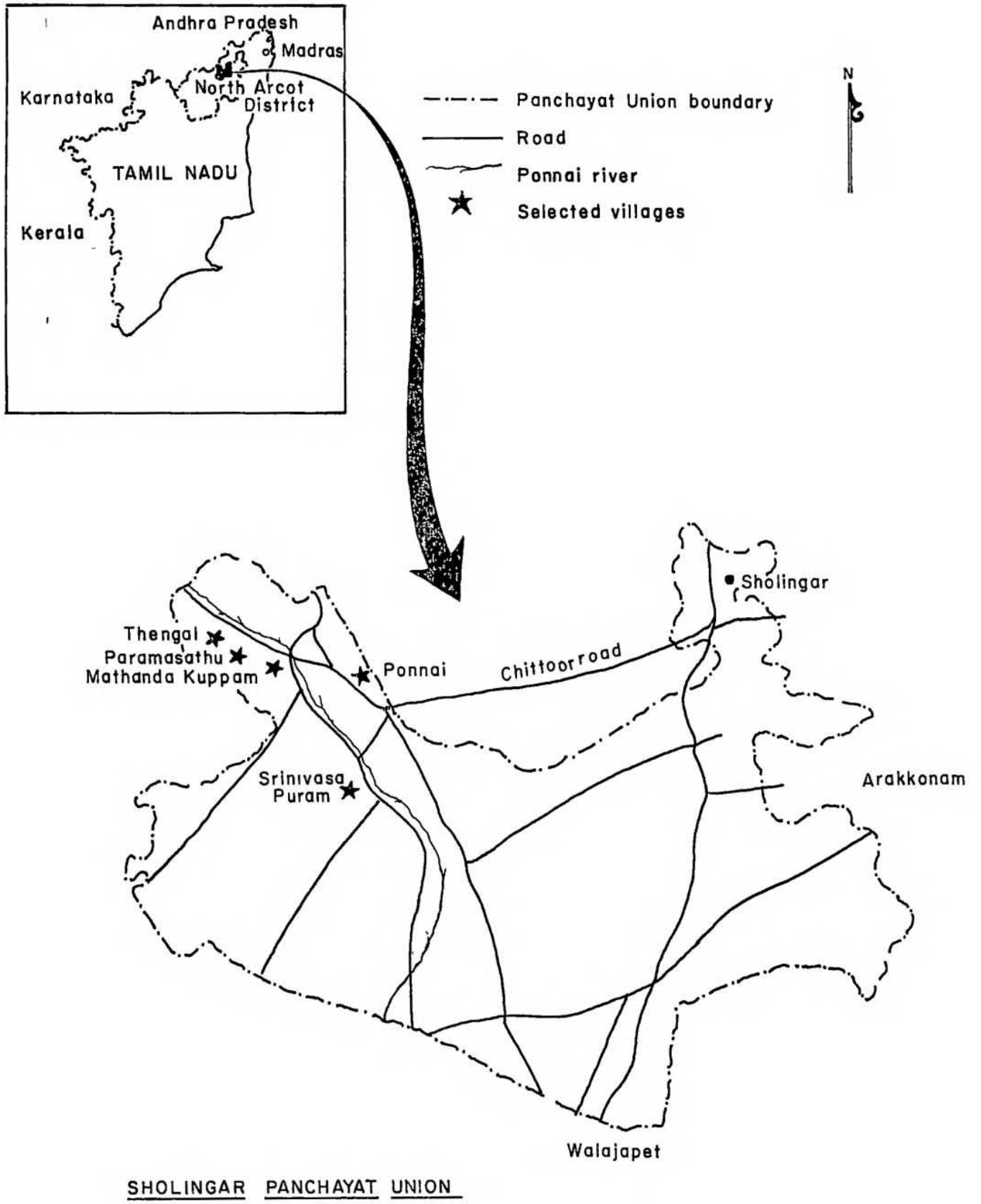

Fig.3.1. Locale of research - preliminary projects

as respondents for identification of stages in innovation-decision process. Number of respondents to be contacted in each village was fixed in proportion to the number of adopters and non-adopters available in the village using the formula.

$$C_i = \frac{n_i}{N} \times 35$$

where,

C_i = Number of adopters/non-adopters to be interviewed in the i^{th} village

n_i = Number of adopters/non-adopters available in the i^{th} village

N = Total number of adopters/non-adopters available in the selected five villages

Number of respondents selected from each village is presented in Table 3.1.

TABLE 3.1. RESPONDENTS SELECTED FOR PRELIMINARY PROJECTS

Name of village	Total no.of sugarcane growers	No. of adopters	Sample size	No.of non-adopters	Sample size
Thengal	36	19	7	17	5
Parmasathu	42	17	6	25	7
Srinivasapuram	29	11	4	18	5
Nathandakuppam	23	12	5	11	3
Ponnai	91	36	13	55	15
Total	221	95	35	126	35

Respondents as indicated in the table were selected randomly from the list of adopters and non-adopters of the respective villages.

3.1.3. Measurement of variables

3.1.3.1. Identification of perceived attributes of innovation

Semantic differential technique was used to identify the perceived attributes influencing innovation-decision on CoC 671 sugarcane variety.

Semantic differential stems from a desire to give quantitative measurement to meaning since how a person behaves in a situation depends upon what the situation means or signifies to him (Bhatnagar, 1981).

Meaning to a subject is so controversial that it can be better understood by looking into Charles Morris' classification which is as follows.

3.1.3.1.1. Pragmatical meaning: This involves the relationship of signs to situations and behaviour. Something which is not significant becomes a sign of that significate if it gives rise to the idea or thought of that significate. If ammonium sulphate (sign) is understood as something which is to be put (relation) in the field under cultivation (situation) and which boosts up production (behaviour), it is a pragamatical meaning.

3.1.3.1.2. Syntactical meaning: This involves the relationship of signs to other signs. If ammonium sulphate (sign) is understood as a compound (relation) of ammonia and sulphur, it is a syntactical meaning.

3.1.3.1.3. Semantic meaning: This involves the relationship of signs to their significate. When the meaning of ammonium sulphate (sign) is understood in terms of the fertiliser ammonium sulphate (significate) rather than in other terms as exemplified earlier, it is called a semantic meaning.

Now as a change agent or behavioural scientist, we are typically interested in semantic meaning, that is, what do people (client system) mean by an object (significate) to which they are associated? It further becomes clear that semantic meaning will depend on the association with the significate which in many cases may vary from individual to individual or group to group. That is why a farmer may mean ammonium sulphate, a plant growth stimulant, another farmer, a plant burner and still the third farmer, a soil spoiler, depending on whether a particular individual had used it properly or in overdose or for many continuous years without adding organic matter to the soil. In other words, it relates to the individual's experience or association with ammonium sulphate. A change agent thus, needs to have an estimate of these different meanings held by different farmers or farming communities to affect improvement successfully. This leads to the problem of measurement or indexing of meaning.

3.1.3.1.4. Construction and use of semantic differential: The use of linguistic encoding should have a carefully devised sample of alternative verbal responses (i.e. bipolar adjectives) which represents the major ways in which meanings vary. Hence, when the semantic differential technique is used, the questions will consist of bipolar adjectives like good-bad, active-passive etc. Again in order to increase sensitivity of the instrument, a scale can be inserted between the poles of each pair of adjectives which will help the subjects (respondents) indicate both direction and intensity of judgement.

The crux of the problem thus lies in selecting a sample of descriptive bipolar terms which should ideally be representative of all possible ways in which meaning can vary and yet be small enough in size to be efficient in practice. The subject then may be asked to rate the concept against this sample of bipolar adjectives at appropriate place on the scale which will indicate the subject's meaning of the concept. The semantic differential, thus, may be conceived as a combination of controlled association and scaling procedure.

The sample of bipolar adjectives representing all possible ways in which meanings of CoC 671 sugarcane variety can vary to different farmers is given here.

1. Expenditure incurred to put the practice in operation is
   Highly costly ..... Cheapest

2. Additional financial returns obtained through the adoption of this variety is

   High ..... Results in loss

3. Consistency with the past experiences and present needs of the farmer is

   Very high ..... Not consistent

4. Consistency with the existing social values is

   Very high ..... Not consistent

5. Relative difficulty in understanding the innovation is

   Highly difficult ..... Very easy

6. Relative difficulty in using the innovation is

   Highly difficult .....Very easy

7. Relative quickness with which the financial returns are obtained from the investment made on the practice is

   Immediate ..... Highly delayed returns

8. Efficiency of the practice to save time is

   Highly efficient ..... Not at all efficient

9. Efficiency of the practice to save money is

   Highly efficient ..... Not at all efficient

10. Efficiency of the practice to save labour is

    Highly efficient ..... Not at all efficient

11. Perceived risk in adopting the practice is

    Highly risky ..... No risk

12. Extent to which results of using the practice are observable to others is

    Results completely ..... Not at all observable observable

13. Possibility of trying the practice on a smaller scale is

Very high ..... Impossible

14. Possibility of getting suitable physical conditions for adopting the practice in his situation is

Highly feasible..... Not feasible

15. Possibility of getting suitable management skills required for adopting the practice in his situation is

Highly feasible ..... Not feasible

16. Availability of material inputs required for carrying out the practice in time is

Easily available ..... Not at all available

17. Easiness in selling the produce is

Very easy ..... Very difficult

18. Flexibility of the innovation to enable the farmer to cultivate the variety under varying conditions is

Highly flexible ..... Highly rigid

19. Extent to which the innovation is strange/different from what was known or usual as before is

Very novel..... Very old

The list of 19 attributes was administered to 70 respondents, namely, 35 adopters and 35 non-adopters of CoC 671 sugarcane variety selected as per the procedure given in 3.1.2. A five point continuum with the scale values of 5, 4, 3, 2 and 1 was used for this purpose (vide Appendix I). Each item in the list was explained in a few short sentences in the local dialect as to what it signified. The respondents were asked to elicit their opinion individually for each of the attributes on the five point continuum by placing each attribute

at any place on the continuum which they thought most appropriate to reflect their perception on Co6 671 sugarcane variety.

The responses were tabulated and statistically analysed by applying Mahalanobis' D^2 analysis and discriminant function analysis.

3.1.3.2. Identification of stages in innovation-decision process

A check list consisting of the following 25 probable stages (mutually not exclusive) was prepared based on the review of previous studies.

1. The farmer felt a need for a shift from old variety to some new variety
2. Turned the mind to the new idea
3. Availability of innovation inputs to the individual with reference to proximity
4. Availability of innovation inputs to the individual with reference to his purchasing capacity
5. Came to know vaguely of the existence of the innovation but lacked information on its attributes
6. Felt that the innovation might be able to satisfy his needs
7. Developed interest in the practice and sought for information

8. Exposed to the new idea
9. Obtained certain initial knowledge on the innovation especially on its cost-benefit aspects
10. Obtained information on "why" of the innovation
11. Obtained information for proper use of innovation
12. Grasped mentally all relevant aspects of the innovation
13. Formed a favourable or unfavourable attitude towards the innovation
14. Made mental evaluation of the information so far gained about the applicability of the practice in his present or anticipated future situation
15. Applied the practice actually on a small scale in order to determine its utility in his own situation
16. Engaged in activities which led to a choice to adopt or reject the innovation
17. Firmly believed in the applicability of the innovation in his own situation
18. Decided to use the practice continuously on full scale
19. Farmer carried out the innovation in his field situation more or less on a permanent basis
20. Satisfied with reference to the need felt earlier
21. Sought reinforcement for the innovation-decision he has made, but he might reverse his previous decision if exposed to conflicting message about the innovation

22. Integration of innovation into the individual's routine and achieving a terminal relationship

23. Put aside the innovation as not to be practised in his field situation

24. Decided to cease using the innovation in order to adopt a better idea which superseded it

25. Decided to cease using the innovation as a result of dissatisfaction with its performance

The check list was used to record the case history of the 35 adopters of Co 671 sugarcane variety selected as per the sampling procedure described in 3.1.2. Appropriate lead questions were putforth to each respondent to elicit information on the different stages through which each respondent had passed (vide Appendix II). Time at which different stages occurred together with the major sources of information at these stages were recorded. Content analysis was done and the responses were plotted on graph sheets to identify the important stages in innovation-decision process.

3.2. Sugarcane Variety Acceptability Index

3.2.1. Selection of variables

A farmer may be growing a particular sugarcane variety in his farm. Research and development personnel after testing a new variety in the locality decide to introduce the new variety in that area and start taking promotional efforts

such as spreading the message about the advantages of growing the new variety through various communication channels, persuading the farmer in their personal contact situations, announcing premium/subsidy, ensuring easy availability of setts etc. Now, it is for the farmer to decide. He is getting information about the variety from various sources like extension personnel, mass media and his friends and neighbours in addition to his own observation about the performance of the variety in demonstration plots and other farmers' fields in the neighbourhood. He mentally measures all the advantages and disadvantages of changing the variety grown by him and when the advantages (benefits) are more than the disadvantages (drawbacks), he decides to adopt the new variety.

As in the case of any other technology, the acceptability of a sugarcane variety is a complex one. Many factors operate for the acceptance or otherwise of the technology recommended. These factors either accelerate the adoption or retard the process of acceptance. The acceleration factors are positive ones while those that retard are grouped under negative factors. In this study, it was assumed that both the positive and negative factors act on the sugarcane growers and among these factors, the positive ones tend to act more vigorously as compared to the negative factors when the individual accepts and adopts the technology advocated.

Hence, identification of number and kind of positive and negative factors contributing to adoption behaviour is

important, but it is inadequate since each positive or negative factor varies in its intensity of effect on the farmers' behaviour. However, ultimately, it is the differential cumulative effect of positive and negative factors that determine the adoption behaviour of an individual. When the cumulative effect of all the positive factors is more, a farmer would decide to adopt the innovation and he may take the reverse decision if the cumulative effect of negative factors dominate.

Based on the available literature on these aspects, discussions with various scientists, extension personnel and farmers as well as the researcher's own experience in the spreading of new sugarcane varieties, various degrees of positive as well as negative factors which might possibly influence innovation-decision on sugarcane varieties were listed out. These aspects (totalling 202 in number) were then grouped as positive and negative forces under the following six major factors (as the major factors were closely related to one another, it was almost impossible to correctly classify the different aspects as to which major factor each belongs. However, the grouping was done by allotting each aspect under the most relevant major factor as perceived by the researcher).

1. Difference in yield
2. Difference in duration
3. Plant characters

4. Innovation attributes
5. Extension system's promotional efforts
6. Social factors

Various aspects included under each of the major factors are as follows.

The difference in yield was represented by plant crop cane yield, ratoon crop cane yield, plant crop jaggery yield, ratoon crop jaggery yield, texture of jaggery, colour of jaggery, capacity to maintain cane yield even if harvest is delayed, capacity to maintain jaggery yield even if harvest is delayed and additional cost involved in changing the variety.

The difference in duration included plant crop duration, ratoon crop duration, early harvest enabling the farmer to get better jaggery prices and early harvest enabling the farmer to take more number of crops in a given time.

The plant characters were analysed in terms of germination percentage, number of tillers per clump, number of nodes per cane, length of internode, spininess of leaves, easiness in removing leaf sheath, flowering percentage, girth of cane, height of cane, hardiness of cane, brittleness of cane, sprouting of buds in plants, stalk pithiness, lodging, utility of plant tops as cattle feed, crop stand of ratoon, susceptibility to early shoot borer, susceptibility to grassy shoot disease and susceptibility to smut.

The innovation attributes included managerial ability required for planting the variety in correct season, managerial ability required to get the fertilizers in time, managerial ability required to provide irrigation as per the requirements of the variety, difficulty in understanding the quantity of fertilizers to be applied at different stages, difficulty in adopting the recommended spacing, flexibility of the variety to enable the farmer to grow the variety under varying conditions, possibility of getting suitable soil conditions required for cultivating the variety, possibility of getting labour to carry out planting in correct season, possibility of getting labour to apply fertilizers in correct time, possibility of getting labour to harvest the crop in correct time, efficiency of the variety in reducing the labour requirement and consistency of recommendations for the variety with the past experiences of the farmer.

Extension system's promotional efforts was studied in terms of premium/subsidy given for the variety, persuasion given by extension personnel for growing the variety, extent to which the farmer believes that the extension personnel serve the interest of the farmer, arrangements made for facilitating easy availability of setts, priority given in sanctioning credit, priority given in registration for factory supply, priority given in issuing cutting orders for factory supply, recognition given to adopters of the variety through awards, number of demonstration plots organised on the variety,

training programmes organised on cultivation of the variety, number of exhibitions and field days organised on cultivation of the variety and degrees to which the field level extension worker has faith on the performance of the variety.

The major factor on social factors included appreciation by fellow farmers for adopting the variety, performance of the variety in fellow farmers' fields, opinion of the fellow farmers about the performance of the variety, opinion of the family members about the performance of the variety and preparedness of the farmer to change the variety.

Though the different aspects included in the first three major factors are concerned primarily with the innovation attributes, for the purposes of clarity and convenience of the respondents, they have been grouped into three major factors as described above.

Different degrees of the above aspects were again regrouped as positive and negative factors.

3.2.2. Assigning weightages

A questionnaire which included all the major factors and varying degrees of different aspects was formulated along with the guidelines for assigning scores (vide Appendix III).

The questionnaire was of two parts - Part I consisting of scoring for various aspects and Part II consisting of scoring for major factors. Procedure for giving scores in Part I was entirely different to that followed in Part II.

In part I, the respondents were requested to assess the degree to which each individual aspect would influence the farmer to adopt the variety in respect of positive factors and the degree to which each individual aspect would influence the farmer to reject the variety in respect of negative factors by giving scores ranging from 0 to 100 to each aspect. Scores were to be assigned separately to each individual aspect without bothering about the total quantity of scores assigned to any group of aspects or major factors.

In Part II, the positive and negative aspects listed in Part I were grouped into six major factors. The respondents were requested to ascertain the contribution of each major factor in making the variety acceptable or rejectable. They had to assign scores to each of the major factors of the variety acceptability or rejectability on the basis of their relative importance in making the variety acceptable or rejectable. The total score given to all the major factors in either case (acceptance/rejection) should not exceed 100. Another condition for scoring has been that the different aspects included under each major factor should be considered while scoring. The aspects and major factors for

acceptance and rejection were arranged independently and subsequently scored and weightages computed separately.

Twenty Chief Cane Officers and Senior Cane Development Officers and twenty sugarcane growers were purposively selected as respondents for this analysis.

For each respondent, weightages for different aspects were calculated in proportion to (i) the score given to a particular aspect, (ii) scores given to all the aspects included in the concerned major factor and (iii) the score given to the concerned major factor using the formula.

$$W_i = \frac{x_i}{X} \times N$$

where,

W_i = Weightage for the aspect i

x_i = Score assigned by the respondent to the aspect i

X = Sum of scores given to all the aspects included under the concerned major factor in Part I

N = Score assigned to the concerned major factor in Part II.

Weightages for different positive as well as negative aspects were thus calculated for each respondent. Arithmetic mean values of the weightages given to each aspect by the 40 respondents were worked out. These mean values were taken

as the final weightages for different aspects which formed the Sugarcane Variety Acceptability Index.

Thus the instrument was prepared following scientific procedure in order to ensure validity and reliability for the measure developed.

3.3. Major project

Methodology adopted in the conduct of the major project in order to (i) measure the individual threshold levels of innovation-decision on sugarcane varieties; (ii) compute a critical threshold level for a given social system; (iii) identify positive and negative factors influencing innovation-decision; (iv) evolve a threshold typology and study its characteristics and (v) analyse the relationship between threshold categories and stages in innovation-decision process is discussed in the succeeding pages.

3.3.1. Sample and sampling procedure

A multistage random sampling with probability proportion to size was followed to select 200 respondents (100 adopters and 100 non-adopters of Co^ 671 sugarcane variety) for the study.

3.3.1.1. Selection of state and district

Tamil Nadu state was selected for this study due to the familiarity of the researcher to agricultural situation of the state and the language of the people. The state has

sixteen districts and agriculture is the predominent occupation of the state.

South Arcot district has the largest area under sugarcane (28,681 ha) in Tamil Nadu. The State Sugarcane Research Station which released the popular, early maturing and high sugar variety Co6 671 is located in this district. In addition to this, the district has fair representation of farmers supplying their cane to factories as well as those who crush the cane and market the produce as jaggery or brown sugar. Due to the above reasons, South Arcot district has been selected for this study.

South Arcot district has agriculture as the main occupation. Paddy, sugarcane, finger millet, groundnut, cotton, tapioca, chillies, vegetables, coriander and turmeric are the major crops grown in irrigated areas. The favourable climate and soil conditions facilitate the cultivation of a variety of crops and the enterprising nature of the farmers enthuse them to opt for more cash crops. This is further supported by the availability of assured irrigation facilities to a large extent.

3.3.1.2. Selection of taluk

South Arcot district has 12 taluks of which nine taluks have considerable area under sugarcane (more than 1000 ha). A list of these nine taluks was prepared and from this list Kallakurichi taluk was selected at random for the present study.

Kallakurichi taluk is situated in the north-west corner of South Arcot district bound on the north by Thiruvannamalai taluk; south by Salem and Thiruchirapalli districts; east by Vridhachalam and Thirukovilur taluks and west by Salem and Dharmapuri districts. Kallakurichi taluk is predominently a rural one. Of the total area of 2269.97 sq. km 2233.84 sq.km come under rural areas and 36.13 sq.km are classified as urban areas.

Average rainfall of the area is 762.4 mm received mainly from north east monsoon and to a certain extent from south west monsoon. The major soils are red loam and sandy loam and to a certain extent black loam soils are also noticed.

Land utilisation pattern in Kallakurichi taluk is intensive, the particulars of which are appended at the end (vide Appendix IV). Agriculture is the main occupation of the taluk. Major crops grown in this taluk are paddy, groundnut, millets and sugarcane.

The major irrigation sources are Komugi Vadhi Reservoir and Manimutha Vadhi Reservoir. In addition, there are 50 Public Works Department tanks and 287 minor irrigation tanks. Most of the tanks are rainfed ones. Besides this, Pathanur right bank canal also covers a portion of the taluk.

The Kallakurichi Co-operative Sugar Mills Limited is located in this taluk at Moongilthuraipattu village.

Kallakurichi town is the main marketing centre of the taluk.

3.3.1.3. Selection of villages

All the villages in Kallakurichi taluk which possessed considerable area under sugarcane were alphabetically listed and ten villages were selected at random for conducting this study (Figure 3.2).

3.3.1.4. Selection of respondents

A list of sugarcane growers was prepared for these ten villages with the help of records, village level extension personnel and local leaders. It is to be noted that the list consisted of farmers supplying their cane to factories as well as those who crush the cane and market the produce as jaggery. The list was divided into two groups, namely, adopters and non-adopters of CoC 671 sugarcane variety. Number of respondents for each village was arrived at by random sampling with probability proportion to size (Table 3.2).

3.3.1.5. Selection of technology

The researcher works as an Agricultural Research Service Scientist (Agricultural Extension) at Sugarcane Breeding Institute of the Indian Council of Agricultural Research. This Institute, located at Coimbatore, is an internationally acclaimed institution shouldering the responsibility of evolving new sugarcane varieties suited

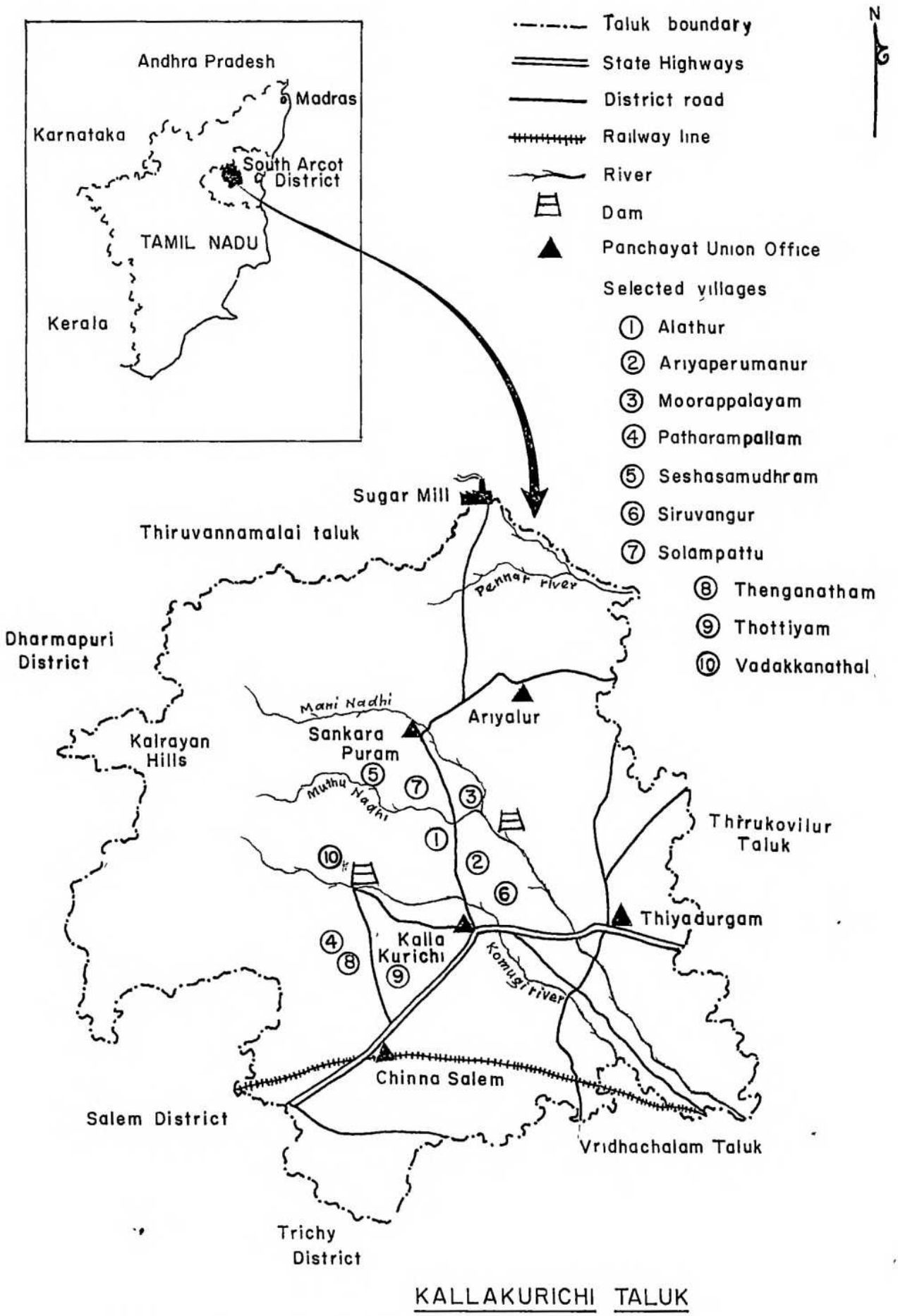

Fig. 3.2. Locale of research - major project

TABLE 3.2. SELECTION OF RESPONDENTS FOR MAJOR PROJECT

S. No.	Name of village	Adopters		Non-adopters	
		Available	Sample size	Available	Sample size
1.	Alathur	15	6	34	20
2.	Ariyaperumanur	51	20	--	--
3.	Mooramballayam	30	12	34	8
4.	Pattharampallam	--	--	97	23
5.	Seshasamudhram	59	23	21	5
6.	Siruvangur	75	30	--	--
7.	Solampattu	20	8	50	12
8.	Thenganatham	3	1	25	6
9.	Thottiyam	--	--	80	19
10.	Vadakkanathal	--	--	29	7
	Total	252	100	420	100

to different agro-climatic regions of the country. The Institute's interest in an in depth analysis of innovation-decision on sugarcane varieties led to the selection of the innovation CoC 671 sugarcane variety. This variety, which was recently released in Tamil Nadu, is an early maturing and sugar rich variety and is spreading fast in the state.

3.3.2. Selection and measurement of variables

The present investigation was an ex-post-facto research which treated threshold levels as the central theme. In some cases observational and descriptive analysis were also used. The details of measurement of different variables are given under the following heads.

3.3.2.1. Individual threshold level
3.3.2.2. Critical threshold level
3.3.2.3. Positive and negative factors influencing innovation-decision
3.3.2.4. Threshold categorisation
3.3.2.5. Stages in innovation-decision process
3.3.2.6. Background variables and their measurement

3.3.2.1. Individual threshold level

The respondents were requested to give their perception on the performance of the CoC 671 sugarcane variety and other related items included in the Sugarcane Variety Acceptability Index. Respondents were asked to check against any one of the

alternatives given for each aspect under the six major factors with regard to their perception on the CoC 671 sugarcane variety as compared to the variety under cultivation before adopting this variety (in case of adopters) and the variety under cultivation at the time of interview (in case of non-adopters).

Each response was assigned with their respective weightages as available in the Sugarcane Variety Acceptability Index. The sum of positive and negative perception scores were independently worked out for each respondent which formed the Performance Perception Index of that respondent. In this index, the sum of negative perception scores is termed as the threshold level of the respondent (in the case of adopters) and the theoretical threshold level (in the case of non-adopters). Sum of positive perception scores for each respondent gives additional information about the threshold levels and throws more light on the task before the research and development personnel engaged in the identification and spread of new sugarcane varieties.

3.3.2.2. Critical threshold level

Importance of the concept of threshold of a function is well recognised in the literature on regional planning. The threshold is defined as the minimum number of consumers required to support a particular function. Settlements above the threshold level which do not have the function in question

can be listed out. These settlements can support the function but it is missing in them. These are therefore recommended for provision of the particular function (Balakrishna, 1976).

It is felt that in the ideal situation there is no entry zone as such but only an entry point. Below this point, no settlement possesses the function and above this entry point every settlement possesses the function. This is because the population required to support the function is present in the latter case and is absent in the former case. In this sense, this point separates the continuum of settlements into two segments such that for the lower segment the probability of a settlement having a function is zero and for the higher segment the corresponding probability is one. Thus the difference between the two probabilities is the maximum possible, viz., one.

However in actual practice, such a clear cut-off point does not exist. But the settlements can be grouped into suitable class intervals or ranges (such as 0-200; 200-400; 400-600; 600-800 and 800-1000). For each point which separates two consecutive intervals (like 200, 400, 600, 800 and 1000) two percentages can be calculated: One, out of the settlements below this point, the percentage of settlements which have the function (P_L) and two, out of the settlements above this point, the percentage of settlements which have the function (P_U). (L and U refer to the lower and upper segments respectively).

As already mentioned, for the ideal entry point $P_L = 0$ and $P_U = 100$. P_L and P_U, expressed as proportions, could be interpreted as the probabilities following the relative frequency definition of probability. While the ideal entry point obtains the maximum separation between P_L and P_U (100), our attempt will be to determine the point which does separation to the maximum extent possible in practice. According to our method, the threshold is that adoption level for which the percentage of larger settlements having the function and the percentage of smaller settlements having the function differ to the maximum extent. The method is illustrated in Table 3.3.

The five percentage differences calculated in the table correspond to the separation points 200, 400, 600, 800 and 1000 respectively. Since the difference is the maximum for the fourth point, this level (800) is taken as the threshold.

In the present study, we are interested in finding out a critical threshold level below which the farmers are expected to adopt a new sugarcane variety. Similarly we can also work out a critical level for positive perception scores above which the farmers are expected to adopt the new sugarcane variety. Procedure as described by Balakrishna (1976) was followed for working out these critical levels.

3.3.2.3. <u>Positive and negative factors influencing innovation-decision</u>

Each aspect included in the Performance Perception Index was considered as a positive/negative factor (variable)

TABLE 3.3. CALCULATION OF POPULATION THRESHOLD - AN EXAMPLE

S.No.	Details	Population range				
		0 - 200	200-400	400-600	600-800	800-1000
1.	Number of settlements	10	10	10	10	10
2.	Number of settlements having the function	0	3	4	6	10
3.	Number of settlements at this and smaller levels	10	20	30	40	50
4.	With function at this and smaller levels	0	3	7	13	23
5.	Percentage of (4) to (3) (P_L)	0.00	15.00	23.33	32.50	46.00
6.	Number of settlements above this level	40	30	20	10	0
7.	With function above this level	23	20	16	10	0
8.	Percentage of (7) to (6) (P_U)	57.50	66.67	80.00	100.00	0.00
9.	Difference between P_U and P_L	57.50	51.67	56.67	67.50	46.00

and relative importance of different variables were worked out.

3.3.2.4. Threshold categorisation

Mean and standard deviation of the threshold scores were used to classify the adopters into three adopter categories, based on the threshold distribution. Adopters whose threshold scores came within the mean ± one standard deviation were defined as middle threshold adopters. Adopters with threshold scores of less than mean - one standard deviation were classified as low threshold adopters and the adopters with threshold scores of more than mean + one standard deviation formed the high threshold adopters. Non-adopters were dumped arbitrarily into one threshold category, and that category could be treated for analytic purposes, as the threshold laggards category (as don by Losier, 1978).

3.3.2.5. Stages in innovation-decision process

By carrying out the content analysis of responses of the adopters about their individual innovation-decision process, stages involved in the process were identified. The three threshold categories were compared for the stages passed in innovation-decision process, innovation-decision period and sources of information at each stage.

3.3.2.6. Background variables and their measurement

In most of the social science research, the researchers used the available measures, provided they met their requirement.

They also designed their own research tools in terms of new indices. A combined approach was followed in this study for analysing the background information. Some variables were measured with the help of already available suitable tools, while for some others new measures were developed. The empirical measures are given below:

S.No.	Variable	Measure
1.	Age	Chronological age of respondents
2.	Educational status	Schedule constructed for the study
3.	Occupation	Schedule followed by Balasubramanian (1980)
4.	Farming experience	Schedule constructed for the study
5.	Experience in sugarcane cultivation	Schedule constructed for the study
6.	Soil type	Schedule constructed for the study
7.	Source of irrigation	Schedule constructed for the study
8.	Water availability during summer	Schedule constructed for the study
9.	Type of disposal of sugarcane	Schedule constructed for the study
10.	Time of planting	Schedule constructed for the study
11.	Mass media utilisation	Schedule constructed for the study
12.	Social participation	Schedule developed by Trivedi (1963)
13.	Contact with extension agency	Schedule constructed for the study
14.	Credit behaviour	Schedule followed by Balasubramanian (1980)
15.	Adoption quotient	Schedule constructed for the study

The details of measurement of these background variables are given in the following paragraphs.

3.3.2.6.1. Age : It refers to the chronological age of the respondent, rounded to the nearest whole number, at the time of investigation and was determined by asking him an open ended question.

3.3.2.6.2. Educational status: Educational status was operationalised as the level of formal education attained by an individual. The variable was measured with the help of the following scores:

Educational status	Score
Illiterate	0
Primary	1
Secondary	2
College	3

3.3.2.6.3. Occupation: It refers to the nature of occupation the respondent practiced and the scores were allotted based on the importance and time allotted to farming. /It was assumed that the farmer who gave greater importance to farming profession would be able to pay more attention to agriculture than those who got attached to one or more professions in addition to farming./ Scoring procedure followed by Balasubramanian (1980) was used in this study.

Occupation	Score
Farming alone	5
Farming + Agricultural labour	4
Farming + Independent profession	3
Farming + Business	2
Farming + Service	1

3.3.2.6.4. Farming experience: It was operationalised as the number of years of experience in farming possessed by the respondent. It was assumed that more the number of years of farming experience possessed by the individual, the better would be his level of management of his farm. Hence the following scores were allotted to different lengths of farming experience.

Length of farming experience	Score
Upto 5 years	1
6 - 10 years	2
11 - 15 years	3
16 - 20 years	4
21 - 25 years	5
Above 25 years	6

3.3.2.6.5. Experience in sugarcane cultivation: It was operationalised as the number of years of experience in sugarcane cultivation possessed by the respondent. It was assumed that more the number of years of experience possessed by the individual, the better would be his level of management

of his sugarcane crop. Hence the following scores were allotted to different lengths of experience in sugarcane cultivation.

Length of experience in sugarcane cultivation	Score
Upto 5 years	1
6 - 10 years	2
11 - 15 years	3
16 - 20 years	4
21 - 25 years	5
Above 25 years	6

3.7.2.6.6. Soil type: This refers to the type of soil available in the land cultivated by the respondent. Though Co 671 sugarcane variety can be grown in a number of types of soil, experience in cultivation of this variety in the study area has shown that the variety comes up better in clayey type of soil as compared to sandy soil. Consequently, the red sandy loam was allotted with the minimum score and the black clay soil was allotted with the maximum score. Scoring procedure adopted in this study is as follows:

Soil type	Score
Red sandy loam	1
Red loam	2
Alluvial	3
Black loam	4
Red clay	5
Black clay	6

3.3.2.6.7. Source of irrigation: This refers to the sources of water from which the respondent irrigated his farm. The following scores were allotted for various irrigation sources depending upon their cost-efficiency.

Irrigation source	Score
Canal	5
Tank	4
Bore well	3
Open well-pucca	2
Open well-kutcha	1

3.3.2.6.8. Water availability during summer: Sugarcane crop requires water throughout its crop growth period. Limited availability of water during summer exposes the young sugarcane crop to moisture stress conditions which in turn reduces the cane yield and quality considerably. A farmer with easy availability of water during summer which would enable him to maintain his irrigation schedule was allotted with two scores; when the respondent found it difficult to follow the irrigation schedule and irrigated the crop at higher intervals he was allotted with one score and when he was not at all able to irrigate his sugarcane crop during summer, he was allotted with zero score.

Water availability during summer	Score
Easy	2
Difficult	1
Not at all available	0

3.3.2.6.9. Type of disposal of sugarcane: A sugarcane farmer may straightaway sell his cane to sugar factory or the farmer himself may prepare jaggery and market the same or undertake both depending upon the market trends observed during the previous year. Earlier studies on the extent of adoption of improved sugarcane management practices in Tamil Nadu showed that farmers supplying cane to sugar factories (registered sugarcane growers) adopted more number of practices mainly due to their frequent contact with sugarcane development personnel and the crop loan and other facilities arranged by the sugar factories. Hence the following scoring procedure was followed.

Type of disposal of cane	Score
Cane used for preparing jaggery	1
Partly used for preparing jaggery and partly supplied to sugar factory	2
Cane supplied to sugar factory	3

Scores for the current season and the previous season were calculated separately and the mean value was taken as the final score for this variable.

3.3.2.6.10. Time of planting: Co? 671 sugarcane variety which is prone to heavy flowering is to be planted earlier in the planting season (December-January) to harvest a better yield. Planting the variety in April-May would reduce the period available for vegetative growth as the variety may come to flowering in November, resulting in very poor yield. The

scoring procedure for the time of planting is given below:

Time of planting	Score
December-January	3
February-March	2
April-May	1

Scores for the current season and previous season were calculated separately. The mean value was used as the final score for this variable.

3.3.2.6.11. Mass media utilisation: It is defined as the degree to which an individual used mass media of communication. This was measured on five dimensions namely, radio listening, reading newspapers, reading magazines and bulletins, seeing motion pictures and participating in the farmers' day and exhibitions. Scores given to differmt degrees of mass media utilisation are as follows:

Radio listening

Frequency	Score
Every day	5
Two to six days a week	4
Once a week	3
More than once a week	2
Rarely	1
Never	0

Reading newspapers

Frequency	Score
Every day	5
Two to six days a week	4
Once a week	3
More than once a week	2
Rarely	1
Never	0

Reading magazines and bulletins

Frequency	Score
Regularly	3
Occasionally	2
Rarely	1
Never	0

Seeing motion pictures
(Number seen during the last year)

Frequency	Score
Five or more	5
Four	4
Three	3
Two	2
One	1
None	0

Participation in the farmers' day and exhibitions (Number participated during the last year)

Frequency	Score
Three or more	3
Two	2
One	1
None	0

3.3.2.6.12. Social participation: This refers to the participation of an individual farmer in the formal organisations like cooperatives and other institutions. The following scoring procedure as adopted by Trivedi (1963) was used in this study.

Nature of participation	Score
Membership in one organisation	1
Membership in more than one organisation	2
Office bearer in one organisation	3
Office bearer in more than one organisation	4
Distinct feature (MLA & MP)	6

The scores for each item of participation of an individual were added and used for further analysis.

3.3.2.6.13. Contact with extension agency: It refers to the degree to which an individual contacted the extension personnel for getting information on agricultural practices and for obtaining day to day guidance on crop management. It was

measured in terms of frequency of contact. The responses were obtained over a seven point continuum. Scores allotted to different frequencies of contact are as follows:

Frequency of contact	Score
Almost every day	6
Atleast once a week	5
Atleast once a fortnight	4
Atleast once a month	3
Atleast once in six months	2
Atleast once a year	1
Never	0

3.3.2.6.14. Credit behaviour: Credit behaviour is operationalised as the borrowing pattern of the farmers for sugarcane cultivation. The rate of interest charged was taken into account while quantifying the variable. It was decided to give lesser weightage to the source that charged more interest as done by Balasubramanian (1980). The scores are as follows:

Credit source	Score
Professional money lender	1
Cooperative societies	2
Nationalised banks	3
Government sources	4
Friends/neighbours/relatives	5

Mode of payment of the loan amount to the farmers and the procedure followed for repaying the loan amount were also recorded through open ended questions.

3.3.2.6.15. Adoption quotient: Extent of adoption of farm innovations was measured by different methods by various researchers. The following are some of the techniques used in the measurement of adoption.

Adoption measure	Researcher	Year
Adoption quotient	Chattopadyay	1963
Adoption index	Salvi and Pawar	1966
Adoption index	Sengupta	1967
Adoption index	Subramanyan	1969
Adoption intensity index	Choubey	1972
Use adoption quotient	Ambantha	1974
Adoption index	Somasundaram	1976
Use adoption quotient	Chandrakandan	1982

Earlier attempts during sixties except that of Chattopadyay (1963) were very simple and offered scope for an individual's extent and potentiality of adoption. These measures did not emphasise the time dimension. But, the later attempts considered the dimensions such as potentiality, extent, weightage and to a certain extent time dimension too. But most of these measures were used while studying a number of practices simultaneously for computing the extent of adoption.

In the present study, the following two aspects were to be taken into consideration for measuring the extent of adoption:

i) the variable was to be measured with reference to one innovation only, namely the Co^ 671 sugarcane variety;

ii) The variety was introduced in the study area during 1978 and it was observed during the pretesting that the respondents were finding it difficult to recollect the information on the area under sugarcane as well as the area under the new variety since 1978. Hence the information to be collected on the potential area available and extent of area under the new variety were to be restricted to two years only.

Keeping obviously the reasons stated earlier, it was decided to measure the extent of adoption of CoC 671 sugarcane variety by an Adoption quotient using the following formula.

$$\text{Adoption quotient} = \left[\frac{\left[\frac{Y_1}{P_1} + \frac{Y_2}{P_2}\right]}{2}\right] W$$

where,

Y_1 = Area in which CoC 671 was cultivated during the year of study

P_1 = Area in which sugarcane was cultivated during the year of study

P_0 = Area in which Co 671 was cultivated during the previous year

P_2 = Area in which sugarcane was cultivated during the previous year

N = Number of years during which Co 671 was cultivated

3.3.3. Conceptual model of research

The conceptual flow chart of data analysis sequence for the present study is given in Figure 3.3.

Two preliminary projects were undertaken, (i) to identify farm practice-attributes influencing innovation-decision and (ii) to identify stages in innovation decision process (IDP). The results of these projects were used in further investigations.

Various aspects under the six major factors, namely, difference in yield, difference in duration, plant characters, innovation attributes, extension system's promotional efforts and social factors were assigned weightages by twenty senior cane development personnel and twenty sugarcane growers from which the Sugarcane Variety Acceptability Index was developed. This index along with the performance perception by 200 sugarcane farmers gave performance perception index. From this index, critical threshold level as well as critical level for positive perception scores were worked out. These two critical levels determine the suitability of a variety for release to commercial cultivation.

Based on the individual threshold levels, threshold categories were evolved and characteristics of respondents

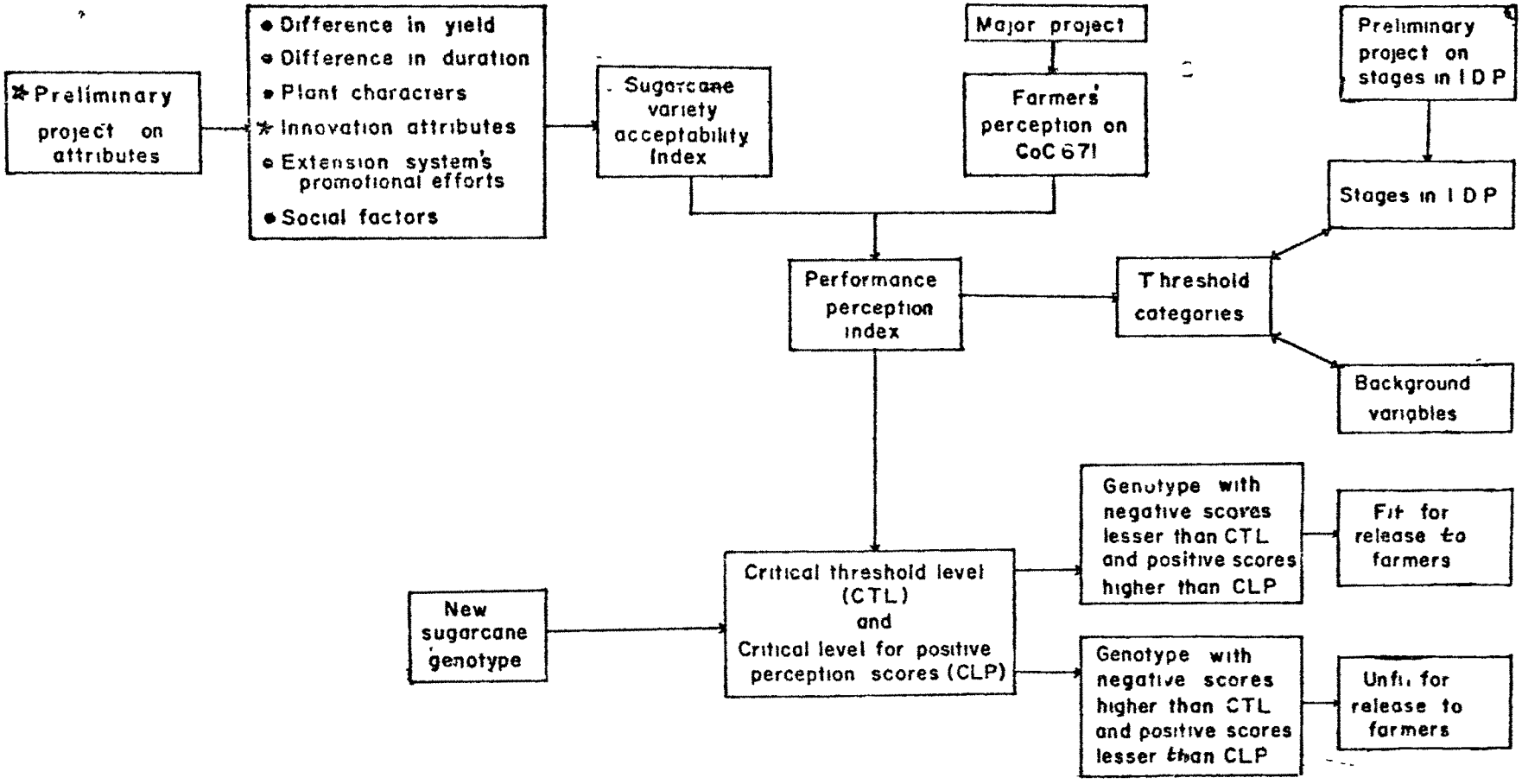

Fig 3 3 Conceptual flow chart of the data analysis sequence

belonging to different threshold categories were analysed. Finally, the relationship between threshold categories and stages in innovation-decision process was worked out.

3.3.4. Tools and techniques of data collection

An interview schedule covering the objectives of the major project was developed. The schedule was pretested which revealed the need for certain modifications. Based on the experience gained during the pretesting, the final interview schedule was prepared. The final schedule consisted of four parts. The first part dealt with background information of the respondents. Second part was concerned with the measurement of extent of adoption of CoC 671 sugarcane variety while the third part dealt with the identification of stages in innovation-decision process. The last part of the schedule pertained to the measurement of the respondent's perception on CoC 671 sugarcane variety and other related items (vide Appendix V).

The 200 respondents selected as per the sampling procedure described in 3.3.1. were interviewed with the help of the pretested interview schedule.

3.3.5. Statistical techniques used

For analysing the data collected during the investigation, the following statistical techniques were used based on the nature of data and the relevance to information required.

1. Percentages
2. F test
3. Kolmogorov -Smirnov two-sample test
4. Zero order correlation
5. Linear simple regression analysis
6. Mahalanobis' D^2 analysis
7. Discriminant function analysis
8. Path analysis
9. Stepwise regression analysis

Advanced statistical calculations were carred out with the help of B-4700 electronic computer available at Indian Agricultural Statistics Research Institute, New Delhi and Micro-2200 available at Sugarcane Breeding Institute, Coimbatore and interpretations were made based on the results obtained.

Findings and Discussion

CHAPTER IV

FINDINGS AND DISCUSSION

The present study was conducted with the primary objective of analysing the role of threshold in innovation-decision on sugarcane varieties and other related aspects. The findings are discussed in this chapter under the following heads.

4.1. Results of preliminary projects
4.2. Sugarcane Variety Acceptability Index
4.3. Individual threshold levels of innovation-decision
4.4. Critical threshold level for a social system
4.5. Positive and negative factors influencing innovation-decision
4.6. Threshold typology and its characteristics
4.7. Relationship between threshold categories and stages in innovation-decision process.

4.1. Results of preliminary projects

4.1.1. Farm practice-attributes influencing innovation-decision

Mahalanobis' D^2 analysis was carried out to find the difference in perception of attributes between adopters and non-adopters of CoC 671 sugarcane variety when all the nineteen variables were considered together (Table 4.1).

TABLE 4.1. D^2 VALUE AND DISCRIMINANT FUNCTION COEFFICIENT OF PERCEIVED ATTRIBUTES

S.No.	Attribute	Discriminant function coefficient	D^2 value
1.	Managerial feasibility	10.7207	
2.	Use complexity	8.7790	
3.	Flexibility	6.8710	
4.	Content complexity	6.7181	
5.	Physical feasibility	5.7360	
6.	Labour efficiency	5.1832	
7.	Physical compatibility	5.1412	
8.	Time efficiency	4.0622	
9.	Profitability	3.1000	25.5610
10.	Input availability	3.1130	
11.	Marketability	2.7570	
12.	Risk	2.6691	
13.	Novelty	2.4001	
14.	Trialability	2.0983	
15.	Observability	1.7937	
16.	Cost-benefit efficiency	1.7744	
17.	Cost	1.0808	
18.	Cultural compatibility	0.2983	
19.	Immediacy of return	0.1138	

F value = 16.968**

** Significant at one per cent level of probability

The D^2 value was found to be 25.56 with F value of 16.97 which was significant at one per cent level of probability. Therefore it could be concluded that the two groups of respondents differed in their perception of attributes when all the nineteen attributes were taken together. Hence, our hypothesis that 'there will be no difference between adopters and non-adopters in their perception of the innovation-attributes' is to be rejected. The result is in line with the generalisation offered by Rogers with Shoemaker (1971) based on an analysis of results of earlier studies on this aspect.

Discriminant function analysis was carried out to identify the key attributes involved in differentiating the adopters and non-adopters. The attributes were arranged in the descending order of their discriminant function coefficients (Table 4.1). Among the nineteen attributes, the top seven were selected for inclusion in the final study, namely, managerial feasibility (10.72), use complexity (8.78), flexibility (6.97), content complexity (6.72), physical feasibility (5.30), labour efficiency (5.18) and physical compatibility (5.14).

It is the experience of the farmers, extension personnel and scientists that the Co 671 sugarcane variety, an early maturing and high sucrose variety, needs special care to get the maximum yield (Subramani, 1982 and Rajathurai, 1983). In the present study also, the major

discriminating factor between adopters and non-adopters was found to be the managerial feasibility. This means that the respondents who felt that they would be able to provide the needed managerial requirements adopted the variety. On the otherhand, those farmers who felt that they might not be able to provide fully the managerial requirements did not adopt the variety.

Next to the managerial feasibility was the perception of the attribute use complexity. The non-adopters expressed that the methods of cultivation, the special package of practices recommended for the variety especially on the planting season, fertiliser schedule, spacing etc., were difficult to follow in their farming situations. Similarly, the variety was also perceived by the non-adopters as less flexible. In other words, if the planting of the variety was somewhat delayed or if the fertiliser schedule was not strictly followed, the reduction in yield was perceived by the non-adopters as to be the maximum. Other important attributes were content complexity, physical feasibility, labour efficiency and physical compatibility.

Various sub aspects of these attributes were included in further investigations for an indepth analysis.

4.1.2. Stages in innovation-decision process

Diffusion scholars have long recognised that an individual's decision about an innovation is not an

instantaneous act rather it is a process that occurs over a period of time and consists of a series of actions.

Rogers (1983) defined 'process research' as a type of data gathering and analysis that seeks to determine the time-ordered sequence of a set of events. In contrast, variance research is a type of data gathering and analysis that consists of determining the co-variances among a set of variables but not their time order.

Variance research is inappropriate for exploring the nature of innovation-decision process. Here one needs a dynamic perspective to explain the causes and sequence of a series of events over time. Data gathering methods in process research are usually less structured and the data are typically qualitative in nature, than they are in variance research. Seldom statistical methods are used to analyse the data in process research. According to Rogers (1983), the first step toward gaining a better understanding of the innovation-decision process has been to recognise the process research as an appropriate research design.

In this study, responses of 35 adopters of CoC 671 sugarcane variety were content analysed and plotted on a graph (Fig. 4.1), which led to the identification of stages involved in innovation-decision process. It further led us to reject our hypothesis that 'innovation-decision is a snap decision and no intermediary stage exists between the awareness and final decision about the new idea'.

In the Figure 4.1., each circle represents the mention of the stage by any one of the respondents and a line connecting two stages may represent one or more inter-connections between the stages. The following conclusions were drawn from the figure.

i. Whenever the stage 'availability of innovation inputs to the individual with reference to proximity' (No.3) occurred, simultaneously 'availability of innovation inputs to the individual with reference to his purchasing capacity' (No. 4) also occurred in most of the cases. Hence these two stages need not be considered as two separate stages. The combined stage was termed as 'availability'.

ii. It was observed that only when the initial information on the new variety was accompanied by 'why' of the innovation detailing the advantages of growing the new variety, the farmers tend to give attention to the message. Hence the two stages 'obtained certain initial knowledge on the innovation especially on its cost-benefit aspects' (No. 9) and 'obtained information on 'why' of the innovation' (No.10) were merged into a single stage and the name was termed as 'information' stage.

iii. During the investigations, it was observed that the stages 'firmly believed in the applicability of the innovation in his own situation' (No.17) and 'decided to use the practice continuously on full scale' (No.18) occurred simultaneously. Hence these two stages were combined into a single stage as 'decision'.

iv. Due to the limited availability of planting materials and its high cost, most of the farmers adopted the new sugarcane variety only on a limited scale. As it was difficult to distinguish between the stages, 'applied the practice actually on a small scale in order to determine its utility in his own situation' (No.15) and 'farmer carried out the innovation in his field situation more or less on a permanent basis' (No. 1), these two were merged into one stage called 'adoption'.

v. The stage 'integration' (No.22) occurred as the final one in a number of cases.

vi. The following four stages occurred throughout the innovation-decision process: 'engaged in activities which led to a choice to adopt or reject the innovation' (No. 16), 'made mental evaluation of the information so far gained

about the applicability of the practice in his present or anticipated future situation' (No.14), 'put aside the innovation as not to be practised in his field situation' (No.23) and 'sought reinforcement for the innovation-decision he has made but he may reverse his previous decision if exposed to conflicting message about the innovation' (No.21).(Repeated nature of occurrence of these four stages could not be depicted in the figure due to limitations of space).

From the Figure 4.1., it could be concluded that the stages, availability (3 and 4), information (9 and 10) decision (17 and 18), adoption (15 and 19) and integration (22) occurred in majority of the cases in addition to the repeated occurrence of exploration (15), evaluation (14), rejection (23) and reinforcement (21). Other stages occurred only in a negligible number of cases.

In order to explore the possibility of obtaining further information on stages in innovation-decision process, the original data were again plotted as a network flow chart (Fig. 4.2), keeping the repeatedly occurring stages of exploration, evaluation, rejection and reinforcement at the periphery and omitting the rarely occurring/non-occurring stages.

The network flow chart again confirmed that the stages mentioned earlier were the important ones in that they occurred

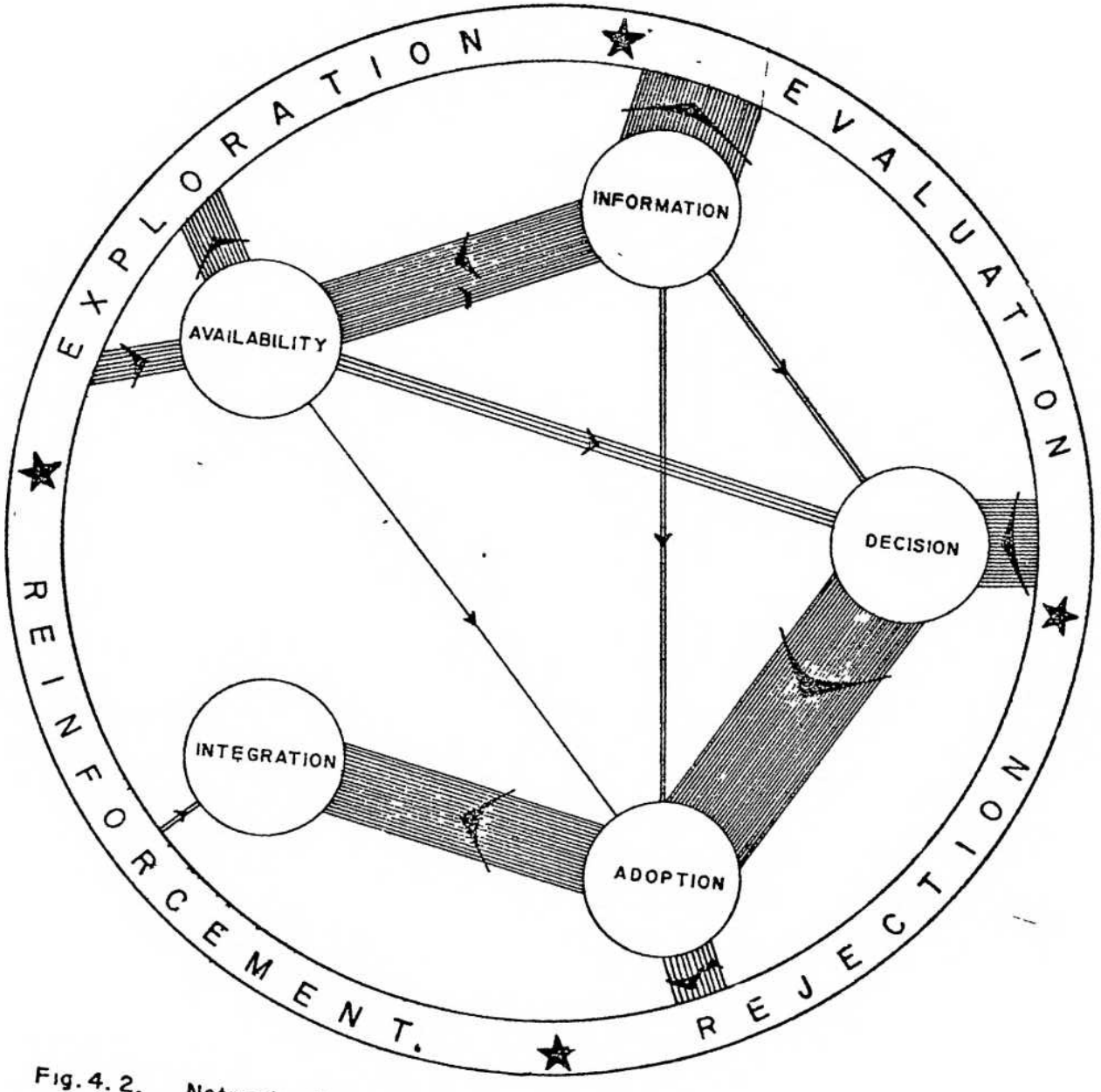

Fig. 4. 2. Network flow chart on innovation - decision process - I

in most of the cases. Figure 4.2. further reiterates the fact that the stages exploration, evaluation, rejection and reinforcement were constantly occurring throughout the process.

To enable the researcher to identify the exact sequence in which different stages occurred, the original data were again plotted as a network flow chart (Fig. 4.3), keeping the repeatedly occurring stages in the outer circle without involving them in the flow chart as it was already proved beyond any doubt about their nature of occurrence.

From this network flow chart, it could be concluded that the stages, availability and information occurred simultaneously and concurrently followed by decision, adoption and integration. Exploration, evaluation, rejection and reinforcement were occurring throughout the process.

Results of the analysis of stages in innovation-decision process are summarised as an empirical model in Fig. 4.4.

As Rogers (1983) observed, a technology usually has two components, (i) a hardware aspect, consisting of the tool that embodies the technology as material or physical objects and (ii) a software aspect consisting of the information base for the tool. The model clearly shows that availability of these two aspects of innovation formed the first stage in the innovation-decision process. Pande (1976) also observed that availability of inputs was an important pre-requirement for the adoption of an innovation.

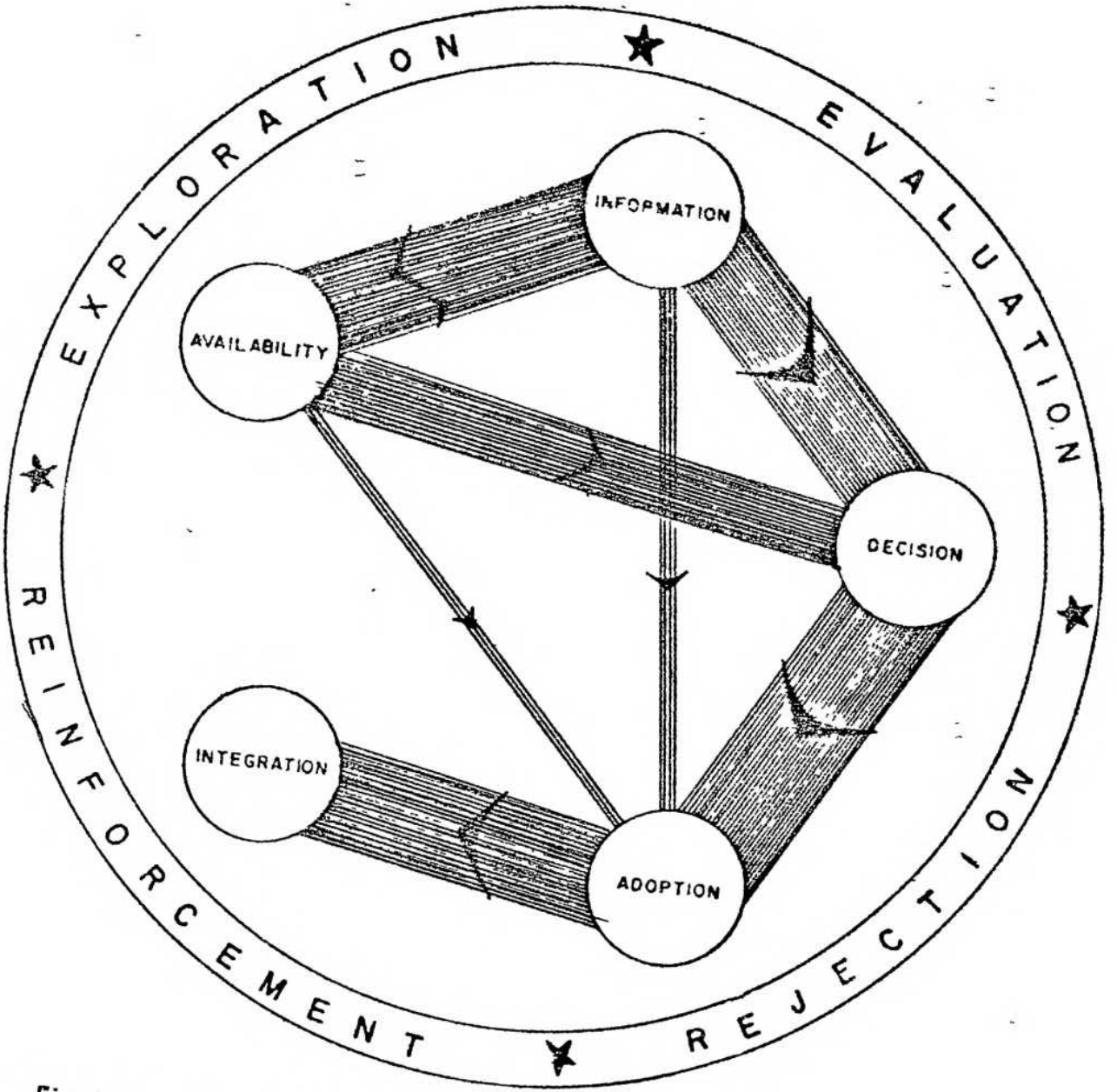

Fig. 4 3. Network flow chart on innovation - decision process - II

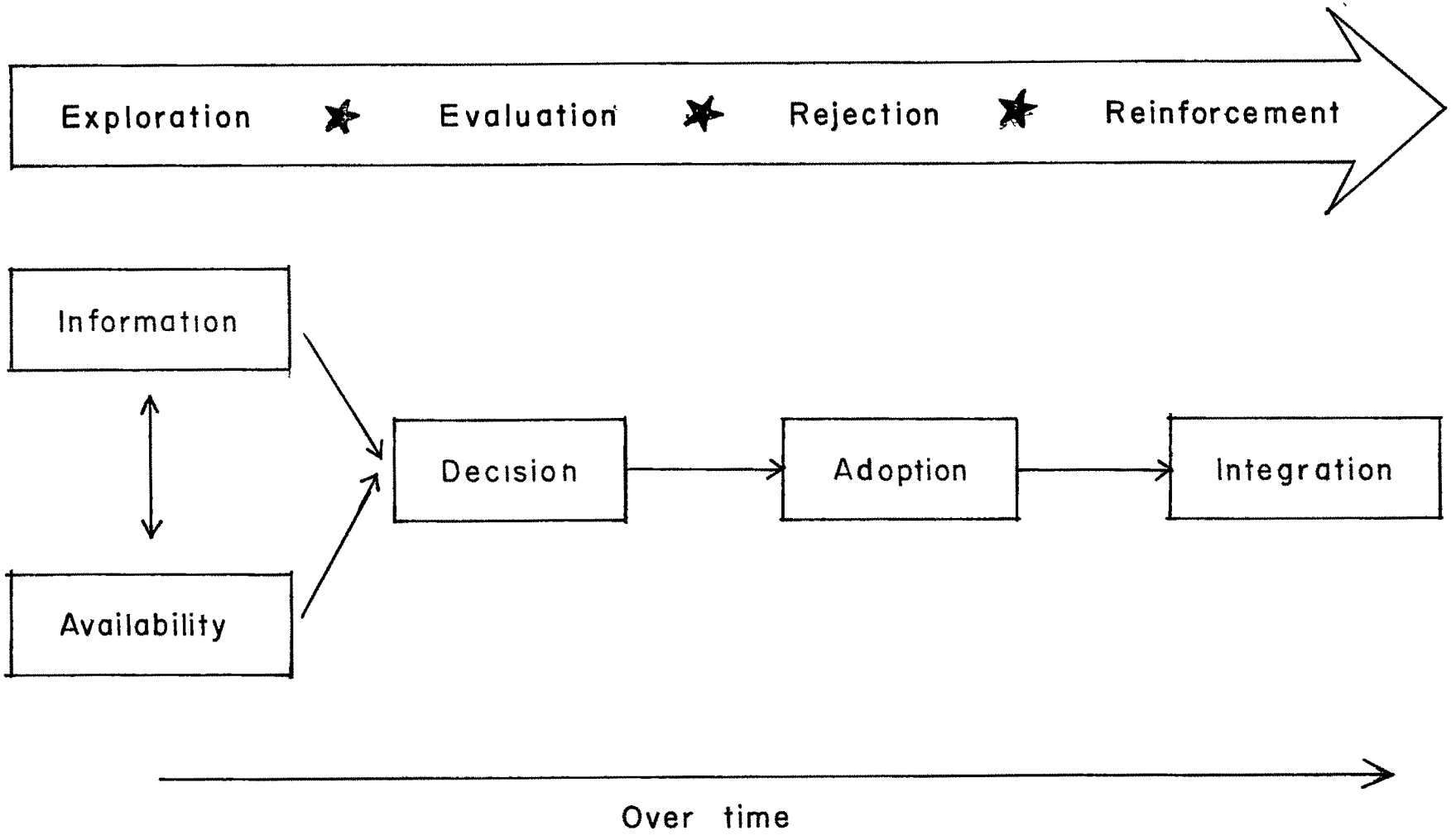

Fig. 4.4. An empirical model on innovation-decision process

Regarding the repeated occurrence of the exploration, evaluation, rejection and reinforcement stages, the results are in line with the findings of Prabukumar (1976) and Eveland (1979).

Wagill and Rogers (1981) observed that for some individuals and for some innovations, the trial of a new idea by a peer group could substitute atleast in part, for their own trial of an innovation. This 'trial by others' provides a kind of vicarious trial for an individual. In the present study also, limited number of respondents only mentioned 'trial' as one of the stages in their innovation-decision process.

4.2. Sugarcane Variety Acceptability Index

As a prelude for working out the threshold levels, a Sugarcane Variety Acceptability Index was developed. The index consisted of six components dealing with the six major factors, namely:

1. Difference in yield
2. Difference in duration
3. Plant characters
4. Innovation attributes
5. Extension system's promotional efforts
6. Social factors.

Relative importance of these major factors and weightages obtained for the different aspects of each major factor are discussed here. The fact that different aspects of Sugarcane

Variety Acceptability Index have varied levels of weightages made us to reject the hypothesis that "different determinants of sugarcane variety acceptability possess the same degree of influence on the innovation-decision".

As could be seen from tables 4.2 to 4.7, the differences in weightages given by extension personnel and farmers were significant in the case of only a few variables. Hence, it was decided to pool these scores together to form the final index.

4.2.1. Difference in yield

Different aspects constituting the major factor 'difference in yield' along with their mean weightages worked out based on the score values given by extension personnel and farmers, F value for testing the significance of the difference between scores given by these two categories of respondents and the final weightage are given in Table 4.2.

The difference in yield formed the most important constituent of the Sugarcane Variety Acceptability Index with 46.34 per cent of the total scores for positive aspects and 39.63 per cent for negative aspects. As it is obvious, when the differences in cane yield (plant/ratoon) and jaggery yield increased respective weightages also increased. Researchers on sugarcane should bear in mind that the texture and colour of jaggery and capacity to maintain cane/jaggery yield even if harvest is delayed were also equally important for the

TABLE 4.2. SUGARCANE VARIETY ACCEPTABILITY INDEX-DIFFERENCE IN YIELD

S.No.	Aspects	Mean weightage		F value	Final weightage
		Extension personnel	Farmers		
1	2	3	4	5	6
A.	Positive factors				
1.	Plant crop cane yield -increase upto 12.5 t/ha	1.6672	1.4558	0.4926	1.5615
2.	Plant crop cane yield -increase of 12.6 to 25 t/ha	2.8608	2.6147	0.5317	2.7378
3.	Plant crop cane yield -increase of 25.1 to 37.5 t/ha	4.7754	4.2499	0.7910	4.5127
4.	Ratoon crop cane yield -increase upto 12.5 t/ha	1.6833	1.4313	0.7905	1.5573
5.	Ratoon crop cane yield -increase of 12.6 to 25 t/ha	3.0162	2.6509	1.2753	2.8336
6.	Ratoon crop cane yield -increase of 25.1 to 37.5 t/ha	4.7167	3.8726	2.9540	4.2946
7.	Plant crop jaggery yield - increase upto 12.5 q/ha	1.3320	1.5044	0.4903	1.4182
8.	Plant crop jaggery yield - increase of 12.6 to 25 q/ha	2.6388	2.8440	0.3385	2.7414
9.	Plant crop jaggery yield - increase of 25.1 to 37.5 q/ha	4.1802	4.4820	0.2420	4.3311
10.	Ratoon crop jaggery yield - increase upto 12.5 q/ha	1.3320	1.4724	0.4005	1.4022
11.	Ratoon crop jaggery yield - increase of 12.6 to 25 q/ha	2.5571	2.6302	0.0473	2.5936

TABLE 4.2 (CONTD.)

1	2	3	4	5	6
12.	Ratoon crop jaggery yield - increase of 25.1 to 37.5 q/ha	3.9670	4.1060	0.0559	4.0365
13.	Texture of jaggery is better	1.5847	2.2297	4.9360* (0.5879)	1.9072
14.	No change in texture of jaggery	0.3281	0.7377	4.8079* (0.3782)	0.5329
15.	Colour of jaggery is better	1.7191	2.2282	2.8176	1.9741
16.	No difference in the colour of jaggery	0.4587	0.7298	1.7994	0.5943
17.	Capacity to maintain cane yield even if harvest is delayed is better	2.3857	2.1221	0.3601	2.2539
18.	Capacity to maintain cane yield even if harvest is delayed is equal	0.8212	0.5569	0.8243	0.6891
19.	Capacity to maintain jaggery yield even if harvest is delayed is better	1.7616	2.1677	1.4520	1.9647
20.	Capacity to maintain jaggery yield even if harvest is delayed is equal	0.5590	0.7924	1.3370	0.6757
21.	No additional cost is involved in changing the variety (cost of setts, transport etc.)	1.3124	1.4691	2.2078	1.7307
	Total				46.34

TABLE 4.2 (CONTD.)

1	2	3	4	5	6
B.	Negative factors				
1.	Plant crop cane yield - decrease upto 12.5 t/ha	1.9477	1.7227	0.4252	1.8352
2.	Plant crop cane yield - decrease of 12.6 to 25 t/ha	2.8236	2.7113	0.0713	2.7675
3.	Plant crop cane yield - decrease of 25.1 to 37.5 t/ha	3.7802	3.6626	0.0488	3.7214
4.	Ratoon crop cane yield - decrease upto 12.5 t/ha	1.7075	1.4407	0.6750	1.5741
5.	Ratoon crop cane yield - decrease of 12.6 to 25 t/ha	2.6735	2.4361	0.2539	2.5548
6.	Ratoon crop cane yield - decrease of 25.1 to 37.5 t/ha	3.4220	3.1957	0.2155	3.3089
7.	Plant crop jaggery yield -decrease upto 12.5 q/ha	1.3012	1.6306	2.3728	1.4659
8.	Plant crop jaggery yield decrease of 12.6 to 25 q/ha	1.9800	2.5128	3.7445	2.2464
9.	Plant crop jaggery yield decrease of 25.1 to 37.5 q/ha	3.0393	3.4478	0.8742	3.2435
10.	Ratoon crop jaggery yield -decrease upto 12.5 q/ha	1.2646	1.4424	0.8750	1.3535
11.	Ratoon crop jaggery yield -decrease of 12.6 to 25 q/ha	1.9531	2.3436	2.2947	2.1484
12.	Ratoon crop jaggery yield -decrease of 25.1 to 37.5 q/ha	2.9016	3.0764	0.1429	2.9890

TABLE 4.2 (CONTD.)

1	2	3	4	5	6
13.	Texture of jaggery is poor	1.9363	2.3802	1.2854	2.1583
14.	Colour of jaggery is poor	1.7144	1.8474	1.4530	1.7809
15.	Capacity to maintain cane yield even if harvest is delayed is poor	1.8451	1.9627	0.1049	1.9039
16.	Capacity to maintain jaggery yield even if harvest is delayed is poor	1.4682	1.7758	2.4379	1.6220
17.	Additional cost involved in changing the variety is about Rs. 2500/ha	2.1856	2.2204	0.0151	2.2030
18.	Additional cost involved in changing the variety is about Rs.250-500/ha (to plant a nursery crop in his farm)	0.8454	0.7088	0.5846	0.7771
	Total				39.63

* Significant at five per cent level of probability

Note: For significant variables, value of C.D. at five per cent level of probability is given in parentheses

acceptability of a sugarcane variety. Additional cost involved in changing the variety (including the cost of setts, transport etc) also formed an important aspect for the acceptability of a new variety. The extension personnel while introducing the new varieties should arrange for easy credit through sugar factories or other agencies for getting the seed material without much difficulty.

4.2.2. Difference in duration

Details of weightages obtained for different aspects of this major factor are given in Table 4.3.

"Difference in duration" formed 13.24 per cent of the total scores for positive aspects and 13.97 per cent for negative aspects. As the difference in duration increased, their relative importance also increased, though not proportionately.

It is to be noted that if sugarcane varieties with four months lesser duration were released for cultivation they might be accepted by the farming community only when their yield level is equal or more than the variety under cultivation and in any case, reduction in yield should not exceed 12.5 tonnes per ha. On the contrary, farmers might accept varieties of longer duration, if the increase in yield is substantial.

TABLE 4. 3. SUGARCANE VARIETY ACCEPTABILITY INDEX-DIFFERENCE IN DURATION

S.No.	Aspects	Mean weightage		F value	Final weightage
		Extension personnel	Farmers		
1	2	3	4	5	6
A.	Positive factors				
1.	Plant crop duration -decreased by one month	0.6411	0.5067	1.0705	0.5739
2.	Plant crop duration -decreased by two months	1.2785	0.9631	3.8128	1.1208
3.	Plant crop duration -decreased by three months	1.3987	1.5086	2.7105	1.7037
4.	Plant crop duration -decreased by four months	2.3550	1.9854	1.2476	2.1702
5.	Ratoon crop duration -decreased by one month	0.5785	0.4040	1.7928	0.4912
6.	Ratoon crop duration -decreased by two months	1.2096	0.8095	5.9114** (0.3338)	1.0095
7.	Ratoon crop duration -decreased by three months	1.8578	1.3817	4.5319* (0.4535)	1.6197
8.	Ratoon crop duration -decreased by four months	2.3807	1.9025	2.0886	2.1416
9.	Early harvest enabling the farmer to get better jaggery prices	1.4934	1.1561	1.3791	1.3272
10.	Early harvest enabling the farmer to take more number of crops in a given time	1.1600	0.9004	0.4436	1.0842
	Total				13.24

TABLE 4.3. (CONTD.)

1	2	3	4	5	6
D.	Negative factors				
1.	Plant crop duration -increased by one month	1.1711	1.0455	0.2510	1.1083
2.	Plant crop duration -increased by two months	1.6544	1.4384	0.7336	1.5464
3.	Plant crop duration -increased by three months	2.0875	1.9153	0.4106	2.0014
4.	Plant crop duration -increased by four months	2.7244	2.4723	0.6310	2.5983
5.	Ratoon crop duration -increased by one month	1.1119	0.9311	0.6124	1.0215
6.	Ratoon crop duration -increased by two months	1.6471	1.3084	1.8765	1.4779
7.	Ratoon crop duration -increased by three months	2.0741	1.8069	0.9647	1.9405
8.	Ratoon crop duration -increased by four months	2.3535	2.1979	0.2016	2.2757
	Total				13.97

* Significant at five per cent level of probability
** Significant at one per cent level of probability

Note: For significant variables, value of C.D. at five per cent level of probability is given in parentheses.

4.2.3. Plant characters

Details of weightages obtained for different aspects of the major factor 'plant characters' are given in Table 4.4.

'Plant characters' formed 8.44 per cent of the total scores for positive aspects and 7.71 per cent for negative aspects. Relatively low level of weightages were recorded for various plant characters. This might be due to the rigorous selection procedure followed by Sugarcane Breeding Institute and other Sugarcane Research Stations which prevent the release of genotypes with extremely undesirable plant characters for commercial cultivation. Ill-effects of minor degrees of drawbacks can be overcome by proper manipulation of crop management practices.

4.2.4. Innovation attributes

Details of weightages obtained for different aspects of this major factor are given in Table 4.5.

Innovation attributes formed 8.56 per cent of the total scores for positive aspects and 10.91 per cent for the negative aspects. Higher flexibility of a new sugarcane variety which would enable the farmer to grow the variety under varying conditions was the most important positive aspect . If the managerial ability required to provide irrigation as per the requirments of the variety and the managerial ability required for planting the variety in correct season are higher, the acceptance of the variety would be lower.

TABLE 4.4. SUGARCANE VARIETY ACCEPTABILITY INDEX-PLANT CHARACTERS

S.No.	Aspects	Mean weightage		F value	Final weightage
		Extension personnel	Farmers		
1	2	3	4	5	6
	A. Positive factors				
1.	Germination percentage is higher	0.3931	0.5178	2.1563	0.4555
2.	No change in germination percentage	0.1133	0.1260	0.1349	0.1227
3.	Higher number of tillers per clump	0.3996	0.5046	1.6257	0.4522
4.	Equal number of tillers per clump	0.1297	0.1612	0.3042	0.1455
5.	More number of nodes per cane	0.2392	0.2298	0.0411	0.2345
6.	Equal number of nodes per cane	0.1414	0.1382	0.0026	0.1398
7.	Length of internode is longer	0.3847	0.3103	0.9772	0.3475
8.	Length of internode is equal	0.1756	0.1295	0.4607	0.1526
9.	Spininess of leaves is less	0.3339	0.2995	0.2383	0.3167
10.	Easier to remove leaf sheath	0.3324	0.2668	0.6611	0.2996
11.	Lower flowering percentage	0.6178	0.7296	2.8134	0.6717
12.	Girth of cane is more	0.5055	0.4281	0.9913	0.4668
13.	Girth of cane is equal	0.1814	0.1805	0.0002	0.1809
14.	Height of cane is more	0.4468	0.3509	1.1036	0.3989
15.	Height of cane is equal	0.2044	0.1911	0.0194	0.1978

TABLE 4.4 (CONTD.)

1	2	3	4	5	6
16.	Less hardiness of cane	0.2092	0.2183	0.0227	0.2138
17.	Less brittleness of cane	0.2951	0.2479	0.2606	0.2715
18.	Less sprouting of buds in plants	0.3593	0.3308	0.1333	0.3451
19.	Less stalk pithiness	0.3734	0.3765	0.0019	0.3750
20.	Less lodging	0.3042	0.5578	0.5518	0.5360
21.	Utility of plant tops as cattle feed is higher	0.2447	0.2152	0.2748	0.2299
22.	Utility of plant tops as cattle feed is equal	0.0923	0.0917	0.0005	0.0922
23.	Crop stand of ratoon is better	0.4850	0.5463	0.4502	0.5157
24.	Crop stand of ratoon is equal	0.1526	0.1955	0.5583	0.1751
25.	Less susceptible to early shoot borer	0.4488	0.3580	1.4413	0.4034
26.	Less susceptible to grassy shoot disease	0.4083	0.2860	3.0256	0.3474
27.	Less susceptible to smut	0.3901	0.3182	1.0855	0.3542
	Total				8.44
	B. Negative factors				
1.	Germination percentage is lower	0.4856	0.4404	0.2063	0.4630
2.	Lower number of tillers per clump	0.4146	0.4636	0.3128	0.4391
3.	Lower number of nodes per cane	0.3316	0.2474	2.1390	0.2895
4.	Length of internode is lower	0.3992	0.3037	2.1439	0.3510

TABLE 4.4 (CONTD.)

1	2	3	4	5	6
5.	Spininess of leaves is more	0.6036	0.3995	2.1655	0.5015
6.	Spininess of leaves is equal	0.1181	0.1063	0.0895	0.1122
7.	Difficulty in removing leaf sheath is more	0.4105	0.2858	2.0903	0.3482
8.	Difficulty in removing sheath is equal	0.0941	0.0984	0.0079	0.0963
9.	Higher flowering percentage	0.7545	0.7172	0.1927	0.7359
10.	Flowering percentage is equal	0.1539	0.2602	2.5359	0.2071
11.	Girth of cane is less	0.4857	0.4054	0.6233	0.4456
12.	Height of cane is less	0.4566	0.3638	0.8583	0.4127
13.	Hardiness of cane is more	0.1491	0.1702	0.2278	0.1597
14.	Hardiness of cane is equal	0.0893	0.1163	0.2904	0.1031
15.	Higher brittleness of cane	0.2993	0.3143	0.0432	0.3068
16.	Brittleness of cane is equal	0.1441	0.1119	0.3872	0.1280
17.	More sprouting of buds in plants	0.5123	0.4397	0.4446	0.4760
18.	Equal sprouting of buds in plants	0.2151	0.2002	0.0411	0.2077
19.	Stalk pithiness is more	0.5035	0.4031	1.0976	0.4558
20.	Stalk pithiness is equal	0.2253	0.1766	0.3856	0.2009
21.	More lodging	0.5266	0.6282	1.0769	0.5774
22.	Equal amount of lodging	0.1931	0.2362	0.6935	0.2147
23.	Utility of plant tops as cattle feed is lower	0.2196	0.1934	0.4222	0.2065
24.	Crop stand of ratoon is poor	0.5385	0.4870	0.2417	0.5128
25.	More susceptible to early shoot borer	0.4521	0.4244	0.1083	0.4382

TABLE 4.4. (CONTD)

1	2	3	4	5	6
26.	Equally susceptible to early shoot borer	0.2361	0.2115	0.1384	0.2238
27.	More susceptible to grassy shoot disease	0.5020	0.3850	1.3025	0.4435
28.	Equally susceptible to grassy shoot disease	0.2321	0.1905	0.4695	0.2113
29.	More susceptible to smut	0.4655	0.3649	1.1944	0.4152
30.	Equally susceptible to smut	0.2561	0.2075	0.4151	0.2318
	Total				9.91

Note : All the F values are non-significant

TABLE 4.5. SUGARCANE VARIETY ACCEPTABILITY INDEX - INNOVATION ATTRIBUTES

S.No.	Aspects	Mean weightage		F value	Final weightage
		Extension personnel	Farmers		
1	2	3	4	5	6
	A. Postive factors				
1.	Managerial ability required for planting the variety in correct season is lower	0.4915	0.6243	1.3553	0.5579
2.	Managerial ability required for planting the variety in correct season is equal	0.1867	0.2925	2.1436	0.2396
3.	Managerial ability required to get the fertilisers in time is lower	0.3598	0.4829	1.8469	0.4213
4.	Managerial ability required to get the fertilisers in time is equal	0.1895	0.2132	0.0333	0.2014
5.	Managerial ability required to provide irrigation as per the requirements of the variety is lower	0.4769	0.9234	9.6096** (0.2960)	0.7032
6.	Managerial ability required to provide irrigation as per the requirements of the variety is equal	0.2208	0.2904	0.7403	0.2556
7.	Difficulty in understanding the quantity of fertilizers to be applied at different stages is less	0.3320	0.3591	0.1473	0.3456
8.	Difficulty in adopting the recommended spacing is less	0.2909	0.3393	0.4190	0.3154
9.	Flexibility of the variety to enable the farmer to grow the variety under varying conditions is higher	0.6490	1.0785	5.6390* (0.3668)	0.8638

TABLE 4.5 (CONTD.)

1	2	3	4	5	6
10.	Flexibility of the variety to enable the farmer to grow the variety under varying conditions is equal	0.2840	0.3771	1.0551	0.3306
11.	Possibility of getting suitable soil conditions required for cultivating the variety is higher	0.4372	0.6076	5.7046* (0.2109)	0.5624
12.	Possibility of getting suitable soil conditions required for cultivating the variety is equal	0.2391	0.3009	0.7059	0.2700
13.	Possibility of getting labour to carry out planting in correct season is higher	0.3827	0.5249	3.3015	0.4538
14.	Possibility of getting labour to carry out planting in correct season is equal	0.1535	0.2261	1.1347	0.1898
15.	Possibility of getting labour to apply fertilisers in correct time is higher	0.3042	0.3520	0.3239	0.3286
16.	Possibility of getting labour to apply fertilisers in correct time is equal	0.1218	0.1328	0.0459	0.1273
17.	Possibility of getting labour to harvest the crop in correct time is higher	0.4728	0.5292	0.3706	0.5010
18.	Possibility of getting labour to harvest the crop in correct time is equal	0.2339	0.2113	0.0804	0.2226
19.	Efficiency of the variety in reducing the labour requirement is higher	0.5126	0.6186	0.8458	0.5656

TABLE 4.5 (CONTD.)

1	2	3	4	5	6
20.	Efficiency of the variety in reducing the labour requirement is equal	0.1049	0.2591	0.6265	0.2270
21.	Consistency of recommendations for the variety with the past experience of the farmer is higher	0.5297	0.7615	2.7415	0.6456
22.	Consistency of recommendations for the variety with the past experience of the farmer is equal	0.1964	0.2674	1.1259	0.2519
	Total				9.56
	B. Negative factors				
1.	Managerial ability required for planting the variety in correct season is higher	0.8931	1.2675	3.4163	1.0803
2.	Managerial ability required to get the fertilizers in time is higher	0.7711	0.9507	1.3928	0.9609
3.	Managerial ability required to provide irrigation as per the requirements of the variety is higher	0.8627	1.4956	6.8895* (0.4429)	1.1490
4.	Difficulty in understanding the quantity of fertilizers to be applied at different stages is more	0.6661	0.5471	0.5282	0.6056
5.	Difficulty in understanding the quantity of fertilizers to be applied at different stages is equal	0.2900	0.3240	0.1018	0.3070
6.	Difficulty in adopting the recommended spacing is more	0.6255	0.6554	0.0687	0.5404
7.	Difficulty in adopting the recommended spacing is equal	0.2760	0.3169	0.1863	0.2964

TABLE 4.5 (CONTD.)

1	2	3	4	5	6
8.	Flexibility of the variety to enable the farmer to grow the variety under varying conditions is lower	1.1644	1.6399	4.5137* (0.4533)	1.4022
9.	Possibility of getting suitable soil conditions required for cultivating the variety is lower	1.8082	1.0623	2.8172	0.9353
10.	Possibility of getting labour to carry out planting in correct season is lower	0.7198	0.7120	0.0031	0.7159
11.	Possibility of getting labour to apply fertilisers in correct time is lower	0.5932	0.4246	1.3516	0.5089
12.	Possibility of getting labour to harvest the crop in correct time is lower	0.7296	0.8187	0.3179	0.7741
13.	Efficiency of the variety in reducing the labour requirement is lower	0.7149	0.8859	1.0731	0.8004
14.	Consistency of recommendations for the variety with the past experience of the farmer is lower	0.7676	0.8075	1.0545	0.8326
	Total				10.91

* Significant at five per cent level of probability
** Significant at one per cent level of probability

Note : For significant variables, value of C.D. at five per cent level of probability is given in parentheses

4.2.5. Extension system's promotional efforts

Details of weightages obtained for different aspects of this major factor are given in Table 4.6.

Extension system's promotional efforts formed 14.86 per cent of the total scores for positive aspects and 9.95 per cent for negative aspects. Announcement of premium/subsidy (usually by sugar factories) for cultivation of a new variety formed an important promotional effort. Priority given in issuing cutting orders for factory supply was also found to be important. Degree to which the field level extension worker has faith on the performance of the variety was also observed to be an important positive/negative aspect influencing the acceptance of a new sugarcane variety.

4.2.6. Social factors

Details of weightagon obtained for different aspects of 'social factors' are given in Table 4.7.

Social factors constituted 9.56 per cent of the total scores for positive aspects and 15.63 per cent for the negative aspects. Better performance of the variety in fellow farmers' fields and a favourable opinion among fellow farmers about the variety could act as strong positive aspects. All the negative aspects were found to play a significant role in preventing the spread of a new sugarcane variety.

TABLE 4.6. SUGARCANE VARIETY ACCEPTABILITY INDEX - EXTENSION SYSTEM'S PROMOTIONAL EFFORTS

S.No.	Aspects	Mean weightage		F value	Final weightage
		Extension personnel	Farmers		
1	2	3	4	5	6
	A. Positive factors				
1.	Premium/subsidy @ Rs.750/ha	0.4292	0.4513	0.0343	0.4403
2.	Premium/subsidy @ Rs.1250/ha	0.7684	0.7485	0.0269	0.7585
3.	Premium/subsidy @ Rs.2000/ha	1.0745	1.1600	0.1841	1.1172
4.	Premium/subsidy @ Rs.2500/ha	1.3568	1.4641	0.2063	1.4105
5.	Persuasion given by extension personnel for growing the variety is more	0.8524	0.9100	0.1722	0.8812
6.	Persuasion given by extension personnel for growing the variety is equal	0.3081	0.3124	0.0032	0.3102
7.	Extent to which the farmer believes that the extension personnel serve the interest of the farmer is higher	0.9511	0.8950	1.3910	0.9231
8.	Arrangements made for facilitating easy availability of setts is more	0.7262	0.7367	0.0077	0.7315
9.	Arrangements made for facilitating easy availability of setts is equal	0.2736	0.2713	0.0010	0.2725
10.	Priority given in sanctioning credit is higher	0.5853	0.5966	0.0111	0.5910
11.	Priority given in sanctioning credit is equal	0.2441	0.2190	0.0976	0.2320
12.	Priority given in registration for factory supply is higher	0.6455	0.6726	0.0526	0.6591
13.	Priority given in registration for factory supply is equal	0.2689	0.2787	0.0085	0.2738

TABLE 4.6 (CONTD.)

1	2	3	4	5	6
14.	Priority given in issuing cutting orders for factory supply is higher	1.0382	1.2188	1.3680	1.1285
15.	Priority given in issuing cutting orders for factory supply is equal	0.3282	0.4125	0.4942	0.3704
16.	Recognition given to adopters of the variety through awards is more	0.6743	0.5287	0.3889	0.6015
17.	Recognition given to adopters of the variety through awards is equal	0.2877	0.1734	1.3183	0.2506
18.	Number of demonstration plots organised on this variety is more	0.6346	0.5106	1.1963	0.5772
19.	Number of demonstration plots organised on this variety is equal	0.2620	0.1958	0.6598	0.2289
20.	Number of training programmes organised on cultivation of this variety is more	0.6271	0.5909	0.1424	0.6086
21.	Number of training programmes organised on cultivation of this variety is equal	0.2616	0.1970	0.5387	0.2293
22.	Number of exhibitions and field days organised on cultivation of this variety is more	0.6363	0.6081	0.0544	0.6222
23.	Number of exhibitions and field days organised on cultivation of this variety is equal	0.2578	0.2307	0.1370	0.2443
24.	Degree to which the field level extension worker has faith on the performance of the variety is more	1.0491	1.1120	0.1127	1.0806

TABLE 4.6 (CONTD.)

1	2	3	4	5	6
25.	Degree to which the field level extension worker has faith on the performance of the variety is equal	0.5618	0.5121	0.3159	0.3370
	Total				14.86
	B. Negative factors				
1.	Persuasion given by extension personnel for growing the variety is less	1.0526	0.6606	3.0785	0.8566
2.	Extent to which the farmer believes that the extension personnel serve the interest of the farmer is moderate	0.8266	0.7332	0.4279	0.7799
3.	Extent to which the farmer believes that the extension personnel serve the interest of the farmer is less	0.8827	0.9936	0.2284	0.9381
4.	Arrangements made for facilitating easy availability of setts is less	1.0050	0.8219	0.6725	0.9135
5.	Priority given in sanctioning credit is less	0.8218	0.6211	1.2967	0.7215
6.	Priority given in registration for factory supply is less	0.9859	0.9447	0.0244	0.9653
7.	Priority given in issuing cutting orders for factory supply is less	1.2919	1.1467	0.0425	1.3191
8.	Recognition given to adopters of the variety through awards is less	0.5477	0.3691	2.3793	0.4434
9.	Number of demonstration plots organised on this variety is less	0.7397	0.4475	3.3611	0.5936

TABLE 4.6 (CONTD.)

1	2	3	4	5	6
10.	Number of training programmes organised on cultivation of this variety is less	0.6272	0.4112	2.4721	0.5192
11.	Number of exhibitions and field days organised on the cultivation of this variety is less	0.6199	0.9349	2.2780	0.5024
12.	Degree to which the field level extension worker has faith on the performance of this variety is less	1.4206	1.7742	0.0274	1.3974
	Total				9.95

Note - All the F values are non-significant

TABLE 4.7. SUGARCANE VARIETY ACCEPTABILITY INDEX -SOCIAL FACTORS

S.No.	Aspects	Mean weightage		't' value	Final weightage
		Extension personnel	Farmers		
1	2	3	4	5	6
	A. Positive factors				
1.	Appreciation by fellow farmers for adopting the variety is higher	1.0044	0.6774	2.8435	0.8409
2.	Appreciation by fellow farmers for adopting the variety is equal	0.4730	0.4370	0.0535	0.4530
3.	Performance of the variety in fellow farmers' fields is better	1.2459	1.7351	5.0839	1.4845
4.	Opinion of the fellow farmers about the variety is favourable	1.1260	1.4318	1.8073	1.2789
5.	Opinion of the fellow farmers about the variety is neutral	0.4494	0.5330	3.7349	0.4682
6.	Opinion of family members about the performance of the variety is favourable	1.3001	1.5020	0.6902	1.4056
7.	Opinion of family members about the performance of the variety is neutral	0.3516	0.4765	0.9932	0.4141
8.	Preparedness of the farmer to change the variety is high	1.4171	1.4151	0.0007	1.4161
9.	Preparedness of the farmer to change the variety is moderate	0.7791	0.8144	0.0529	0.7968
	Total				8.56

TABLE 4.7 (CONTD.)

1	2	3	4	5	6
	B. Negative factors				
1.	Appreciation by fellow farmers for adopting the variety is less	2.3634	1.1534	7.6791** (0.8320)	1.7614
2.	Performance of the variety in fellow farmers' fields is equal	1.0915	1.0444	0.0232	1.0680
3.	Performance of the variety in fellow farmers' fields is poor	3.2477	4.2262	3.3186	3.7370
4.	Opinion of the fellow farmers about the variety is not favourable	2.7011	3.3157	2.0350	3.0074
5.	Opinion of the family members about the variety is not favourable	3.0719	3.5808	1.1568	3.3263
6.	Preparedness of the farmer to change the variety is less	2.7392	2.6695	0.0076	2.7299
	Total				15.63

** Significant at one per cent level of probability

Note For the significant variable, value of C.D. at five per cent level of probability is given in parenthesis

When the performance of the variety in fellow farmers' fields was poor and the opinion offered about the variety by the fellow farmers and family members were unfavourable, the rate of acceptability of the new variety would be considerably reduced. Therefore, while introducing new sugarcane varieties in a new area/zone, care must be taken to select farmers who would adopt scrupulously the specific package of practices for the variety so that the variety would be able to fully exhibit its production potential. This would enable the extension system to build up a favourable opinion about the performance of the new variety among the members of the social system.

4.4. Individual threshold levels of innovation-decision

4.4.1. Performance Perception Index

Performance Perception Index scores for the Co^ 671 sugarcane variety are given in Table 4.8 and Fig. 4.5.

As already stated, Performance Perception Index consists of two components, namely, positive perception score and negative perception score and the latter is termed as 'threshold level' in the case of adopters and 'theoretical threshold level' in the case of non-adopters (for convenience, the latter also will be referred as threshold level).

As could be seen from table 4.8 and figure 4.5, threshold levels of adopters were lesser than that of the non-adopters.

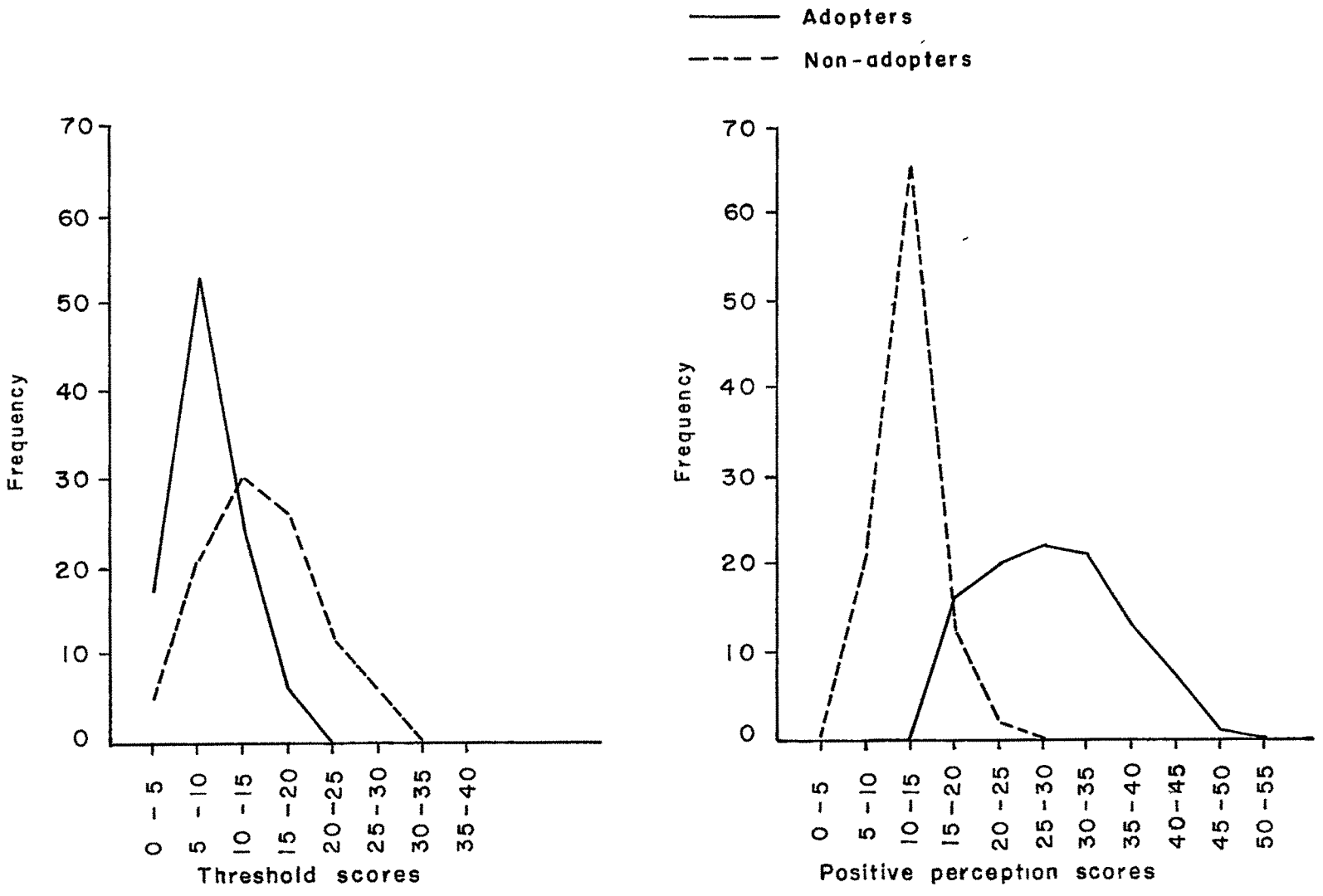

Fig. 4.5. Performance perception index of adopters and non-adopters

The positive perception scores were higher in the case of adopters as compared to non-adopters.

4.3.2. Performance Perception Index and extent of adoption

Mean values of extent of adoption score were plotted in the 'Y' axis with the frequency distribution of positive perception score and threshold score in the 'X' axis in Fig. 4.6.

It could be seen that in the case of positive perception score, the extent of adoption score took off at 10-15 level and then constantly increased as the level of positive perception score increased. On the contrary, as the level of threshold score increased, the extent of the adoption score decreased and at 20-25 level it reached the zero level.

Zero order correlation coefficients and simple linear regression equations were worked out to find the relationship between extent of adoption, positive perception score and threshold score and the results are presented in Table 4.9.

There was positive and significant relationship between extent of adoption and positive perception score. The analysis also revealed that an unit increase in the positive perception score will cause 1.544 units increase in the extent of adoption, ceteri paribus.

The relationship between extent of adoption and threshold score was found to be negative and significant. The regression

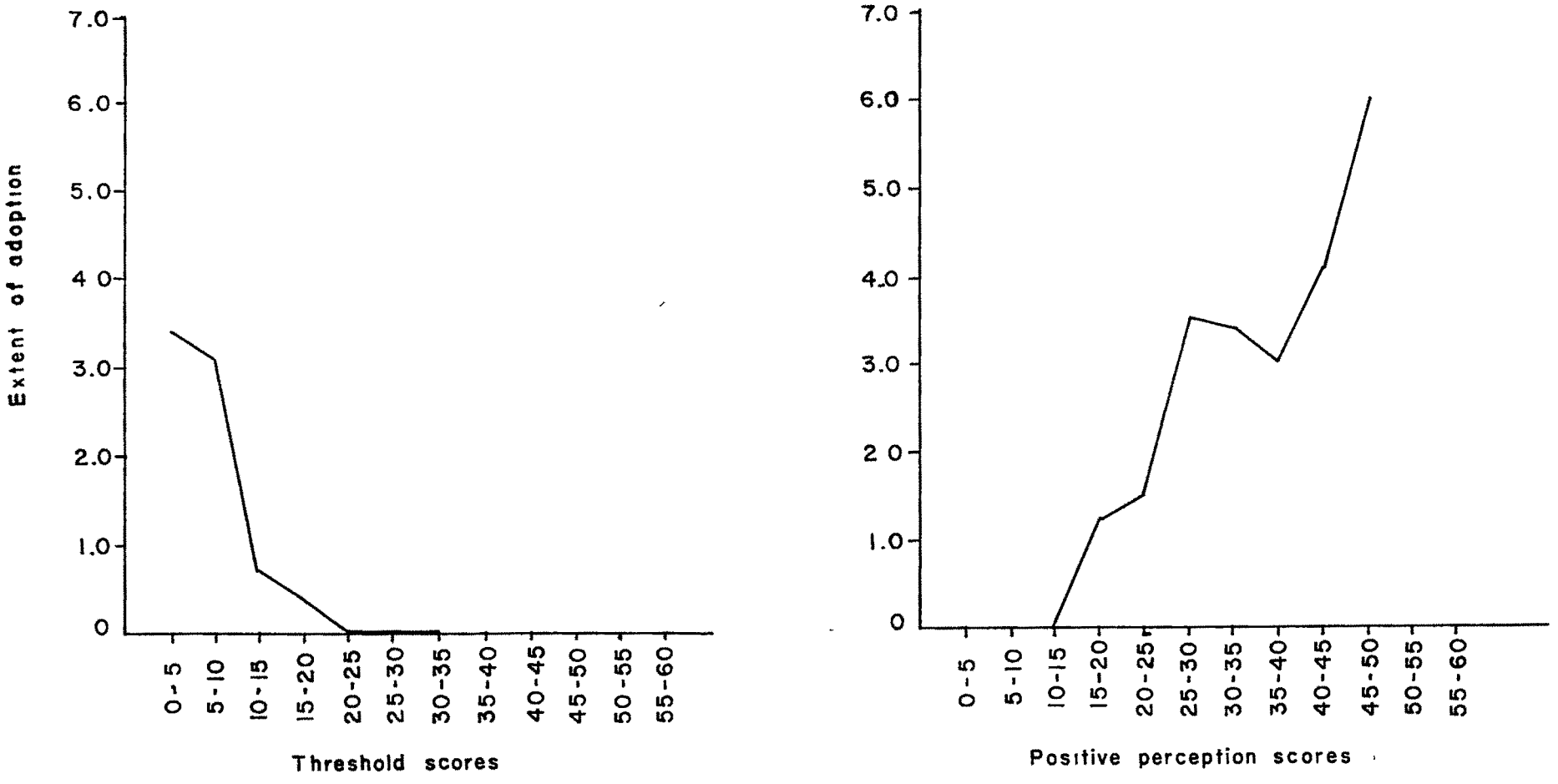

Fig. 4.6. Performance perception index and extent of adoption

TABLE 4.9. RELATIONSHIP BETWEEN EXTENT OF ADOPTION, POSITIVE PERCEPTION SCORE AND THRESHOLD SCORE

Dependent variable	Independent variable	Zero order correlation coefficient	Linear regression equation
Extent of adoption	Positive perception score	0.3034**	Y = 24.6464 + 1.5440 x** (0.4245)
Extent of adoption	Threshold score	-0.3567**	Y = 10.1899 - 0.6471 x** (0.1413)
Positive perception score	Threshold score	-0.6576**	Y = 25.5253 - 0.5665 x** (0.2256)

** Significant at one per cent level of probability

Note : Figures in parenthesis indicate standard error

equation revealed that ceteri paribus, an unit increase in the threshold score will cause 0.6471 unit decrease in the extent of adoption.

Positive perception score and threshold score was observed to be negatively correlated. The simple linear regression equation revealed that ceteri paribus, an unit increase in the threshold score will cause 0.5665 unit decrease in the positive perception score.

It may be concluded that for improving the extent of adoption of innovations, the research and development personnel may direct their efforts in increasing the positive perception score or decreasing the threshold score. Selection of suitable research and development strategies for this purpose should be based on their scientific feasibility and physical and cultural compatibility with the socio-economic system in which the innovations are proposed to be introduced.

4.4. Critical threshold level for a social system

The results on critical threshold level are presented in Table 4.10. Critical threshold level is that level for which the percentage of farmers with lesser threshold score (who are adopters) and the percentage of farmers with larger threshold level (who are adopters) differ to the maximum extent.

The percentage differences calculated in the table correspond to the separation points 5, 10, 15, 20, 25, 30 and 35 respectively. Since the difference between P_H and P_L was

TABLE 4.10. CRITICAL THRESHOLD LEVEL

S.No.	Item	Threshold score range						
		0-5	5-10	10-15	15-20	20-25	25-30	30-35
1.	Number of farmers	17	58	46	36	25	12	6
2.	Number of farmers who have adopted	17	53	24	6	--	--	--
3.	Number of farmers at this and smaller levels	17	75	121	157	182	194	200
4.	Number adopted at this and smaller levels	17	70	94	100	100	100	100
5.	Percentage of (4) to (3) - P_L	100	93.33	77.68	63.69	54.95	51.55	50.00
6.	Number of farmers above this level	183	125	79	43	18	6	--
7.	Number adopted above this level	83	30	6	--	--	--	--
8.	Percentage of (7) to (6) - P_U	45.36	24.00	7.59	--	--	--	--
9.	Difference between P_U and P_L	54.64	69.33	70.09	63.69	54.95	51.55	50.00

maximum (70.09) at the third point, this level was taken as critical threshold level. Thus it could be concluded that for the given social system which the 200 respondents represented in the study, the critical threshold level for innovation-decision on a new sugarcane variety was 15.0.

The results of critical level for positive perception score is presented in Table 4.11. The percentage differences calculated in the table correspond to the separation points 5, 10, 15, 20, 25, 30, 35, 40, 45 and 50 respectively. Since the difference between P_U and P_L was maximum (83.63) at the fourth point, this level was taken as critical level for positive perception score. Thus one can conclude that for the given social system, critical level of positive perception score for innovation-decision on a new sugarcane variety was 20.0.

As explained in the conceptual flow chart of the data analysis sequence presented in the previous chapter (3.3.3), the critical threshold level and the critical level for positive perception score along with the Sugarcane Variety Acceptability Index will determine the suitability of a new sugarcane genotype for release as a variety for commercial cultivation. Any new genotype which comes up for consideration for release as a variety for commercial cultivation may be subjected to scoring for its different characters with the weightages obtained in the Sugarcane Variety Acceptability Index. If the sum of negative scores is lesser than the critical threshold level and the sum of positive scores is

TABLE 4. 11. CRITICAL LEVEL FOR POSITIVE PERCEPTION SCORE

S.No.	Item	Positive perception score range									
		0-5	5-10	10-15	15-20	20-25	25-30	30-35	35-40	40-45	45-50
1.	Number of farmers	--	20	66	28	22	22	21	13	7	1
2.	Number of farmers who have adopted	--	--	--	16	20	22	21	13	7	1
3.	Number of farmers at this and smaller levels	--	20	86	114	136	158	179	192	199	200
4.	Number adopted at this and smaller levels	--	--	--	16	36	58	79	92	93	100
5.	Percentage of (4) to (3)-P_L	--	--	--	14.04	26.47	36.71	44.13	47.32	46.75	50.00
6.	Number of farmers above this level	200	180	114	86	64	42	21	8	1	--
7.	Number adopted above this level	--	--	--	84	64	42	21	8	1	--
8.	Percentage of (7) to (6)-P_U	--	--	--	97.67	100.00	100.00	100.00	100.00	100.00	100.00
9.	Difference between P_U and P_L	--	--	--	83.63	73.53	63.29	55.87	52.68	50.25	50.00

more than the critical level for positive perception score, the variety may be released for commercial cultivation, provided it does not possess extremely adverse plant characters.

For example, for quick spreading of a new variety among the members of a social system, it should have a maximum production potential of an increase of more than 25 t/ha in cane yield of both plant and ratoon crops or an increase of more than 25 q/ha of jaggery yield of both plant and ratoon crops and a moderate level of extension system's promotional efforts. Any negative aspect of the new variety should be adequately compensated by some other positive aspect.

4.5. Positive and negative factors influencing innovation-decision

4.5.1. Mahalanobis' D^2 analysis

Mahalanobis' D^2 analysis was carried out to find whether the adopters and non-adopters of Co 671 sugarcane variety differed in their perception on the performance of the variety when 55 variables were considered together (As the programme for 61 variables was not available, the researcher was advised to eliminate 26 variables that did not show much variation between adopters and non-adopters). D^2 value was found to be 36.75 with a 'F' value of 22.63 which was significant at one per cent level of probability. Hence it could be

concluded that the two groups of respondents differed in their perception on the performance of CoC 671 sugarcane variety with respect to the 35 variables. Thus the hypothesis that there will be no difference between adopters and non-adopters in the perception of positive and negative factors influencing the innovation-decision was rejected.

4.5.2. Discriminant function analysis

Discriminant function analysis was carried out to identify the key variables for differentiating the adopters and non-adopters. Discriminant function coefficients obtained for different variables are presented in Table 4.12. The variables are arranged in the descending order of their discriminant function coefficients in the table.

The sugarcane variety CoC 671 was popularised in the study area primarily by the Kallakurichi Cooperative Sugar Mills Limited as a part of their strategy to improve the factory recovery levels especially in the early part of the crushing season (December-January) as the variety is an early maturing variety with high sucrose content. The new variety was expected to replace Co 6304 in the factory farmers' holdings and Co 997 in jaggery farmers' fields.

Though Co 6304 gave better cane yield in the plant crop, its performance as a ratoon was very poor in some pockets of the study area. Because of this, a number of farmers stopped taking ratoon crop from this variety. As regards

TABLE 4. 12. DISCRIMINANT FUNCTION COEFFICIENTS OF POSITIVE AND NEGATIVE FACTORS

S.No.	Positive/negative factor	Discriminant function coefficient
1.	X_4 Ratoon crop jaggery yield	14.9235
2.	X_2 Ratoon crop cane yield	11.0717
3.	X_{35} Managerial ability required to provide irrigation as per the requirements of variety	10.7327
4.	X_{51} Priority given in issuing cutting orders for factory supply	10.0476
5.	X_{36} Flexibility of the variety to enable the farmer to grow the variety under varying conditions	9.6011
6.	X_{58} Performance of the variety in fellow farmers' fields	9.5389
7.	X_{59} Opinion of fellow farmers about the performance of the variety	9.1223
8.	X_1 Plant crop cane yield	9.0563
9.	X_3 Plant crop jaggery yield	8.9664
10.	X_{60} Opinion of family members about the performance of the variety	7.6721
11.	X_6 Colour of jaggery	6.5248
12.	X_{48} Arrangements made for facilitating easy availability of setts	6.3703
13.	X_5 Texture of jaggery	6.3194
14.	X_{33} Managerial ability required for planting the variety in the correct season	6.2672
15.	X_{46} Persuasion given by extension personnel for growing the variety	6.2189
16.	X_{61} Preparedness of the farmer to change the variety	6.2070

TABLE 4.12 (CONTD.)

S.No.	Positive/negative factor	Discriminant function coefficient
17.	X_{20} Flowering percentage	4.1931
18.	X_{39} Possibility of getting suitable soil conditions required for cultivating the variety	4.1642
19.	X_{10} Plant crop duration	4.1593
20.	X_{11} Ratoon crop duration	3.1563
21.	X_{45} Premium/subsidy given for the variety	2.1556
22.	X_7 Capacity to maintain cane yield even if harvest is delayed	2.0716
23.	X_{56} Degree to which the field level extension worker has faith on the performance of the variety	2.0449
24.	X_9 Additional cost involved in changing the variety	1.2954
25.	X_{44} Consistency of recommendations for the variety with the past experiences of the farmer	1.2007
26.	X_8 Capacity to maintain jaggery yield even if harvest is delayed	1.1667
27.	X_{27} Lodging	1.0232
28.	X_{47} Extent to which the farmer believes that the extension personnel serve the interest of the farmer	0.9008
29.	X_{49} Priority given in sanctioning credit	0.7575
30.	X_{14} Germination percentage	0.5873
31.	X_{57} Appreciation by fellow farmers for adopting the variety	0.5686
32.	X_{50} Priority given in registration for factory supply	0.5365

TABLE 4.12 (CONTD.)

S.No.	Positive/negative factor	Discriminant function coefficient
33.	X_{15} Number of tillers per clump	0.1732
34.	X_{43} Efficiency of the variety in reducing the labour requirement	0.0011
35.	X_{47} Difficulty in adopting the recommended spacing	0.0007

D^2 value = 36.7491

F value = 22.6327**

** Significant at one per cent level of probability

Co 997, it was a low yielding variety specifically grown for jaggery purposes. Hence CoC 671 was perceived to be better both by the factory farmers and jaggery farmers especially as a ratoon crop. Thus, the two characters, ratoon crop jaggery yield and ratoon crop cane yield, had the maximum discriminating power between adopters and non-adopters.

Experience has shown that CoC 671 does not withstand moisture stress caused by drought during summer months which was a regular feature in Kallakurichi taluk. Hence, farmers with good irrigation potential adopted this new variety and harvested better yields while the non-adopters felt that the variety demanded higher managerial ability to provide the recommended schedule of irrigation as compared to other varieties under cultivation. Inadequate irrigation facilities was reported to be an important inhibiting factor for adopting new crop varieties by Sinha and Bhasin (1968), Ghosh (1969), Vannasilpa (1969), Singh and Haque (1970) and Vijayaraghavan (1977).

Since CoC 671 variety comes to maturity within ten months as compared to twelve months for Co 6304, the sugar factory gave priority to the former in issuing cutting orders for factory supply. Delay in receipt of cutting orders (for any variety) put the farmers under considerable strain as the maintenance of the sugarcane crop after February-March has been observed to be a hard task. This was due to the limited water availability which was just sufficient to carry out planting operations and for taking care of the already existing young

crops in the field. Hence the factor 'priority given in issuing cutting orders for factory supply' enthused the adopters to opt for the variety.

Non-adopters perceived CoC 671 variety as highly rigid with low flexibility with reference to planting season and other crop management practices. They were of the opinion that if they failed to follow any of these practices due to unavoidable circumstances, the crop yield would be considerably reduced. Ashby (1982) also concluded that the suitability of a technology to different types of farms is an important factor influencing the acceptance of the technology.

An analysis of the spread of CoC 671 variety in the study area revealed the following. In the villages where the variety was cultivated under optimum conditions during the year of introduction (1978) and during the succeeding year resulting in impressive harvests, there were higher rates of adoption since the adopters perceived the performance of the variety in fellow farmers' fields as better. The poor performance of the variety in a few pockets hindered the spread of this variety among a number of non-adopters. Such rare failures were widely quoted by non-adopters, even when their fields were just adjacent to the adopters' fields who might be harvesting good yields.

It is to be noted that opinion of the family members about the performance of the variety was also found to be

an important discriminating factor between adopters and non-adopters.

4.5.3. Direct and indirect effects of the variables on the extent of adoption

Correlation coefficient values were subjected to path analysis in order to determine the direct effect of independent variables free from the effect of accompanying independent variables. The results of path analysis giving direct as well as indirect effect of independent variables on the dependent variable are discussed in this section. The results of the path analysis are given in Table 4.13. In this table, the second column gives the variables concerned, column 3 gives their direct effect on the dependent variable whereas the column 4 gives the total indirect effect and the last column gives the largest indirect effect of these variables on the dependent variable through other independent variables (variable number given in the parenthesis)

It is interesting to note that only eleven variables yielded substantial direct path coefficients with the extent of adoption of Co C 671 sugarcane variety. These variables were plant crop cane yield (X_1), plant crop jaggery yield (X_3), priority given in issuing cutting orders for factory supply (X_{54}), ratoon crop cane yield (X_2); performance of the variety in fellow farmers' fields (X_{58}); opinion of family members about the performance of the variety (X_{60}): flexibility of the variety

TABLE 4.16. PATH ANALYSIS OF EXTENT OF ADOPTION WITH INDEPENDENT VARIABLES

S.No.	Independent variable	Direct effect	Total indirect effect	Largest indirect effect
	I. Difference in yield			
1.	X_1 Plant crop cane yield	0.4281	0.1663	0.1164 (X_{38})
2.	X_2 Ratoon crop cane yield	0.2652	0.2142	0.0635 (X_{38})
3.	X_3 Plant crop jaggery yield	0.3843	0.0948	0.0047 (X_1)
4.	X_4 Ratoon crop jaggery yield	0.1077	0.1279	0.0767 (X_1)
5.	X_5 Texture of jaggery	0.0972	0.0975	0.0045 (X_{39})
6.	X_6 Colour of jaggery	0.0922	0.0842	0.0674 (X_{39})
7.	X_7 Capacity to maintain cane yield even if harvest is delayed	0.0759	0.2397	0.0479 (X_{38})
8.	X_8 Capacity to maintain jaggery yield even if harvest is delayed	0.0938	0.3451	0.2761 (X_{38})
9.	X_9 Additional cost involved in changing the variety	0.0396	0.4285	0.2186 (X_{49})
	II. Difference in duration			
10.	X_{10} Plant crop duration	0.1292	0.4338	0.0762 (X_{51})
11.	X_{11} Ratoon crop duration	0.0574	0.2148	0.1267 (X_{51})
	III. Plant characters			
12.	X_{14} Germination percentage	0.0089	0.2151	0.1721 (X_1)
13.	X_{15} Number of tillers per clump	0.0082	0.0926	0.0168 (X_1)
14.	X_{20} Flowering percentage	0.0180	0.2151	0.1945 (X_1)
15.	X_{27} Lodging	0.0081	0.1232	0.0246 (X_1)
	IV. Innovation attributes			
16.	X_{33} Managerial ability required for planting the variety in correct season	0.0651	0.4548	0.2875 (X_{38})
17.	X_{35} Managerial ability required to provide irrigation as per the requirements of the variety	0.1677	0.3251	0.1769 (X_{10})

TABLE 4.13 (CONTD.)

S.No.	Independent variable	Direct effect	Total indirect effect	Largest indirect effect
18.	X_{37} Difficulty in adopting the recommended spacing	0.0075	0.0046	0.0019 (X_2)
19.	X_{38} Flexibility of the variety to enable the farmer to grow the variety under varying conditions	0.2337	0.4759	0.3997 (X_1)
20.	X_{39} Possibility of getting suitable soil conditions required for cultivating the variety	0.0497	0.2732	0.1853 (X_{58})
21.	X_{43} Efficiency of the variety in reducing the labour requirement	0.0479	0.0349	0.0316 (X_{11})
22.	X_{44} Consistency of recommendations for the variety with the past experiences of the farmer	0.0173	0.1685	0.1028 (X_3)
	V. Extension system's promotional efforts			
23.	X_{45} Premium/subsidy given for the variety	0.0416	0.2759	0.1159 (X_9)
24.	X_{46} Persuasion given by extension personnel for growing the variety	0.0067	0.4322	0.0351 (X_{51})
25.	X_{47} Extent to which the farmer believes that the extension personnel serve the interest of the farmer	0.0128	0.2738	0.2190 (X_{51})
26.	X_{48} Arrangements made for facilitating easy availability of setts	0.0085	0.1675	0.1005 (X_{33})
27.	X_{49} Priority given in sanctioning credit	0.0049	0.0932	0.0839 (X_{46})
28.	X_{50} Priority given in registration for factory supply	0.0029	0.2338	0.0935 (X_{46})
29.	X_{51} Priority given in issuing cutting orders for factory supply	0.3082	0.0846	0.0194 (X_{10})

TABLE 4.13 (CONTD.)

S.No.		Independent variable	Direct effect	Total indirect effect	Largest indirect effect
30.	X_{56}	Degree to which the field level extension worker has faith on the performance of the variety	0.0303	0.1744	0.0558 (X_3)
	VI.	Social factors			
31.	X_{57}	Appreciation by fellow farmers for adopting the variety	0.0925	0.2852	0.2738 (X_{58})
32.	X_{58}	Performance of the variety in fellow farmers' fields	0.2597	0.0023	0.0009 (X_1)
33.	X_{59}	Opinion of fellow farmers' about the performance of the variety	0.1507	0.4769	0.3481 (X_{58})
34.	X_{60}	Opinion of family members about the performance of the variety	0.2379	0.3284	0.2726 (X_{58})
35.	X_{61}	Preparedness of the farmer to change the variety	0.0351	0.3143	0.1949 (X_1)
		Residual = 0.4949			

to enable the farmer to grow the variety under varying conditions (X_{38}); managerial ability required to provide irrigation as per the requirements of the variety (X_{35}); opinion of fellow farmers about the performance of the variety (X_{59}); plant crop duration (X_{10}) and ratoon crop jaggery yield (X_4). Rest of the independent variables did not carry much direct effect on the extent of adoption.

Indirect effects of the independent variables were routed mostly through the four important variables, namely, plant crop cane yield (X_1), flexibility of the variety to enable the farmer to grow the variety under varying conditions (X_{38}), priority given in issuing cutting orders for factory supply (X_{51}) and performance of the variety in fellow farmers' fields (X_{58}).

These results made us to reject our hypothesis that 'positive and negative factors will have the same levels of direct and indirect influence on the extent of adoption of the variety'.

The direct effect and the respective indirect effect of the six groups of variables included in the analysis and the inferences drawn are discussed here.

4.5.3.1. Difference in yield

Direct effects of the variables taken for path analysis under this major factor along with the largest indirect effect

of these variables on the dependent variable through other independent variables are presented in Fig. 4.7.

Plant crop cane yield was found to have the maximum direct effect followed by plant crop jaggery yield. Ratoon crop cane yield and ratoon crop jaggery yield were also found to have substantial direct effect. Indirect effect of four of these nine variables were routed through the flexibility of the variety.

Economic advantages in terms of additional yield of cane/jaggery played a major role in deciding the extent of adoption of Co 671 sugarcane variety. As the payment by sugar factories was done on weight basis, farmers were highly interested in harvesting maximum cane yield per unit area. For jaggary farmers also, if they were able to maintain an average quality of jaggery in terms of texture and colour (for which, sometimes they took corrective measures while preparing jaggery by using suitable amending materials), their profitability was directly proportional to the additional quantity of jaggery obtained from an unit area. Taking these factors into consideration, sugarcane breeders in this country are keeping the objective of 'breeding for higher yields' as the most important task in their breeding programmes. 'High yields' was reported to be an important positive factor influencing the acceptance of new crop varieties by Oppenfeld and Florentino (1962), Vidyarthi (1967), Thyagarajan (1979), Subramani (1982) and Rajathurai (1983).

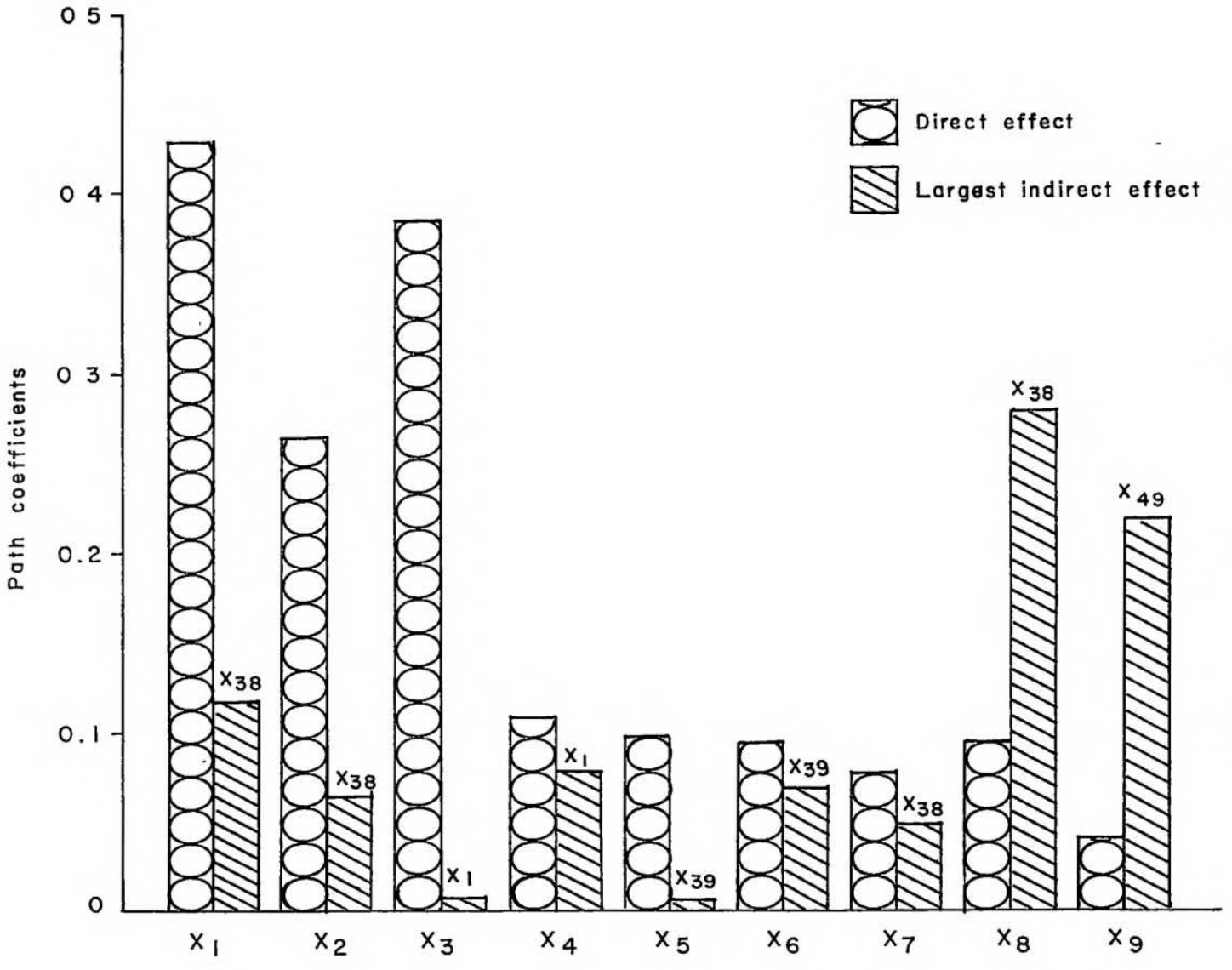

Fig.4.7. Path analysis of extent of adoption with difference in yield variables

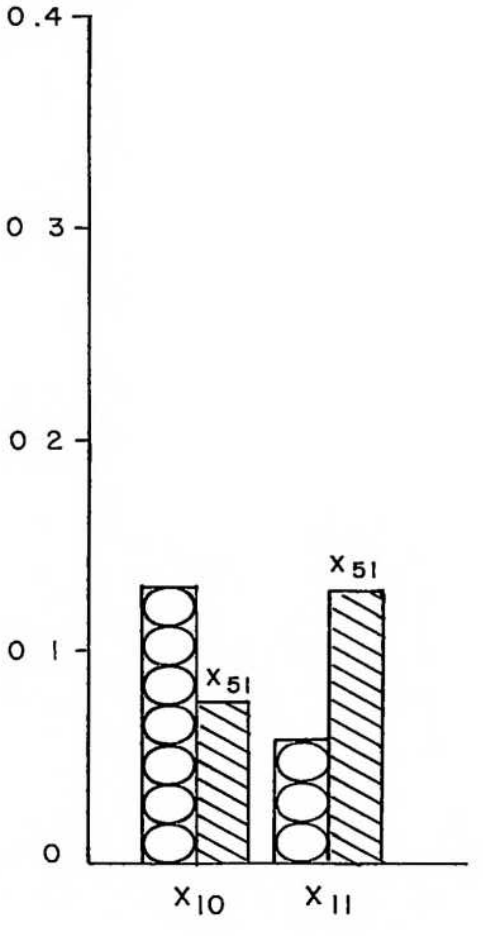

Fig 4.8. Path analysis of extent of adoption with difference in duration variables

Farmers were cultivating sugarcane in varying conditions in terms of type of soil, date of planting, date of harvest, quality and quantity of water availability and different types of management practices. These factors varied from farmer to farmer and many a times within a farmer's holding itself depending upon the circumstances under which one has to grow his sugarcane crop. Hence the farmers preferred to grow varieties with high flexibility which could come up well in varying conditions. It was also observed that a number of respondents were using their cane to meet both the purposes of supplying to sugar factories as well as preparing jaggery depending upon the market situation, for which purpose, they registered only part of their cane area for supply to the factory. Such farmers preferred sugarcane varieties which could give better cane yield as well as better jaggery yield. Thus flexibility of a variety played an important role in the acceptance of a new sugarcane variety. This finding is in line with the conclusion drawn by Ashby (1982).

4.5.3.2. Difference in duration

Direct effects of the variables taken for path analysis under this major factor along with the largest indirect effect of these variables on the dependent variable through other independent variables are given in Fig. 4.8.

It could be noted that though the plant crop duration had somewhat good direct effect, the ratoon crop duration did

not have much direct effect. Indirect effects of these two variables were routed through the variable 'priority given in issuing cutting orders for factory supply'.

If one analyses the expenditure pattern of sugarcane crop cultivation, more than 80 per cent of the amount was found to be spent within 3-4 months of planting/ratooning the crop. Having invested large amount in cane cultivation, it is quite natural that the farmers expect a normal return from the crop. The CoC 671 sugarcane variety, though comes to maturity in 9-10 months, gives better yield when harvested in 11-12 months. Hence the farmers were not much interested in utilising the 'early maturing' character of the variety.

As CoC 671 sugarcane variety flowered heavily in the month of November, the crop needs to be harvested within 75 days of flowering to avoid any loss in yield or quality. Moreover, for a number of adopters, availability of irrigation water was just sufficient to maintain the young sugarcane crop which was recently planted/ratooned. These two factors forced a number of respondents to eagerly wait for the cutting orders for factory supply. On the other hand, sugar factory was also interested in issuing cutting orders to CoC 671 sugarcane variety in the early part of the crushing season (December-January) as this variety would give better sugar recovery when compared to Co 6304. Thus it was found to be beneficial to both the farmers as well as the sugar factory to harvest CoC 671 crop at an early date. This factor on 'priority given in issuing cutting orders for factory supply'

acted as an important indirect independent variable not only for the variables on plant/ratoon crop duration but also to a number of other independent variables.

4.5.3.3. Plant characters

Direct effects of the variables taken for path analysis under the major factor 'plant characters' along with the largest indirect effect of these variables on the dependent variable through other independent variables are presented in Fig. 4.9.

It could be seen that none of these variables had considerable direct effect on the extent of adoption. Indirect effect of all these four variables were routed through the plant crop cane yield.

Sugarcane Breeding Institute as well as the State Sugarcane Research Stations have rigorous testing procedure by which genotypes with extremely adverse plant characters are rejected. In addition to this, suitable crop management practices are available to overcome the ill-effects of limited quantities of drawbacks so far as a number of plant characters are concerned. Hence it is not surprising to note the lower levels of direct effects of these plant character variables.

4.5.3.4. Innovation attributes

Direct effects of the variables taken for path analysis under this major factor along with the largest

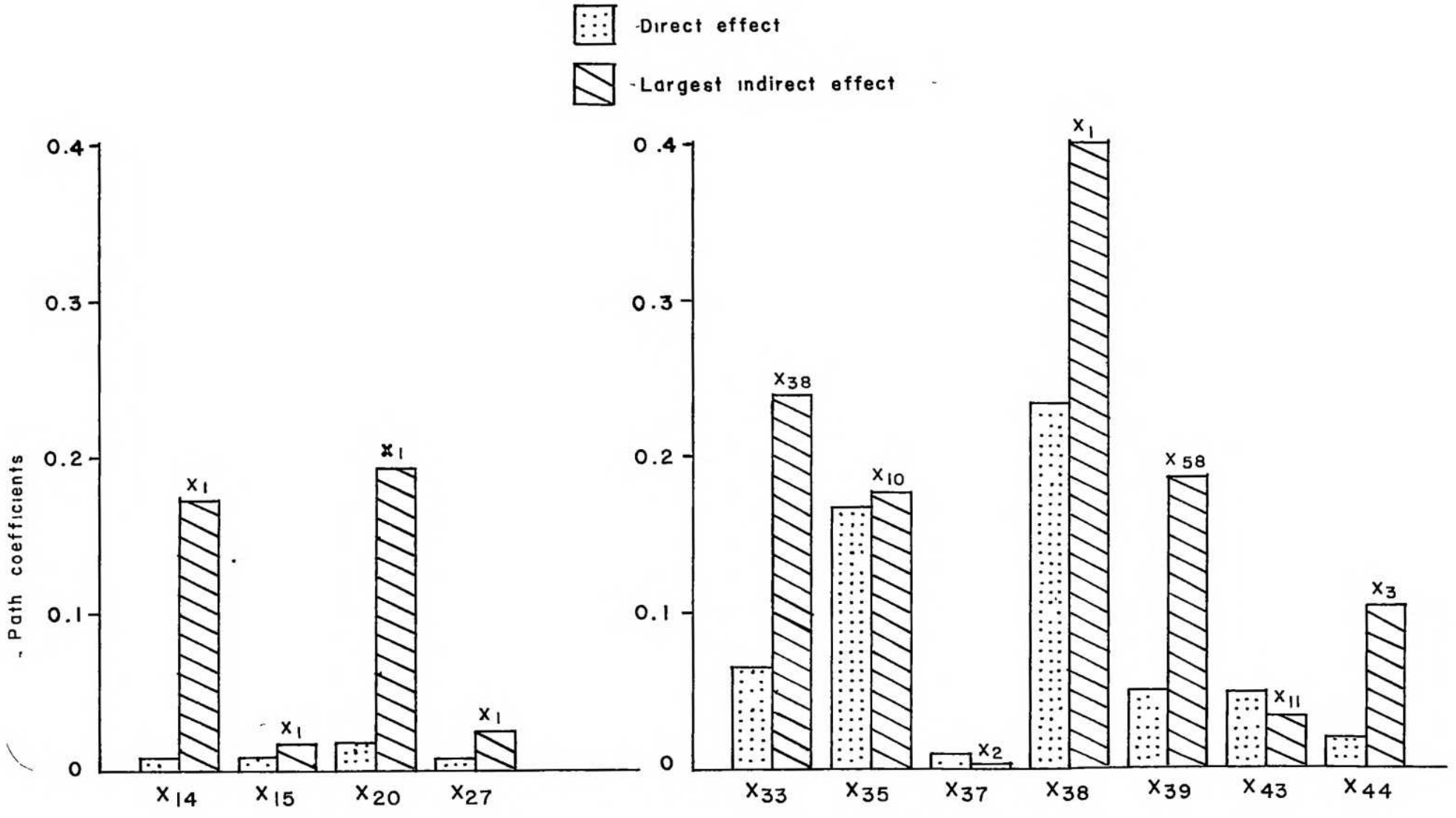

Fig. 4 9 Path analysis of extent of adoption with plant characters

Fig. 4.10 Path analysis of extent of adoption with innovation attributes

indirect effect of these variables on the dependent variable through other independent variables are presented in Fig. 4.10.

It is to be noted that only two variables, namely, flexibility of the variety to enable the farmer to grow the variety under varying conditions and the managerial ability required to provide irrigation as per the requirements of the variety exhibited substantial direct effects. The plant crop cane yield, flexibility of the variety to enable the farmer to grow the variety under varying conditions, performance of the variety in fellow farmers' fields, plant crop duration and plant crop jaggery yield showed substantial indirect effects for different independent variables.

4.5.3.5. Extension system's promotional efforts

Direct effects of the variables taken for path analysis under this major factor along with the largest indirect effect of these variables on the dependent variable through other independent variables are depicted in Fig.4.11.

It may be seen from the figure that 'priority given in issuing cutting orders for factory supply' was having the maximum direct effect on the dependent variable. Degree to which the field level extension worker has faith on the performance of the variety also has shown substantial direct effect. Priority given in issuing cutting orders for factory supply and persuasion given by the extension personnel

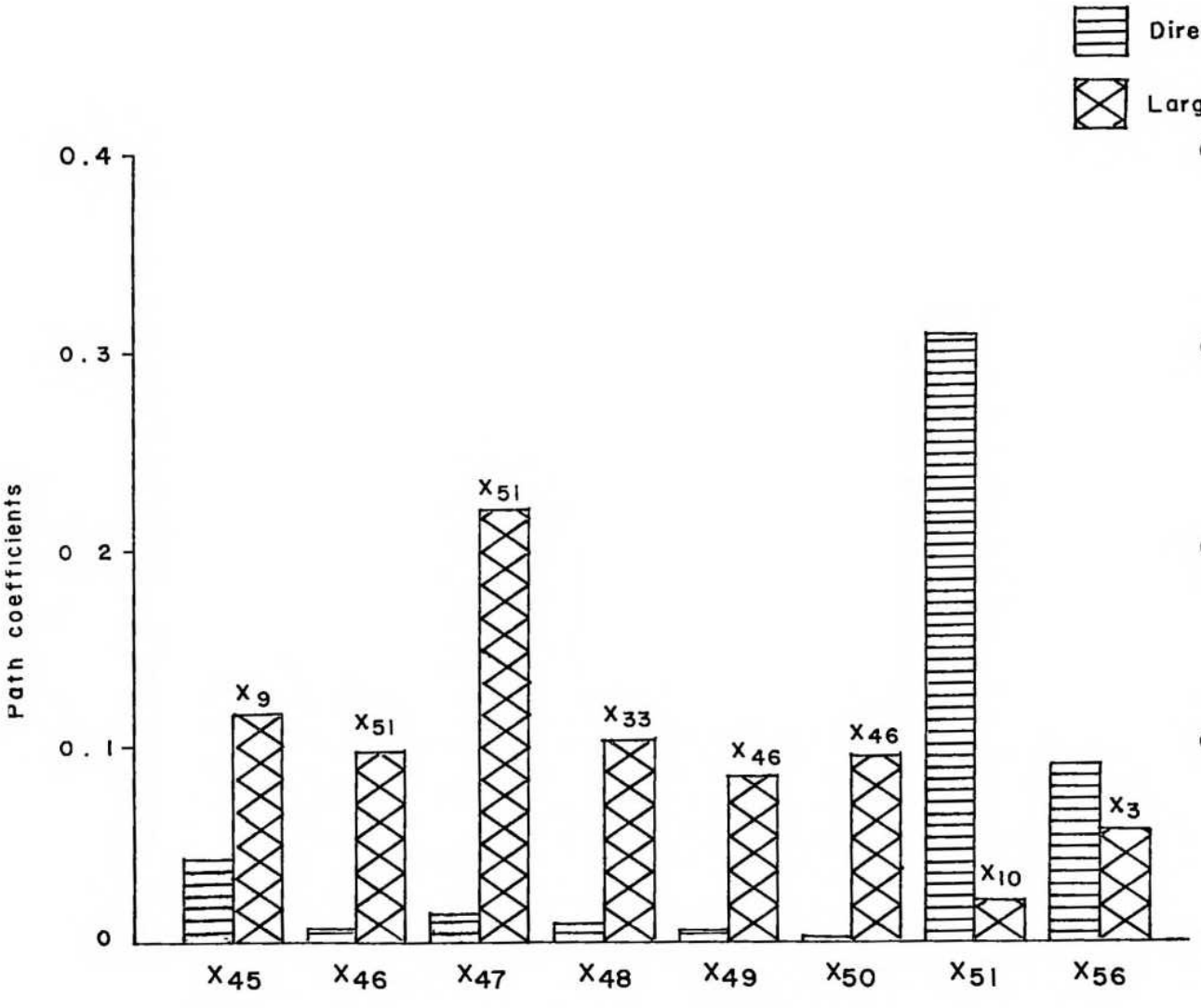

Fig 4.11. Path analysis of extent of adoption with extension system's promotional efforts

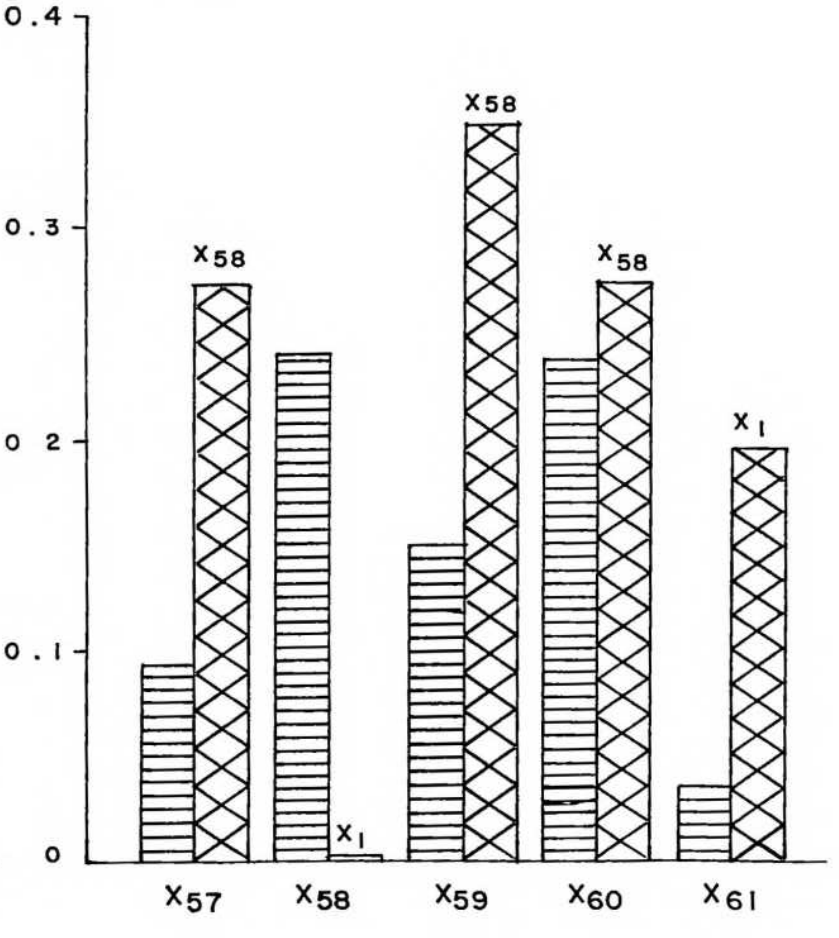

Fig.4.12. Path analysis of extent of adoption with social factors

for growing the variety have shown substantial indirect effect for four of the eight independent variables.

While introducing new sugarcane varieties, research and extension personnel should ensure that the field level extension personnel have faith on the performance of the variety. This will enable the field level extension personnel to spread the message on the new varieties with confidence. For this purpose, proper human resource development programmes for extension personnel should be planned and implemented with due priority. Such a favourable confidence will further lead to an effective persuasion of the farmers for growing the new sugarcane variety.

4.5.3.6. Social factors

Direct effects of the variables taken for path analysis under this major factor along with the largest indirect effect of these variables on the dependent variable through other independent variables are presented in Fig. 4.12.

It could be seen from the figure that the variable 'performance of the variety in fellow farmers' fields' followed by 'opinion of family members about the performance of the variety' and 'opinion of fellow farmers about the performance of the variety' had substantial direct effect on the dependent variable. 'Performance of the variety in fellow farmers' fields' and 'plant crop cane yield' were the variables which have shown substantial indirect effect for the different independent variables.

Extension personnel while introducing a new sugarcane variety in their area should follow it up carefully by frequent field visits and provide timely guidance on the package of practices recommended for the variety to ensure that the variety fully exhibits its production potential. Indiscriminate introduction of the varieties in unsuitable soil or other unfavourable environmental conditions should be avoided.

The fact that opinion of family members about the performance of the variety has a high direct effect on the extent of adoption should draw the attention of the extension personnel and social scientists. This shows the positive role played by the family members in the decision making process on agricultural innovations which was hitherto believed to be the monopoly of the head of family alone. Such a type of emerging trend in decision-making pattern of rural families should be used by the extension system to its advantage by organising training and other educational programmes for the family members. Messages on the better performance of newly introduced sugarcane varieties in a locality should be properly communicated to other fellow farmers and their family members so that a favourable opinion is developed towards the new variety. The finding is in agreement with the conclusion drawn in this respect by Henderson and Gomes (1982).

4.5.4. Stepwise regression analysis

While testing the hypotheses further, more in-depth

analysis of the data was done by employing stepwise regression analysis, which ranks the variables in the order of their explanatory power. It provides for the manipulation of variables in a way to reveal the amount of total variation in the dependent variable explained by the combination of selected independent variables at any step of analysis. This helps to improve the knowledge of relationship between the selected variables. Forward (stepwise) regression analysis was done to identify the different factors influencing the extent of adoption of Co 671 sugarcane variety. Multiple regression analysis was carried out stepwise, until R^2 values showed improvement by the addition of variables. The results of the stepwise regression analysis is presented in Table 4.14.

The combination of eight variables with R^2 value of 0.5527 was taken as the best one. The multiple regression equation obtained is given here.

$$Y = 1.5341 + 0.6474^{**} X_2 + 0.7177^{**} X_{58} + 0.4216 X_{35}$$
$$(0.2274) \qquad (0.1645) \qquad (0.3642)$$
$$+ 0.2136^{*} X_{38} + 0.5277^{*} X_{51} + 0.1174 X_{45}$$
$$(0.1071) \qquad (0.2459) \qquad (0.1073)$$
$$+ 0.3566 X_9 + 0.1463 X_{60}$$
$$(0.7061) \qquad (0.1201)$$

$R^2 = 0.5527$

Note: Figures in parenthesis indicate standard error

TABLE 4.14. RESULTS OF STEPWISE REGRESSION ANALYSIS

No.	Independent variables included in the analysis	R^2 value
1.	x_2, x_{58}	0.2706
2.	x_2, x_{58}, x_{15}	0.3957
3.	x_2, x_{58}, x_{35}, x_{18}	0.4432
4.	x_2, x_{58}, x_{35}, x_{38}, x_{51}	0.4973
5.	x_2, x_{58}, x_{35}, x_{38}, x_{51}, x_{45}	0.5109
6.	x_2, x_{58}, x_{35}, x_{38}, x_{51}, x_{45}, x_3	0.5465
7.	x_2, x_{58}, x_{35}, x_{38}, x_{51}, x_{45}, x_3, x_{60}	0.5527

The analysis of variance worked out to test the significance of the functional equation revealed that it is highly significant at one per cent level of probability.

The coefficient of multiple determination (R^2) was found to be 0.5527 which implies that 55.27 per cent of variation in the extent of adoption was explained by the variables included in the equation. The variables 'return over cane yield', 'performance of the variety in fellow farmers' fields', 'flexibility of the variety to enable the farmer to grow the variety under varying conditions' and 'priority given in issuing cutting orders for factory supply' were significant.

It may also be inferred that ceteri paribus, an unit increase in the 'ratoon crop cane yield' will cause 0.5474 unit increase in the extent of adoption. Similarly, one unit increase in 'performance of the variety in fellow farmers' fields' will cause an increase in the extent of adoption by 0.7177 unit. While an increase in the 'flexibility of the variety to enable the farmer to grow the variety under varying conditions' by one unit will cause 0.2736 unit increase in the extent of adoption, one unit increase in the 'priority given in issuing cutting orders for factory supply' will result in an increase in the extent of adoption by 0.5237 unit.

Thus, it may be concluded that 'ratoon crop cane yield', 'performance of the variety in fellow farmers' fields', 'flexibility of the variety to enable the farmer to grow the variety under varying conditions' and 'priority given in issuing cutting orders for factory supply' were the most important factors influencing the extent of adoption. These results are in agreement with those obtained in path analysis.

4.6. Threshold typology and its characteristics

4.6.1. Threshold typology

A threshold typology is a scheme for the classification of adopters and non-adopters into mutually exclusive and exhaustive groups, based on characteristics of the threshold distribution. In the present study, a threshold

typology has been evolved and the relative merits and demerits of the threshold typology is compared to those of the dominant Rogers (1983) typology of adopters.

The creation of a typology, however is not an end in itself. The purpose of a typology is to facilitate the theoretical and empirical exploration of the phenomenon under investigation, the diffusion of innovations in the present study. A typology permits the grouping of large number of individuals, according to objective criteria, so that characteristics of the 'type' can be systematically explored.

In the present study, mean and standard deviation were used to classify the adopters into three categories based on the threshold distribution. Mean value of the threshold score was found to be 8.0902 and the standard deviation was 3.5479. Adopters, whose threshold score lie within the mean ± standard deviation (4.7403 to 11.4361) were defined as middle threshold adopters. This group comprised of 75 respondents.

Adopters with a threshold score less than 4.7403 were defined as low threshold adopters (13 respondents) and adopters with a threshold score greater than 11.4361 formed the high threshold adopters (12 respondents). Non-adopters were dumped arbitrarily into one threshold category, and that category could be treated, for analytic purposes, as the threshold laggards category (as done by Dasler, 1979).

In Rogers (1983), a different scheme of categorising adopters was followed. That formulation is based on the distribution of adopters as a function of time. He utilised the standard deviation of the normal distribution as his criterion of classification. In this method of categorisation, the typology is neither symmetrical nor exhaustive when adoption levels are less than 100 per cent. This formulation is the most widely used typology in diffusion research.

An additional advantage of the present threshold method of classification is that it permits the handling of non-adopters within the common innovation-decision framework. While the classification of non-adopters into one category is clearly arbitrary, the procedure does permit the application of the classification scheme to situations where the level of adoption is significantly less than complete.

4.6.2. Characteristics of threshold categories

Mean values of the characteristics of the different threshold categories are given in Table 4.15. Kolmogorov-Smirnov two-sample tests were carried out for analysing the significance of the differences between different pairs of threshold categories with reference to the various characteristics studied and the results are presented in Fig. 4.13.

The differences in threshold score of the four groups of respondents were found to be significant. It is obvious

TABLE 4. 15. CHARACTERISTICS OF THRESHOLD CATEGORIES

S.No.	Characteristics	Low threshold adopters	Middle threshold adopters	High threshold adopters	Threshold laggards
1.	Threshold score	3.6993	7.9365	14.8345	19.0541
2.	Positive perception score	31.9648	28.5656	23.1295	12.2128
3.	Age	36.2308	37.1471	42.5797	43.5312
4.	Educational status	1.7077	1.5333	1.3077	0.9238
5.	Occupation	4.5385	4.6534	5.0000	4.9842
6.	Farming experience	5.4615	4.7334	4.4999	4.6271
7.	Experience in sugarcane cultivation	3.1615	4.6134	4.3333	3.9518
8.	Soil type	3.9231	3.9200	3.8333	2.5400
9.	Source of irrigation	2.0769	2.0333	2.1250	2.9531
10.	Water availability during summer	1.0000	1.0133	1.0000	1.3373
11.	Type of disposal of sugarcane	2.6154	2.8533	1.9250	2.6371
12.	Time of planting	2.8462	2.2600	2.0500	1.4546
13.	Mass media utilisation	17.3846	13.5601	12.9167	10.8172
14.	Social participation	1.8462	1.9866	2.0833	1.8427
15.	Contact with extension agency	12.3077	10.5734	10.4833	7.9341
16.	Credit behaviour	1.0769	0.7467	1.1666	0.9612
17.	Extent of adoption	3.4736	2.6057	2.0653	0.0000

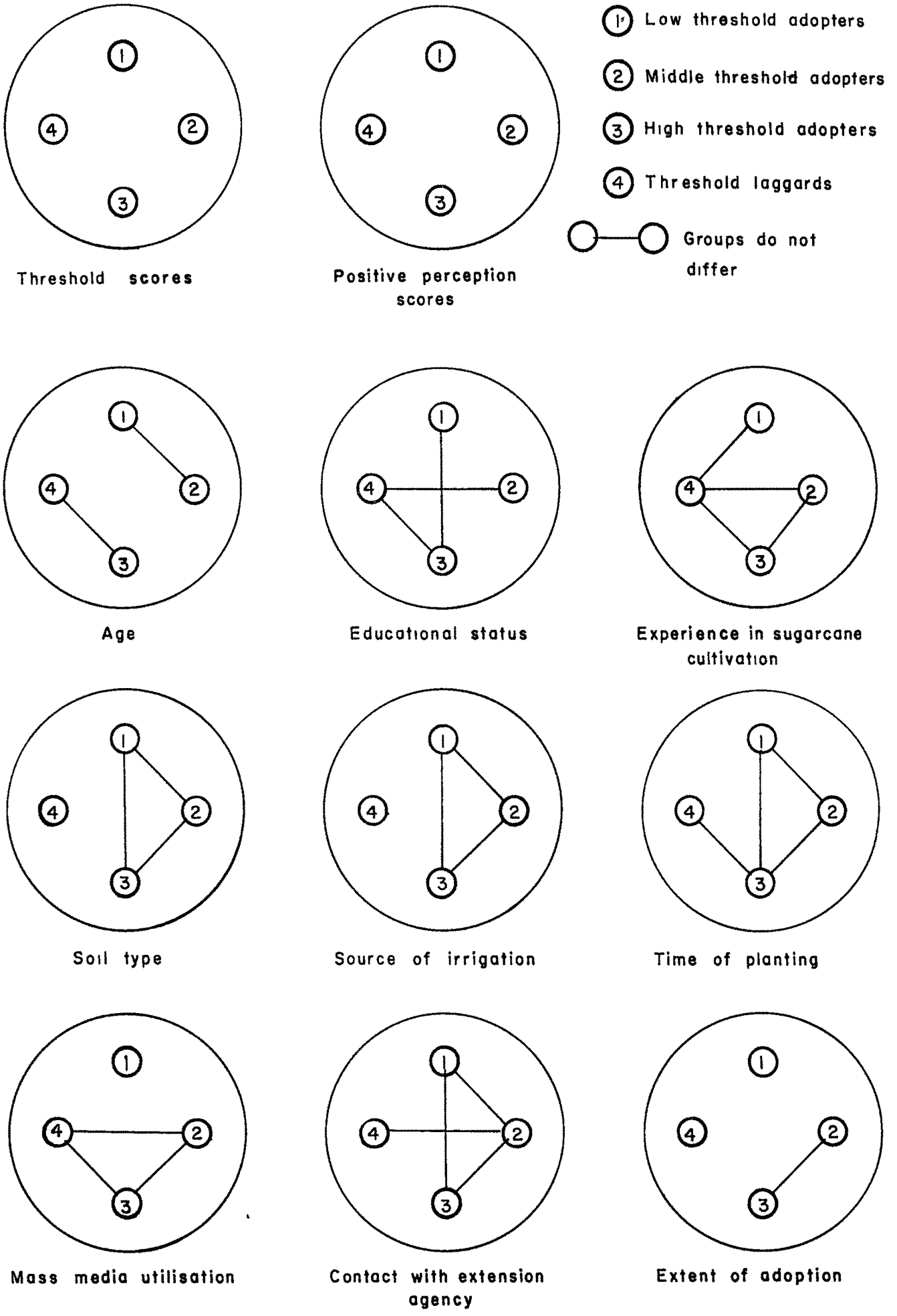

Fig.4.13 Differences in characteristics of threshold categories

to expect that the mean threshold score increased from low threshold adopters to threshold laggards. The earlier discussions have shown that there is significant negative correlation between positive perception score and threshold score. As a result of this, it can be logically expected that positive perception score should decrease from low threshold adopters to threshold laggards and the differences between the four categories were significant.

The differences between the extent of adoption level of the different threshold categories of respondents (except for medium and high threshold adopters) were also found to be significant. It was observed that as the threshold score increased, extent of adoption score decreased implying that the low threshold adopters were comparable to innovators and early adopters.

Age level of the low threshold adopters as compared to high threshold adopters and threshold laggards as well as medium threshold adopters to high threshold adopters and threshold laggards were found to be significantly different. It was found that as the age level increased, level of threshold score also increased. This finding was in contrast to the generalisation made by Rogers (1983) that earlier adopters are not different from later adopters in age. However, he continued that there is inconsistent evidence about the age and innovativeness: about half of the 228 studies on this subject show no relationship whereas 19 per cent show

that earlier adopters are younger and 33 per cent indicated they are older. In the present study, because of their higher level of education, extension agency contact and mass media utilisation, younger farmers were having low threshold score regarding the new sugarcane variety.

Educational status of low threshold adopters was found to be significantly different from that of medium threshold adopters and threshold laggards. Medium threshold adopters were different from high threshold adopters with reference to educational status. It was observed that as the educational status decreased threshold level increased. It has been an established fact that education brings more clarity in thinking and analysis of the situation. Adopters with higher educational level perceived the innovation in its proper perspective and hence have low threshold scores. The fact that the earlier adopters also had higher education was reported by Wilkening (1953), Gupta (1963), Rogers (1961), Chand and Gupta (1966), Rajendra (1968) and Rogers with Shoemaker (1971).

Low threshold adopters were found to be different from medium and high threshold adopters with reference to their experience in sugarcane cultivation. The significance of the difference was due to the fact that the low threshold category consisted of higher proportion of respondents with lower level of experience in sugarcane cultivation. This low level of sugarcane cultivation experience might have compelled these farmers to approach the extension personnel more frequently for guidance. This in turn might have brought down their threshold score level.

Soil type of holdings belonging to threshold laggards was significantly different from that of other three groups. Threshold laggards possessed lands with more of red loam soils which result in lower yields from CoC 671 sugarcane variety in the study area as compared to the crop grown in black clay soils. This would have probably prevented them from adopting the new variety.

Similarly, source of irrigation of threshold laggards was significantly different from that of other groups. Many of the farmers belonging to threshold laggards category reported canals and tanks as their main source of irrigation. The plentiful availability of water either through canals and tanks or from wells whose ground water potential is recharged year after year by these canals and tanks enabled these farmers to cultivate mid-late maturing varieties like Co 6304. Reduction in duration, earliness in issuing cutting orders for factory supply and other positive factors of the new variety might not have exerted much attraction on this category of farmers.

Threshold laggards had significantly different scores for time of planting from that of low and middle threshold adopters. It was observed that many of the threshold laggards were planting their sugarcane crop during April-May. CoC 671 sugarcane variety is to be planted earlier in the planting season (December-January) to harvest a better yield. Planting the variety in April-May would reduce the period available for vegetative growth as the variety would come to flowering in

November, resulting in poor yields. A few of the farmers in the study area, who have planted the variety in April-May harvested very poor yields. This in turn resulted in high threshold score for threshold laggards.

Significant differences were observed between low threshold adopters and the other three categories of respondents in their degree of utilisation of mass media sources of information. The most common mass media used in the villages under study were radio, newspaper, magazines and films. These sources were well utilised by many of the low threshold adopters especially the younger farmers whose educational status was comparatively higher. This might be the reason for the differences between the mass media utilisation score of these threshold categories. This conclusion goes in line with the findings of Rogers and Svenning (1969), Jetley (1977), Balasubramanian (1980) and Rogers (1983).

A decline in contact with extension agency was observed amongst the different threshold categories as one moves from low threshold adopters category to threshold laggards category. Low threshold adopters and high threshold adopters had significantly different levels of extension agency contact as compared to threshold laggards.

The negative relationship of extension agency contact with threshold score revealed that those who had greater contact with extension personnel adopted the new sugarcane variety at lower threshold level. In their frequent contacts

with extension personnel, the latter would have explained in detail about the merits of the new sugarcane variety which in turn might have reduced the threshold score of low threshold adopters. The finding is in agreement with the findings of Rogers (1961), Deb and Sharma (1969), Rogers with Shoemaker (1971), Jetley (1977), Balasubramanian (1980) and Rogers (1983).

These results led us to reject our hypothesis that "the threshold categories will not differ in their bio-socio-agro-economic characters".

4.7. Relationship between threshold categories and stages in innovation-decision process

4.7.1. Stages in innovation-decision process of threshold categories

Rogers (1983) defined innovation-decision process as a process through which an individual passes from first knowledge of an innovation, to forming an attitude toward the innovation, to a decision to adopt or reject, to implementation of the new idea and to confirmation of this decision. This process consists of a series of actions and choices over time through which an individual evaluates a new idea and decides whether or not to incorporate the new idea into ongoing practice. This behaviour consists essentially of dealing with the uncertainty that is inherently involved in deciding about a new alternative. The purpose of this section is to discuss how far the model on stages in innovation-decision process evolved in the preliminary project (4.1.2) is applicable to the 100 adopters

included in the major project, the differences in stages in innovation-decision process undergone by different threshold categories, their innovation-decision period and the sources of information at different stages of the process.

The stages passed by the different threshold categories is presented in Table 4.16. and Figure 4.14.

TABLE 4.16. STAGES PASSED BY THRESHOLD CATEGORIES IN INNOVATION - DECISION PROCESS

S.No.	Stage	Low threshold adopters		Middle threshold adopters		High threshold adopters	
		Frequency (n=13)	Percentage	Frequency (n=75)	Percentage	Frequency (n=12)	Percentage
1.	Availability	13	100.00	69	92.00	8	66.67
2.	Information	13	100.00	75	100.00	12	100.00
3.	Decision	13	100.00	73	97.33	10	83.33
4.	Adoption	13	100.00	75	100.00	12	100.00
5.	Integration	8	61.54	48	64.00	4	33.33
6.	Exploration	13	100.00	75	100.00	12	100.00
7.	Evaluation	13	100.00	75	100.00	12	100.00
8.	Rejection	4	30.77	46	61.33	7	58.33
9.	Reinforcement	13	100.00	62	82.67	12	100.00

In general, it was observed that the model evolved in the preliminary project was found to be applicable to most of the respondents grouped in different threshold categories.

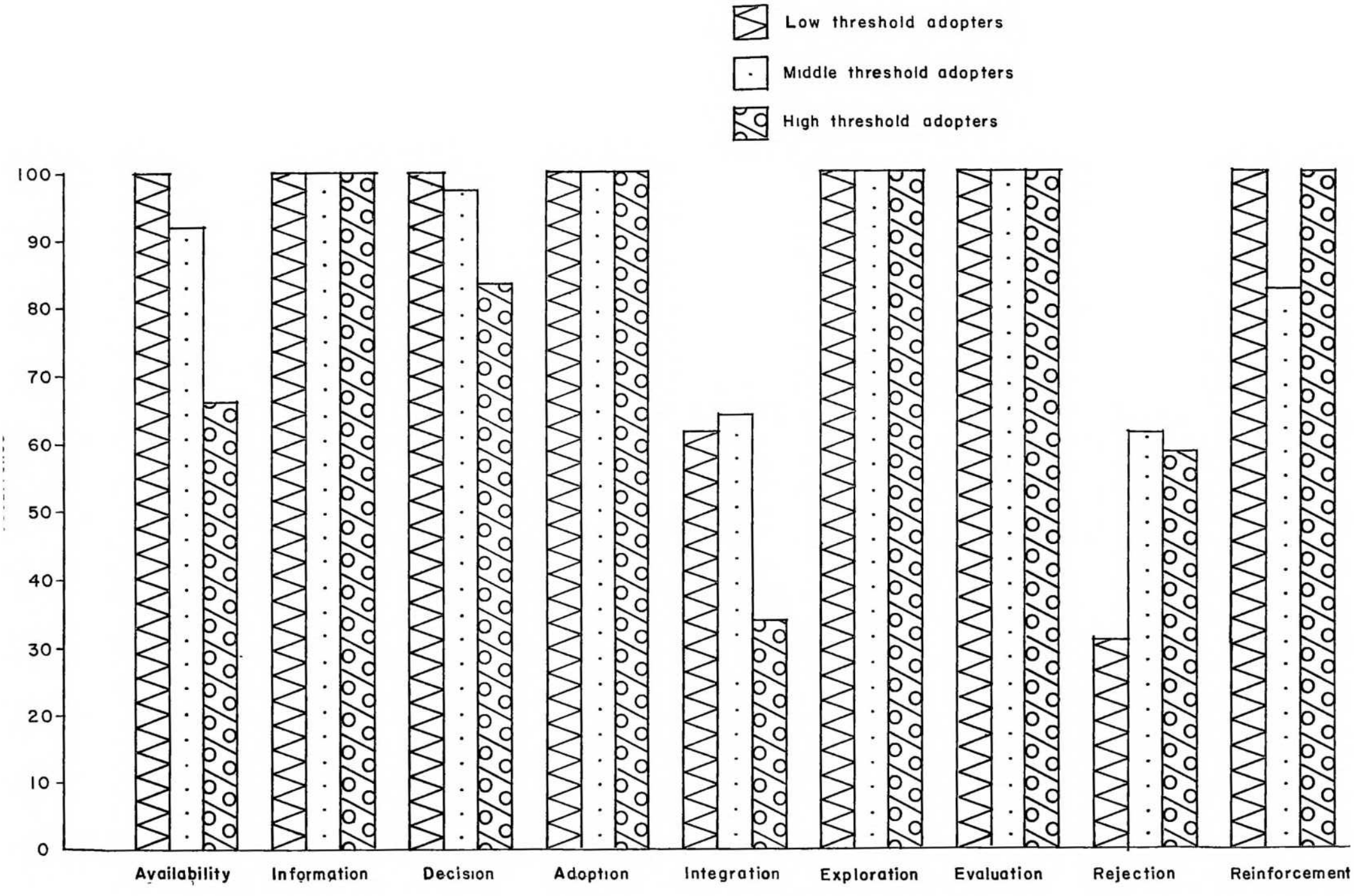

Fig. 4.14 Stages in innovation-decision process of threshold categories

While the information, adoption, exploration and evaluation stages occurred in all the cases of the three categories, differences were observed with reference to the occurrence of other stages.

While all the adopters in low threshold category expressed that they have undergone the availability stage in the beginning itself along with the information stage, 92 per cent of middle threshold adopters and 66.67 per cent of high threshold adopters also expressed the same view. The remaining respondents expressed the availability of hardware aspect of the innovation, the sugarcane setts, with reference to proximity and/or purchasing capacity occurred only at a later stage, mostly just before adoption, thus creating a lot of uncertainty.

About 2.67 per cent of middle threshold adopters and 16.67 per cent of high threshold adopters expressed that they were forced by circumstances to adopt the variety. They felt that this enabled them to harvest the cane along with the neighbouring adopters so that transport of the harvested cane to factory might not pose a problem at a later date. As this might not be taken as a typical optional decision, this was not included in the innovation-decision process.

It is interesting to note that rejection stage occurred in all the three categories of respondents. While 30.77 per cent of the low threshold adopters expressed that they had crossed rejection stage at some phase in their innovation-

decision process, it was 61.33 per cent and 58.33 per cent in the case of middle and high threshold adopters respectively.

In this study, continued adoption - the decision to continue the adoption of CoC 671 sugarcane variety permanently as far as practicable - was taken as integration. While 61.54 per cent of low threshold adopters expressed that they have reached this stage, 64 per cent of middle threshold adopters and 33.33 per cent of high threshold adopters have reached this stage. Other respondents were seemed to be not fully satisfied with the performance of this variety and may like to shift to some other variety, if available.

These results made us to reject our hypothesis that 'there will be no difference between the different threshold categories regarding the stages passed in innovation-decision process'.

4.7.2. Innovation-decision period of threshold categories

The innovation-decision period is the length of time required to pass through the innovation-decision process. The length of innovation-decision period is usually measured from first knowledge till decision to adopt (or reject), although in a strict sense it should perhaps be measured to the time of confirmation. This latter procedure is often impractical or impossible because the confirmation function may continue over an indefinite period (Rogers, 1983). The innovation-decision period is thus a gestation period during which a new idea

ferments in an individual's mind. Details on innovation-decision period of the three threshold categories, their frequency distribution and mean period are given in Table 4.17.

It may be seen from the table that higher percentage of low threshold adopters were having comparatively lower lengths of innovation-decision period. On the other hand, more number of middle and high threshold adopters had higher length of innovation-decision period. The overall mean length of innovation-decision period was the lowest (12.92 months) for low threshold adopters and the highest (19.75 months) for high threshold adopters, while the middle threshold adopters took 17.24 months. Thus, the hypothesis that 'innovation-decision period of different threshold categories will remain the same' was rejected.

Low threshold adopters might have more favourable attitude towards the new sugarcane variety and hence less resistance to change must be overcome by communication messages about the new sugarcane variety. They might also have shorter innovation-decision period because (1) they might use more technically accurate sources of information about innovation and (2) they might place higher credibility in these sources than the other respondents.

4.7.3. Sources of information for threshold categories at different stages

Sources of information utilised at different stages of innovation-decision process by the three threshold categories

TABLE 4.17. INNOVATION-DECISION PERIOD OF THRESHOLD CATEGORIES

Threshold category	Innovation-decision period (in months)										Overall mean
	1-10		11-20		21-30		31-40		41-50		
	Mean period	% of respondents	Mean period	% of respondents	Mean period	% of respondents	Mean period	% of respondents	Mean period	% of respondents	
Low threshold adopters (n=13)	2.57	53.84	16.33	23.08	24.67	23.08	--	--	--	--	12.92
Middle threshold adopters (n=75)	4.67	28.00	13.65	30.67	23.04	21.33	30.09	14.67	42.50	5.33	17.24
High threshold adopters (n=12)	3.55	25.00	16.50	16.67	26.00	16.67	32.00	25.00	44.00	16.67	19.75

of respondents are presented in Table 4.18.

The percentage analysis revealed that Cane Assistants and Assistant Cane Officers employed by the sugar factory for cane development activities formed an important source of information at different stages of innovation-decision process to low threshold adopters. However, the percentage of utilization of this source was comparatively lower in the case of middle threshold adopters and the lowest for high threshold adopters.

Fellow farmers played an important role from availability stage to adoption stage especially in the case of high threshold adopters.

Radio and research station scientists were found to be moderately important sources of information at the information stage for low threshold adopters. These two sources were not properly utilised by middle and high threshold adopters.

Assistant Agricultural Officers employed by the State Department of Agriculture were quoted as important sources of information by low threshold adopters at information stage. It was a less important source for middle threshold adopters. High threshold adopters did not use this source at all. However, the level of utilisation of this source of information at different stages of innovation-decision process was unexpectedly very low for different threshold categories. The low level of utilisation of this source might be due to the multiplicity of crops to be taken care of by these village level extension

TABLE 4.18. SOURCES OF INFORMATION UTILISED AT DIFFERENT STAGES BY THE THRESHOLD CATEGORIES
(Percentage of respondents reported)

Stage	Sources of information	Low threshold adopters	Middle threshold adopters	High threshold adopters
Availability	Assistant Cane Officer	61.54	34.67	16.67
	Cane Assistant	76.92	62.67	41.67
	Circular letter	69.23	72.00	25.00
	Fellow farmer	15.38	58.67	91.67
Information	Research station scientist	38.46	5.33	--
	Assistant Cane Officer	69.23	30.67	8.33
	Cane Assistant	76.92	74.67	41.67
	Assistant Agricultural Officer	53.85	10.67	--
	Radio	46.15	10.67	8.33
	Fellow farmer	30.77	86.67	100.00
Decision	Assistant Cane Officer	15.38	4.00	8.33
	Cane Assistant	76.92	26.67	16.67
	Fellow farmer	30.77	56.00	83.33
Adoption	Assistant Cane Officer	15.38	4.00	8.33
	Cane Assistant	76.92	21.33	8.33
	Fellow farmer	15.38	85.33	100.00
Integration	Self experience	61.54	64.00	33.33
	Cane Assistant	30.77	2.67	--
	Fellow farmer	15.38	13.33	8.33

Note: Due to multiple choice answers, the sum of percentages may come to more than 100 at any specific stage

personnel. They, in turn, might have given a low priority for sugarcane development work as separate sugar factory personnel were available for this purpose.

Self experience has been the major source of information for all the respondents who have reached the integration stage. Cane Assistants and fellow farmers also helped in this aspect to a certain extent.

These results made us to reject the hypothesis that 'individuals belonging to different threshold categories will seek identical sources of information at different stages of innovation-decision process'.

The Vallakurichi Cooperative Sugar Mills Limited was highly interested in popularising the Co6 671 sugarcane variety in the study area so that the industry could improve its sugar recovery percentage level, especially at the early part of the crushing season (December-January). This would also enable the farmers to improve their income from sugarcane cultivation from an unit area per unit time. Therefore, the cane development personnel employed by the sugar factory were leaving no stone unturned in hastening the rate of adoption of this variety in Vallakurichi taluk. Consequently, the Assistant Cane Officers and Cane Assistants formed the most important sources of information in almost all the stages in innovation-decision process for majority of the respondents.

Summary and Conclusion

CHAPTER V

SUMMARY AND CONCLUSION

5.1. The problem

One reason why there is so much interest in the diffusion of innovations is because getting a new idea adopted, even when it has obvious advantages, is often very difficult. One needs to learn why, if hundred different innovations are conceived simultaneously, ten will spread while ninety will be forgotten. Innovation-decision on new recommended practices is influenced by the threshold level of the individual for that innovation and the positive and negative aspects of the innovation. This research project entitled, 'Threshold in innovation-decision on sugarcane varieties' is an attempt to analyse the threshold concept as applied to innovation-decision in agriculture. In this study, threshold is defined as the point from which an individual is pressurised to adopt an innovation. When the sum of the effects of positive factors of an innovation exceeds the sum of the effects of negative factors, the individual is assumed to have reached the threshold level and he is expected to adopt the innovation.

5.2. Objectives

The specific objectives of the study are as follows:

1. To develop a Sugarcane Variety Acceptability Index
2. To measure individual threshold levels of innovation-decision on sugarcane varieties

3. To compute a critical threshold level for a given social system

4. To identify positive and negative factors influencing innovation-decision

5. To evolve a threshold typology and study its characteristics

6. To analyse the relationship between threshold categories and stages in innovation-decision process.

5.3. Research methodology

To achieve the above objectives, the study was conducted by using the descriptive type of research design, applying ex-post-facto approach.

Two preliminary projects on (i) the farm practice-attributes influencing the innovation-decision on sugarcane varieties and (ii) the stages involved in innovation-decision process were undertaken as a preliminary step for further analysis of the problem under investigation.

A detailed questionnaire was prepared covering 202 aspects (grouped into six major factors) which might have an influence on the acceptability of a new sugarcane variety. Weightages for these aspects were arrived at based on the scores given by twenty Chief Cane Officers and senior Cane Development Officers from different parts of Tamil Nadu state

and twenty sugarcane growers and a 'Sugarcane Variety Acceptability Index' was developed.

The major project was conducted in South Arcot district of Tamil Nadu state. A multistage random sampling with probability proportion to size was followed to select 200 respondents (100 adopters and 100 non-adopters of CoC 671 sugarcane variety) for the study. The respondents were interviewed personally by the researcher with the help of a well structured interview schedule. Data were analysed by using appropriate statistical techniques.

5.4. The results

The results are briefly explicated in the form of an empirical model on threshold in innovation-decision on sugarcane varieties in Fig. 5.1. A summary of the results is presented here:

1. Among the nineteen innovation-attributes studied, managerial feasibility, use complexity, flexibility, content complexity, physical feasibility, labour efficiency and physical compatibility were the seven important attributes influencing innovation-decision on CoC 671 sugarcane variety.

2. Analysis of stages in innovation-decision process revealed that the stages, availability and information occurred simultaneously and concurrently followed by decision, adoption and integration. Exploration, evaluation, rejection and reinforcement were found to occur throughout the process.

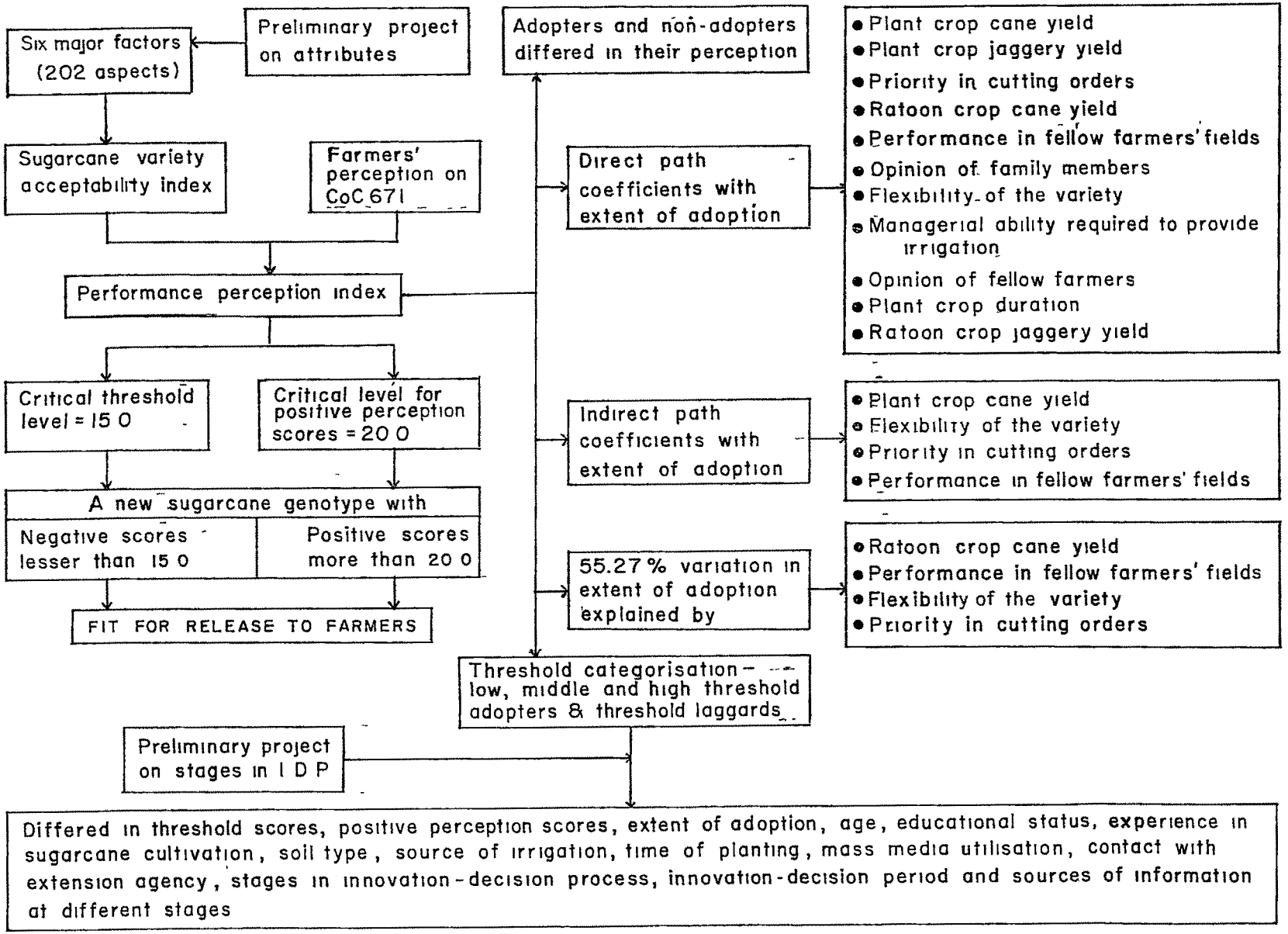

Fig 5 1 An empirical model on threshold in innovation-decision on sugarcane varieties

3. 'Sugarcane Variety Acceptability Index' developed in this study gives the relative importance of various factors influencing the acceptance or otherwise of a new sugarcane variety. It may be noted that various aspects included in the major factor 'difference in yield' formed the most important group of items in the index constituting 46.34 per cent of the total scores for positive aspects and 39.63 per cent for negative aspects.

4. Based on the perception of individual respondents on the performance of Co 671 sugarcane variety and the weightages as obtained from the Sugarcane Variety Acceptability Index, 'Performance Perception Index' for each respondent was worked out. It was observed that in the case of positive perception score, adoption occurred at 10-15 level and then the extent of adoption increased as the level of positive perception score increased. On the contrary, as the level of threshold score increased, the extent of adoption score decreased and at 20-25 level it reached the zero level.

5. Threshold score was negatively associated with extent of adoption while the positive perception score was positively associated with extent of adoption. It was also observed that ceteri paribus, an unit increase in the threshold score would cause 0.5665 unit decrease in the positive perception score.

6. For the given social system, critical threshold level for innovation-decision on a new sugarcane variety was found to be 15.0 and the critical level of positive perception score was 20.0.

7. The Mahalanobis' D^2 analysis revealed that the adopters and non-adopters of CoC 671 sugarcane variety had different perceptions on the performance of the variety. The top ten key factors which were involved in differentiating the adopters and non-adopters as identified through a discriminant function analysis were as follows: ratoon crop jaggery yield; ratoon crop cane yield; managerial ability required to provide irrigation as per the requirements of the variety; priority given in issuing cutting orders for factory supply; flexibility of the variety to enable the farmer to grow the variety under varying conditions; performance of the variety in fellow farmers' fields; opinion of fellow farmers about the performance of the variety; plant crop cane yield; plant crop jaggery yield and opinion of family members about the performance of the variety.

8. Only eleven variables yielded substantial direct path coefficients with the extent of adoption of CoC 671 sugarcane variety. These variables were plant crop cane yield; plant crop jaggery yield; priority given in issuing cutting orders for factory supply; ratoon crop cane yield; performance of the variety in fellow farmers' fields; opinion of family members about the performance of the variety;

flexibility of the variety to enable the farmer to grow the variety under varying conditions; managerial ability required to provide irrigation as per the requirements of the variety; opinion of fellow farmers about the performance of the variety; plant crop duration and ratoon cane jaggery yield.

9. Indirect effects of the independent variables were routed mostly through four important variables, namely, plant crop cane yield; flexibility of the variety to enable the farmer to grow the variety under varying conditions; priority given in issuing cutting orders for factory supply and performance of the variety in fellow farmers' fields.

10. The stepwise regression analysis revealed that only four variables, namely, ratoon crop cane yield; performance of the variety in fellow farmers' fields; flexibility of the variety to enable the farmers to grow the variety under varying conditions and priority given in issuing cutting orders for factory supply were the most important factors influencing the extent of adoption. These variables explained 55.27 per cent of variation in the extent of adoption.

11. Mean and standard deviation were used to classify the adopters into three categories based on the threshold distribution. Adopters whose threshold score came within the mean $\pm$ standard deviation (4.7405 to 11.8361) were defined as middle threshold adopters. This group comprised of 75 respondents. Adopters with a threshold score of less

than 4.7403 were defined as low threshold adopters (13 respondents) and adopters with a threshold score of more than 11.8361 formed the high threshold adopters (12 respondents). Non-adopters (100 respondents) were grouped into one threshold category and that category was treated for analytic purposes as the threshold laggards category.

12. Significant differences between all or many of the pairs of threshold categories were observed with respect to threshold score, positive perception score, extent of adoption, age, educational status, experience in sugarcane cultivation, soil type, source of irrigation, time of planting sugarcane, mass media utilisation and contact with extension agency.

13. The innovation-decision process model which was developed in the preliminary project was found to be applicable to most of the respondents grouped in different threshold categories. While the information, adoption, exploration and evaluation stages occurred in all the cases of the three categories, significant differences between the threshold categories were observed with reference to the occurrence of availability, rejection and integration stages.

14. The overall mean length of innovation-decision period was the lowest (12.92 months) for low threshold adopters and the highest (19.75 months) for high threshold adopters, while the middle threshold adopters took 17.24 months.

15. Cane Assistants and Assistant Cane Officers employed by the sugar factory for cane development activities were quoted as an important source of information at various stages of innovation-decision process by low threshold adopters. However, the percentage of utilisation of this source was comparatively lower in the case of middle threshold adopters and lowest for high threshold adopters. Similarly radio, research station scientists and Assistant Agricultural Officers (of the State Department of Agriculture) were not properly utilised by middle and high threshold adopters, while the low threshold adopters effectively utilised these sources especially at 'information' stage. Fellow farmer was observed to be an important source of information for all the categories of adopters at different stages of innovation-decision process.

5.5. Implications

1. The research and development personnel may use the 'Sugarcane Variety Acceptability Index' along with the critical threshold level and the critical level for positive perception score to determine the suitability of a new sugarcane genotype for release as a variety for commercial cultivation. Any new genotype which comes up for consideration for release may be subjected to scoring for its different characters with the weightages as obtained in the Sugarcane Variety Acceptability Index. If the sum of negative scores is lesser than the critical threshold level and the

sum of positive scores is more than the critical level for positive perception score, the genotype may be released for commercial cultivation provided it does not possess any adverse plant character.

2. Managerial feasibility was found to be the most important farm-practice attribute influencing the innovation-decision on CoC 671 sugarcane variety. Sugarcane scientists may try to evolve new varieties which demand less managerial abilities from the farmers. Extension personnel may also try to impart the required managerial abilities to the farmers so that they can cultivate the new varieties without much difficulty.

3. The innovation-decision process model clearly shows that the availability of material input (hardware) and information input (software) was the first stage in the innovation-decision process. Extension personnel while formulating strategies for popularising new sugarcane varieties must take intensive efforts for making the planting materials available to their clientele with reference to proximity and purchasing capacity. For the latter one, suitable credit facilities may be arranged through sugar factories and credit institutions for getting the seed materials.

4. The economic advantages in terms of additional yield of cane/jaggery played a major role in deciding the extent of adoption of CoC 671 sugarcane variety. As the payment by

sugar factories was done on weight basis, farmers were highly interested in harvesting maximum cane yield per unit area. For jaggery farmers also, if they were able to maintain an average quality of jaggery in terms of texture and colour, their profitability was directly proportional to the additional quantity of jaggery obtained from an unit area. Hence sugarcane scientists should give top priority in evolving varieties which give better cane/jaggery yield. When varieties with less impressive yields are to be introduced in an area due to other scientific compulsions, the reduction in yield should be adequately compensated through incentives.

5. The differential perception on the performance of ratoon crop of CoC 671 sugarcane variety was observed to be due to the differential levels of adoption of ratoon management practices. Extension personnel may give adequate thrust for the diffusion of ratoon management practices among the sugarcane growers.

6. It was observed that the response of the farmers to utilise the early maturing nature of the variety was rather luke warm eventhough they would be able to harvest the crop two months earlier. The possible reason for such an attitude may be the marginal reduction in cane yield when the crop was harvested at tenth month in some locations. Having invested huge amount of money in sugarcane crop cultivation, the farmers preferred to wait one or two months more and harvest a better yield. Hence scientists, while focussing their

efforts to reduce the duration of the sugarcane crop, may also see that yield levels are not sacrificed.

7. Farmers are cultivating sugarcane in varying conditions in terms of different type of soil, date of planting, date of harvest, quality and quantity of water availability and different types of management practices. These factors varied from farmer to farmer and many a times within a farmer's holding itself depending on the circumstances under which one has to grow his sugarcane crop. Hence the farmers preferred to grow varieties with high flexibility which could come up well in varying conditions. Sugarcane scientists may note this aspect and modify their selection procedure accordingly.

8. While introducing new sugarcane varieties, research and development personnel should ensure that the field level extension personnel have faith on the performance of the variety. This will enable the field level extension personnel to spread the message on the varieties with confidence. For this purpose proper human resource development programmes for extension personnel may be planned and implemented with due priority.

9. Priority given in issuing cutting orders for factory supply was found to be an important factor influencing adoption of Co 671 sugarcane variety. This advantageous factor may be maximum utilised for introducing new sugarcane varieties by adopting proper varietal schedules for different

factory zones and different months of planting in a more scientific manner.

10. Extension personnel while introducing a new sugarcane variety in their area should follow it up carefully by frequent field visits and provide timely guidance on the package of practices recommended for the variety to ensure that the variety fully exhibits its production potential. Indiscriminate introduction of the varieties in unsuitable soil conditions or other unfavourable environmental conditions should be avoided as such rare instances will have a high degree of negative effect on the spread of the new varieties.

11. Another point of interest is the positive role played by the family members in the decision making process on agricultural innovations which was hitherto believed to be the monopoly of the head of family alone. Such a type of emerging trend in decision-making pattern of rural families should be used by the extension system to its advantage by organising adequate training programmes and other educational activities for the family members.

12. Assistant Agricultural Officers employed by the State Department of Agriculture were mentioned as a source of information by a very low percentage of respondents. The low level of utilisation of this source might be due to the multiplicity of crops to be taken care of by these village level extension personnel. They would have given a low

priority for sugarcane development work as separate sugar factory personnel were available for this purpose. While the registered sugarcane growers who supply their cane to sugar factory may be obtaining information on latest sugarcane cultivation technologies from the sugar factory personnel to a certain extent, the jaggery farmers are to be taken care of mainly by the Agricultural Department personnel. As the transfer of technology is a tremendous task, even for the former category of farmers these extension personnel may play a complimentary role in this task. Hence the State Agricultural Department personnel may give equal priority for sugarcane crop as well in their dissemination programmes.

5.6. Suggested areas for future research

1. An action research project on the utility of the Sugarcane Variety Acceptability Index and the critical threshold level as applied to new sugarcane varieties may be taken up.

2. Applicability of the threshold concept and its measurement procedure may be tested for other crop varieties as well as other types of innovations in different crops.

3. Applicability of the threshold concept and its measurement procedure may be tested in market management studies for different agricultural as well as industrial products to forecast their market potential.

4. Though the methodology for the measurement of threshold has been standardised, this methodology along with a few modified ones may be tried on an experimental basis and a final procedure may be evolved for easy adoption by second line research personnel.

References

REFERENCES

Agro-economic Research Centre (1968). "A study of HYVP in district of Cuttack, Orissa, with special reference to credit," Mimeographed report, Shantiniketan: Vishwa Bharati.

Alcober, D.L. (1981). "Innovative performance of coconut farmers in Leyte and Southern Leyte, Philippines," Annals of Tropical Research, 3 (2): 150-160.

Ambastha, C.K. (1974). "Communication patterns in farm innovation developing, extension and client systems in Bihar - A systems approach," Unpublished Ph.D. Thesis, New Delhi: IARI.

Anbalagan, C. (1974). "A study of factors influencing adoption of package of practices for high yielding varieties of paddy," Unpublished M.Sc.(Ag.) Thesis, Coimbatore: TNAU.

Arulraj, S. (1976). "A study of the influence of farm practice-attributes on the innovation-decision process," Unpublished M.Sc.(Ag.) Thesis, Coimbatore: TNAU.

Arulraj, S. and A.John Knight (1977). "Influence of farm practice-attributes on innovation-decision process," Ind. J. Ext. Edu., 13 (3&4): 1-5.

Asch, S.E. (1956). "Studies of independence and conformity: a minority of one against the majority," Psychological Monographs, 70 (9): 1-70.

Ashby, J.A. (1982). "Technology and Ecology: implications for innovation research in peasant agriculture," Rural Sociology, 47 (2): 274-290.

Balakrishna, S. (1976). "Calculation of population threshold in regional planning exercises - An alternative method," Behavioural Sciences and Community Development, 10 (2): 87-99.

Balasubramanian, T.V. (1980). "A study on innovativeness in relation to adoption of high yielding rice technology and consequential socio-economic changes in farming community of Tamil Nadu," Unpublished Ph.D. Thesis, New Delhi : IARI.

Banarjee, B.N. (1974). "Factors associated with adoption of new farm technology," Farm Journal, 16 (1): 17-21.

Barnett, H.G. (1953). Innovations-The Basis of Cultural Change, New York: Mac-Graw Hill Book Company, p.357-377.

*Beal, G.M. and E.M.Rogers (1960). "The adoption of two farm practices in Central Iowa Community," Iowa Agric. and Home Eco. Expt. Sta. Spec. Rpt. 26, Ames.

*Beal, G.M. and J.M. Bohlen (1957). "The diffusion process," Iowa Ames. Agric.Ext. Service Spec. Rpt. 18, Iowa.

Bhatnagar, D.P. (1981). Research Methods and Measurements in Behavioural Sciences, New Delhi : Agricole Publishing Company. 240 pp.

Bohlen, J.M. (1965). "The adoption and diffusion of ideas in agriculture," in Our changing Rural Society: Perspectives and Trends, (Ed; James H.Copp), Iowa : Iowa State University Press, p. 265-287.

*Bohlen, J.M. and G.M.Beal (1960). "Sociological and socio-psychological factors related to credit use patterns," Unpublished paper presented at annual conference of TVA cooperators, Knoxville, Tennesse (Mimeographed), Ames : Iowa State University of Science and Technology.

Bose, S.P. and S.Das Gupta (1962). The Adoption Process, Calcutta : Department of Agriculture, West Bengal.

Brady, N.C. (1981). "Significance of developing and transferring technology to farmers with limited resources," in Transferring Technology for Small-scale Farming, (Ed ; W.R.Usherwood), Madison : American Society of Agronomy, p. 1-21.

Brandner, Lowell and Bryant Kearl (1964). "Evaluation for congruence as a factor in adoption rate of innovations," Rural Sociology, 29 (3), 288-303.

Brim, Orville (1965). "The acceptance of new behaviour in child rearing," Human Relations, 7 : 473-492.

Brown, L.A., M.J.Edward and M.A.Spector (1976). "Adopter categories in a spatial context : alternative explanations for an empirical regularity," Rural Sociology, 41 (1) : 99-118.

*Cannon, W.B. (1932). The Wisdom of the Body, New York : W.W.Norton.

Caplan, N. and S.D.Nelson (1973). "On being useful : the nature and consequences of psychological research on social problems," American Psychologist, 28 : 199-211.

Chand, R. and M.L.Gupta (1966). "A study of the adopters of improved farm practices and their characteristics," Ind. J. Ext. Edu., 2 (4): 259-267.

Chandrakandan, K. (1982). "Effectiveness of farm broadcast on listeners' affective, cognitive and psychomotor behaviours," Unpublished Ph.D. Thesis, Coimbatore:TNAU.

Chattopadyay, S.N. (1963). "A study of some psychological correlates of adoption of innovations in farming," Unpublished Ph.D. Thesis, New Delhi : IARI.

Choubey, C.L. (1972). "A study of differential adoption of high yielding wheat varieties technology as related to and influenced by selected demographic, socio-psychological and political variables in Sehore district, Madhya Pradesh," Unpublished Ph.D. Thesis, New Delhi : IARI.

Choudhary, K.V. (1965). "Factors effecting accentance of improved agricultural practices," Rural Sociology, 30 (2): 355.

Choukidar and P.S.George (1972). "Adoption behaviour and characteristics of farmers," Ind. J. Ext. Edu., 8 (3&4): 40-53.

Clark, R.C. and L.A.Akinbode (1968). "Factors associated with adoption of three farm practices in the Western State, Nigeria," Research Bulletin 1., Ile : University of Ile press.

Cofer, C.N. and M.H. Appley (1980). Motivation : Theory and Research, New Delhi : Wiley Eastern Ltd., 958 pp.

Coughenour, M.C. (1965). "Technology, diffusion and theory of action," Ind. J. Ext. Edu., 1 (3): 159-184.

Das, K.K. and D.R.Sardar (1970). "Economic motivation and adoption of improved farming practices," Ind. J. Ext. Edu., 6 (1 & 2) : 103-107.

Deb, M.C. and S.S. Sharma (1969). "Characteristics of adopters of improved farm practices," Ind.J.Ext. Edu., 5(3):204-209.

Desai, A.N. and A.V.S. Narayanan (1967). "Planning and implementation in agriculture-Studies on HYV-Hybrid maize in Madhya Pradesh," Project Report, Ahmedabad : Indian Institute of Management.

Desai, B.N. and N.N.Desai (1968). "New strategy of agricultural development in operation - A case study in Kaira district in Gujarat," Mimeographed report. Vallaba Vidhyanagar: Agro-economic Research Centre, Sardar Patel University.

Desai, B.N. and D.A. Patel (1967). "Planning and implementation in agricultural studies in HYV-Hybrid bajra in Gujarat state," Project Report, Ahmedabad : Indian Institute of Management.

Deutschmann, P.J. (1962). "A model for machine simulation of information and attitude flow," Unpublished manuscript, San Jose, Costa Rica : Programa Interamericano de Informacion Popular.

*Dewey, J. (1910). How We think, Boston U.S.: Heath & Co.

Dozier, David Michael (1978). "Communication networks and the role of thresholds in the adoption of innovations," Unpublished Ph.D. Thesis, Stanford University.

Emery, F. E. and D.A. Trist (1958). Information, Decision and Action : A study of Psychological Determinants of Changes in Farming Techniques, New York : Cambridge University Press.

*Eveland, J.D. (1979). "Issues in using the concept of adoption of innovation," Unpublished paper presented to the American Society for Public Administration, Baltimore, Maryland.

Fletcher, J.G. (1938). "The wisdom of the mind," Sigma Xi Quart., 26 : 6-16.

Fliegel, F.C. and J.P.Kivlin (1962). "Farm practice-attributes and adoption rates," Social Forces, 40 : 364-370.

Fliegel, F.C., J.P.Kivlin and G.S.Sen (1966). Agricultural Innovation Among Indian Farmers, Hyderabad : National Institute of Community Development.

Gaikwad, V.R. (1971). Small Farmers : State Policy and Programme Implementation, Hyderabad; National Institute of Community Development.

Gaikwad, V.R., C.L.Verma and K.V.Raju (1969). "Adoption process and change inducing capacities of characteristics," Journal of Agricultural Sciences, 24 : 62-70.

Ghosh, M.G. (1969). "A study of HYVP in the district of Birbhum, West Bengal with reference to kharif paddy (1968-69)," Mimeographed report, Shantiniketan : Agro-economic Research Centre, Vishwa Bharati.

Giriappa, S. (1978). "Technology adoption and hill area development: A case study of the Nilgiris district," Ind. J. Agric. Econ., 33 (4): 60-61.

Gonzales, N.N. (1969). Black Carib Household Structure, Seattle : University of Washington Press.

Gowda, C.M.B. and K.A.Jalihal (1974). "Adoption of recommended varieties and seedling practices of paddy by farmers," Ind. J. Ext. Edu., 10 (1&2) : 103-107.

Granovetter, Mark (1977). "Threshold models of collective behaviour," Research report. Stoneybrook: State University of New York.

Granovetter, Mark (1978). "Threshold models of collective behaviour," Amer. J. Soc., 83 (6): 1420-1443.

Granovetter, Mark and Roland Soong (1981). "Threshold models of diffusion and collective behaviour," in Modelle fur Ausbreitungsprozesse in sozialen strukturen, (Ed ; Hans Hummell and Wolfgang Sodeur), Duisberg, West Germany, Verlag der Sozialwissenschaftliche, Kooperative.

Grodzins, M. (1957). "Metropolitan segregation," Scientific American, 24 : 33-41.

Gupta, D.P. (1968a). "Evaluation of HYVP rabi (1967-68) - A study of IR 8 paddy in Saharanpur district in U.P.," Mimeographed report, New Delhi : Agro-economic Research Centre, Delhi University.

Gupta, D.S. (1963). "The innovators," Research Bulletin-1, Calcutta : Department of Agriculture, West Bengal.

Gupta, R.S. (1968b). "Analysis of adoption of package of practices in Mexican wheat, block Kalyanpur, Kanpur," Unpublished M.Sc.(Ag.) Thesis, Agra : Agra University.

Gurcharan, B.S. and C.R.Harold (1968). "Factors related to the acceptance of new ideas and techniques in farming, Punjab, India," Ind. J. Ext. Edu., 4 (1&2): 29-39

Hagerstrand, T. (1967). Innovation Diffusion as a Spatial Process, Chicago : University of Chicago Press.

Harwood, R.R. (1981). "Agronomic and economic considerations for technology acceptance," in Transferring Technology for Small Scale Farming, (Ed : R.T.Sherwood), Madison : American Society of Agronomy.

Henderson, T.H. and P.I. Gomes (1982). "Family structure, attitudes and decision making among Caribbean peasant farmers," Agricultural Administration, 9 (4): 257-265.

*Hess, C.W. and L.F. Miller (1954). "Some personal, economic and sociological factors influencing dairy men's action and success," Pa.Agr.Expt. Sta. B. 577. University of Park.

Hildebrand, P.E. (1981). "Motivating small farmers, scientists and technicians to accept change," Agricultural Administration, 8 (5): 375-383.

Hoffer, C.R. and Stangland Dale (1958). "Farmers' attitudes and values in relation to adoption of approved practices in corn growing," Rural Sociology, 23 (1): 112-120.

Holmberg, Allen (1960). "Land tenure and planned social change - A case from Vicose Peru," Human Organisation, 9 : 7-10.

*Jaiswal, N.K. and N.C. Roy (1968). "Farmer's perception of characteristics of agricultural innovations in relation to adoption," Proceedings of Research Foundation. No.10, p. 75-96.

Jetley, Surinder (1977). Modernising Indian Peasants. A Study of Six Villages in Eastern U.P., New Delhi : Asian Educational Services, India.

*Jones, G.E. (1960). "Factors affecting the adoption of new practices with particular reference to Central Wales and the East Midlands of England," Unpublished B.Litt. Thesis, Oxford : Oxford University.

Joon, B.S., Jagath Singh and T.P.Rana (1970). "Response of the farmers towards the high yielding varieties," Ind. J. Ext. Edu., 6 (3 & 4) : 58-62.

Kelkar, M.G. and A.N.Sohani (1965). "Role of farm practice-attributes in adoption of improved agricultural practices," Ind. J. Ext. Edu., 1 (3): 223-229.

*Kivlin, J. Joseph (1960). "Characteristics of farm practices associated with rate of adoption," Unpublished Ph.D. Thesis, Pennsylvania State University.

Kulkarni, K.R. (1970). "A study of adoption of high yielding varieties of paddy by small farmers in Kolhapur district, Maharashtra," Unpublished M.Sc.(Ag.) Thesis, Hyderabad: ANAU.

*Lee, S.B. (1977). "System effects on family planning behaviour in Korean villages," Unpublished Ph.D. Thesis, University of Michigan.

Lewin, Kurt (1947). "Group decision and social change," in Readings in Social Psychology, (Ed : Theodore M. Newcomb and Eugene L. Hartley), New York : Henry Holt.

Lindstrom, David E. (1958). "Diffusion of agricultural and home economics practices in a Japanese rural community," Rural Sociology, 23 (2): 171-183.

Lionberger, H.F. (1960). Adoption of New Ideas and Practices, Ames, Iowa : The Iowa State University Press.

Nagill, Kathleen M. and D.M.Rogers (1931). "Federally sponsored demonstrations of technological innovations," Knowledge, 3 : 23-42.

Nahbubani, S.T. (1972). "Socio-psychological characteristics of educators differentially adopting an innovation," Dissertation Abstracts International, 509-A.

Nanivannan, N. (1980) "A study on the knowledge and extent of adoption of sunflower growers," Unpublished M.Sc.(Ag.) Thesis, Coimbatore : TNAU.

Marsh, C., P.Coleman and A.L. Coleman (1956). "Group influence and agricultural innovation : some tentative findings and hypotheses," Amer. J. Soc., 61 : 588-594.

Mason, R. (1964). "The use of information sources in the process of adoption," Rural Sociology, 29 : 40-52.

Menchar, J.P. (1978). Agricultural and Social Structure in Tamil Nadu, New Delhi : Allied Publishers Pvt. Ltd., 314 pp.

Misiko, P.A.W. (1976). "Incentives and disincentives influencing farmers in the adoption of agricultural innovations : The case of Bungoma district, Kenya," Rural Extension Education Training Abstract, 1 (3): 114.

Mitra, M.K. (1968). "Relative importance attached in relation to their adoption by adopter farmers," Unpublished M.Sc.(Ag.) Thesis, IARI.

Mohamed, Y.A. (1982). "Diffusion of agricultural innovations among traditional farmers of Western Sudan-the case of East Kordofan and El Fasher districts," Geo Journal, 6 (1): 31-40.

Momi, G.S. and T.S.Sohal (1975). "Significance of characteristics of innovations for adopters and non-adopters," Ind. J. Ext. Edu., 11 (1 & 2) : 74-75.

Mulay, S. and R.N. Roy (1969). "Characteristics of improved farm practices as related to adoption," Ind. J. Ext. Edu., 4 (1 & 2).

North Central Regional Rural Sociology Sub-committee (1955). "How farm people accept new ideas," Iowa Agric. Ext. Svce. Spec. Rpt. 15.

Nowak, P.J. (1983). "Adoption and diffusion of soil and water conservation practices," Rural Sociologist, 3 (2): 83-91.

Nweke, F.I. and J.A. Akorhe (1983). "Determinants of adoption of new technologies among small holders and implications for administration of transfer programmes : a case study of rice production in the Plateau State of Nigeria," Agricultural Administration, 12 (2) : 77-90.

Ohja, G. (1969). "Farmers response to fertilizer use under hybrid maize programme in Sarm district," Fert. News, 14 (10) : 25-32.

Oppenfold and Florentino (1962). "Results of a study of adoption of better farm practices in Philippines," Ind. J. Agric. Econ., 17 (4): 23-32.

Pachico, Douglas and Jacqueline Ashby (1983). "Stages in technology diffusion among small farmers : Biological and management screening of a new rice variety in Nepal," Agricultural Administration, 13 (1): 25-37.

Palaniswamy, A. (1978). "Adoption behaviour of malli and mullai flower growing farmers," Unpublished M.Sc.(Ag.) Thesis, Coimbatore : TNAU.

Pande, Arun Kumar (1976). "A study of incentives and disincentives related to adoption of high yielding varieties of wheat by the small farmers of Jagdishpur block in Shojpur district of Bihar," Unpublished M.Sc.(Ag.) Thesis, Jabalpur: JNKVV.

Parameswaran, K.A. (1975). "A study on the impact of the cotton package programme on the adoption of improved farm practices by the farmers of Madhukkarai block in Coimbatore district," Unpublished M.Sc.(Ag.) Thesis, Coimbatore : TNAU.

Patee, H.H. (1973). Hierarchial Theory : The Challenge of Complex Systems, New York : George Braziller.

Perumal, G. (1970). "A study on factors and agencies responsible for the spread of hybrid maize in Coimbatore district," Unpublished M.Sc.(Ag.) Thesis, Coimbatore : University of Madras.

Prabukumar, S. (1976). "A study of stage concept in innovation-decision process," Unpublished M.Sc.(Ag.) Thesis, Coimbatore : TNAU.

Prasad, C.S. (1967). "Study of impact of package programme (IAAP) in district. Basti with special reference to block. Basti proper," Unpublished M.Sc.(Ag.) Thesis, Kanpur : Agra University.

Presser, H.A. (1969). "Measuring innovativeness rather than adoption," Rural Sociology, 34 (4): 510-527.

Programme Evaluation Organisation (1969). "Sixth evaluation of community development and applied fields," Publication No.2.

Rahim, S.A. (1961). The Diffusion and Adoption of Agricultural Practices : A Study in a Village in East Pakistan, Comilla : Pakistan Academy for Rural Development.

Rajathurai, S. (1983). "Relative adoption behaviour of registered and non-registered sugarcane growers," Unpublished M.Sc.(Ag.) Thesis, Coimbatore : TNAU.

Rajendra (1969). "Distance concept in adoption pattern," Ind. J. Ext. Edu., 4 (1 & 2): 85-89.

Rao, Gopal D., T.K.Singh and Kumkum Pal (1971). "A study of the motivation pattern of farmers towards the adoption of HYV of wheat," Journal of Behavioural Sciences and Community Development, 5 (3): 64-71.

Rao, K.A. (1970). "A study of relationship between rate of adoption of recommended farm practices and their attributes," Unpublished M.Sc.(Ag.) Thesis, Hyderabad : APAU.

Reader's Digest Great Encyclopaedic Dictionary (1964). Volume 3, Oxford : University Press, p. 1034-1744.

Reddy, B.C.K. (1968). "Adoption of improved agricultural practices in Rangarupalam P.S. block in Chittoor district (A.P.)," Unpublished M.Sc.(Ag.) Thesis, Hyderabad : APAU.

Reddy, M.L.N. (1962). "A study of adoption of improved agricultural practices as a function of socio-economic factors and sources of information," Unpublished M.Sc. Thesis, New Delhi : IARI.

Richard Hooker (1554-1600) in The Oxford Dictionary of Quotations. Second Edition, London : Oxford University Press, p. 254.

Rochin, Refugio I. (1978) "Why small farmers do not adopt and utilise technology?" Unpublished paper presented at CIMMYT Seminar on increasing production capacity of small farmers, Lahore, Pakistan.

Rogers, Everett M. (1958). "Categorising the adopters of agricultural practices," Rural Sociology, 23 (4): 345-354.

Rogers, Everett M. (1960). Social Change in Rural Society, New York : Appleton Century Crafts Inc.

Rogers, Everett M (1961). "Characteristics of agricultural innovators and other adopter categories," Ohio Agric. Expt. Sta. Res. Bull. No.881, Wooster

Rogers, Everett M (1962). Diffusion of Innovations, New York: The Free Press.

Rogers, Everett M. (1971). "Social structure and social change," American Behavioural Scientist, 14 : 767-782.

Rogers, Everett M. (1973). Communication Strategies for Family Planning, New York. The Free Press.

*Rogers, Everett M. (1975). "Network analysis of diffusion of innovations," Unpublished paper presented at the Mathematical Social Science Board's Research Symposium on "Social Networks". Hanover, New Hampshire, September, 18-21.

Rogers, Everett M. (1983). Diffusion of Innovations (Third Edition), New York : The Free Press, 453 pp.

Rogers, Everett M. with F.F. Shoemaker (1971). Communication of Innovations : A Cross-cultural Approach (Second edition), New York : The Free Press, 476 pp.

Rogers, Everett M. and G.M. Beal (1958). "Importance of personal influence in the adoption of technological change," Social Forces, 36 : 329-335.

Rogers, Everett M. and L.Svenning (1969). Modernisation Among Peasants : The Impact of Communication, New York : Holt Rinehart and Winston Inc.

Roy, S.N. (1960). "Causes of success and failure of improved farm practices," Labour Research Bulletin No.3, B.A.C. p. 35-37.

Ryan, B. and N.Gross (1943). "The diffusion of hybrid seed corn in two Iowa communities," Rural Sociology, 8 : 15-20.

Salvi, P.V. and M.B.Pawar (1966). "Farm practice-attributes in relation to adoption," Ind. J. Ext. Edu., 2 (3&4): 136-142.

Schelling, T.C. (1972). "A process of residential segregation: neighbourhood tipping," in Racial Discrimination in Economic Life, (Ed ; A. Pascal), Massachusetts : Lexington Books.

Sen, N. (1980). "Transfer of technology and agriculture infrastructure : A suggested paradigm of the innovation-decision process," in Management of Transfer of Farm Technology, Hyderabad : National Institute of Rural Development, p. 98-102.

Sengupta, S. (1967). "A simple adoption scale for selection of farmers for High Yielding Varieties Programme on rice," Ind. J. Ext. Edu., 3 (3) : 107-115.

Sharma, D.K. (1966). "Role of information sources and communication channels in adoption of improved practices," Ind. J. Ext. Edu., 2 (3 & 4): 143-148.

Sharma, R.K. (1969). "Evaluation of High Yielding Varieties Programme (Kharif, 1968) - A study of IR 8 paddy in Karnal district," Unpublished mimeographed report, New Delhi : Agro-economic Research Centre, Delhi University.

Sharma, R.P. (1980). "Uncertainty and subjective beliefs in the adoption of modern farming techniques : a case study of Nepalese farmers," Research paper series, HMG-USAID - A/D/C Project on Training Nepalese in Agricultural Research and Development Planning. No.5. 15 pp.

Sharma, S.T. and G.T. Nair (1974). "A multivariable study of adoption of High Yielding Varieties of paddy," Ind. J. Ext. Edu., 10 (1 & 2): 30-35.

Shivlah, V. et al. (1983). "Improving delivery systems for rural development," Rural Development, 2 (4): 403-422.

Sill, M.L. (1958). "Personal situations associated with the farm practices adoption process," Unpublished report - Part III, University of Park.

Singh, A.I. (1974). "A study on adoption of high yielding varieties of paddy and its associated practices by Manipur farmers," Unpublished M.Sc. Thesis, New Delhi: IARI.

Singh, K.N. and S.M.S. Haque (1970). "How farmers can be helped to adopt HYV," Yojana, 14 : 17.

Singh, R.V. (1969). "Characteristics of farm innovations associated with the rate of adoption,". Ind. J. Agric. Ext., 24 (1): 50-61.

Singh, S.N. (1970). "Adoption and diffusion of agricultural technology and social change," in Research in Extension Education for Accelerating Development Process. (Ed ; K.N.Singh, G.S.S. Rao and D.N.Sahay), New Delhi : Caxton Press Pvt. Ltd., p. 293-302.

Singh, Y.P. and Udai Pareek (1968). "A paradigm of sequential adoption," Ind. Edu. Rev., 3 : 98-114.

Singh, Y.P. and V.K.Babu (1968). "A study of adoption of improved farm practices as a function of positive values," Ind. J. Ext. Edu., 4 (1 & 2) : 71-72.

Sinha, V.V. and S.R.P. Sinha (1974). "Adoption process as operating with artificial insemination," Ind. J. Ext. Edu., 10 (1 & 2): 36-42.

Sinha, P.K.P. and Bhasin, N.S. (1968). "Factors influencing low adoption of some improved farm practices," Ind. J. Ext. Edu., 4 (1 & 2): 58-65.

*Smith, R.T. (1973). "Culture and social structure in the Caribbean : Some recent work on family and kinship studies," Comp. Studies in Soc. and Hist., 6 (1): 24-26.

Sohani, A.K. (1968). "Impact of farm mechanisation on some aspects of farming in Khanjawala block," Unpublished Ph.D Thesis, New Delhi : IARI.

Somasundaram, P. (1976). "A diagnostic study of small farmers with respect to new agricultural technology and its effective communication for adoption," Unpublished Ph.D. Thesis, New Delhi : IARI.

Subramani, . (1992). "A study on the adoption of technological innovations of sugarcane production in Sakthi Sugars area ; Periyar district," Unpublished M.Sc.(Ag.) Thesis, Coimbatore : TNAU.

Subramanyan, V.K. (1968). "Causes for success or failure of recommended package of practices for rice in Vaira," Unpublished M.Sc.(Ag.) Thesis, Hyderabad : APAU.

Summers, L.E., J.R. Arenigo and P. Kidder (1976). "Field monitoring to determine threshold of economic loss due to the sugarcane borer, Diatraea saccharalis (F.)," Proc. A.S.S.C.T., 6 : 148-149.

Sundaram, D. and K.Chandrakandan (1975). "A note on the characteristics of innovators," Madras Agric. J., 62 (10-12) : 851-853.

Terasart, S. (1977). "Incentives and disincentives for behavioural change by farmers related to adoption of dry season cropping, North East Thailand," Rural Xt. Edu. Training Abstract, 1 (4): 155.

Thyagarajan, S. (1979). "Incentives and disincentives related to the adoption behaviour of marginal and neo-marginal farmers," Unpublished M.Sc.(Ag.) Thesis, Coimbatore : TNAU.

Tripathy, A., K.V.Singh and Shankar Shahoo (1982). "Constraints in adoption of high yielding rice technology in coastal Orissa," Ind. J. Xt. Edu., 18 (1 & 2): 50-58.

Trivedi, G. (1963). "Measurement and analysis of socio-economic status of rural families," Unpublished Ph.D. Thesis, New Delhi : IARI.

Van den Ban, A.W. (1960). "Locality group differences in adoption of new farm practices," Rural Sociology, 25 : 308-320.

Vannasilpa, V. (1969). "A study of some of the factors related to non-adoption of HYV wheat," Unpublished M.Sc. Thesis, New Delhi : IARI.

Vidyarthi, G.P. (1967). "Farmers incentives for adoption of recommended farm practices in wheat crop in Aligarh Intensive Agricultural District, India," Unpublished Ph.D. Thesis, New York : Cornell University.

Viswanathan, K. (1972). "A study on impact of high yielding varieties of paddy on small farmers of Mohanur block, Salem district," Unpublished M.Sc.(Ag.) Thesis, Coimbatore : TNAU.

Vijayaraghavan, P. (1977). "Study of the factors affecting the knowledge and adoption of high yielding varieties of paddy by small and marginal farmers," Unpublished M.Sc.(Ag.) Thesis, Coimbatore : TNAU.

Webster's New Twentieth Century Dictionary (1978). Second edition. William Collins + World Publishing Co. Inc. 2129 pp.

Wheeler, D. (1966). "Toward a theory of behavioural contagion," Psychological Review, 73 : 179-192.

*Wilkening, E.A. (1952). "Acceptance of improved farm practices in three coastal plain countries," North Carolina Agric. Expt. Sta. Tech. Bull. No.98, North Carolina.

*Wilkening, E.A. (1953). "Adoption of improved farm practices as related to family factors," Wisconsin Agric. Expt. Sta. Res. Bull. No.183, Madison, Wisconsin.

Wilson, M.C. and C. Gallup (1955). "Extension teaching methods and other factors that influence adoption of agricultural and home economics practices," USDA Federal Extension Service Circular No.495, Washington.

*Winkelman, D. and E.Moscardi (1979). "Aiming agricultural research at the needs of farmers," Unpublished paper for the seminar on "Socio-economic aspects of agricultural research in developing countries". Santiago, Chile, May 7-11.

Zaltman, Gerald (1964). Marketing : Contributions from the Behavioural Sciences, New York : Harcourt, Brace and World.

Zuckerman, M.C. (1978). "Growth cycle, income stream and decision making : a case study of Yoruba smallholders," Nigerian Journal of Economic and Social Studies, 20 (2): 273-294.

* Originals not seen.

Appendices

APPENDIX I

INTERVIEW SCHEDULE FOR PRELIMINARY PROJECT I

TOPIC : Threshold in innovation-decision on sugarcane varieties

Objective : Identification of perceived attributes of the innovation - CoC 671 sugarcane variety

(By Semantic Differential Technique)

Respondent No. .....

1. Name of the respondent : Shri .....

S/O Shri .....

Village :.....

Block :.....

2. Total area under cultivation ..... ha

3. i) Did you plant CoC 671 variety in your field - Yes/No

ii) If 'Yes', from when? .....

iii) If 'No' are you aware of the CoC 671 variety -Yes/No

(If 'No', the interview need not be proceeded further)

4. Year in which the variety was introduced in the area .....

5. Please give the area in which CoC 671 variety was grown as compared to the total area under sugarcane during the following years

	Area under CoC 671 (ha)	Total area under sugarcane (ha)
1982		
1981		

6. i) Give the main reasons for shifting to CoC 671 variety from the earlier variety cultivated (if applicable)

ii) Give the main reasons for not shifting to CoC 671 variety from the variety which you are growing now (if applicable)

7. Please give your rating on the following aspects as to what the cultivation of CoC 671 variety means to you as compared to the other varieties you are/ were growing

i) Expenditure incurred to put the practice in operation is

Highly costly - Costly - Moderate cost - Low cost - Cheapest

ii) Additional financial returns obtained through the adoption of this variety is

High - Moderate - Low - No profit/ no loss - Results in loss

iii) Consistency with the past experiences and present needs of the farmer is

Very high - High - Medium - Low - Not consistent

iv) Consistency with the existing social values is

Very high - High - Medium - Low - Not consistent

v) Relative difficulty in understanding the innovation is

Highly difficult - Moderately difficult - Difficult - Easy - Very easy

vi) Relative difficulty in using the innovation is

Highly difficult - Moderately difficult - Difficult - Easy - Very easy

vii) Relative quickness with which the financial returns are obtained from the investment made on the practice is

Immediate - Takes little time - Takes time - Delayed returns - Highly delayed returns

viii) Efficiency of the practice to save time is

Highly efficient - Moderately efficient - Efficient - Less efficient - Not at all efficient

ix) Efficiency of the practice to save money is

Highly efficient - Moderately efficient - Efficient - Less efficient - Not at all efficient

x) Efficiency of the practice to save labour is

Highly efficient	Moderately efficient	Efficient	Less efficient	Not at all efficient

xi) Perceived risk in adopting the practice is

Highly risky	Moderately risky	Risky	Low risk	No risk

xii) Extent to which results of using the practice are observable to others is

Results completely observable	Observable to a greater extent	Observable to a moderate extent	Observable to a limited extent	Not at all observable

xiii) Possibility of trying the practice on a smaller scale is

Very high	High	Medium	Low	Impossible

xiv) Possibility of getting suitable physical conditions for adopting the practice in his situation is

Highly feasible	Moderately feasible	Feasible	Less feasible	Not feasible

xv) Possibility of getting suitable management skills required for adopting the practice in his situation is

Highly feasible	Moderately feasible	Feasible	Less feasible	Not feasible

xvi) Availability of material inputs required for carrying out the practice in time is

Easily available	Moderately easily available	Available with certain difficulty	Highly difficult to procure	Not at all available

xvii) Easiness in selling the produce is

Very easy - Moderately easy - Easy - Difficult - Very difficult

xviii) Flexibility of the innovation to enable the farmer to cultivate the variety under varying conditions is

Highly flexible - Moderately flexible - Flexible to a certain extent - Rigid - Highly rigid

xix) Extent to which the innovation is strange/different from what was known or usual as before is

Very novel - Somewhat novel - Not different from existing one - Old - Very old

APPENDIX II

INTERVIEW SCHEDULE FOR PRELIMINARY PROJECT - II

Topic : THRESHOLD IN INNOVATION-DECISION ON SUGARCANE VARIETIES

Objective: Identification of stages in innovation-decision process

Respondent No. .....

1. Name of the respondent : Shri .....
   S/O : Shri .....
   Village : .....
   Block : .....

2. Total area under cultivation ..... ha

3. The year in which CoC 671 was introduced in the area .....

4. Please give the area in which CoC 671 variety was grown as compared to the total area under sugarcane during the following years.

	Area under CoC 671 (ha)	Total area under sugarcane (ha)
1982		
1981		

5. Please explain the history of your decision making process on CoC 671 cultivation.

   (Put a (✓) mark near the appropriate items of the following list as relevant ones which denote the stages of the innovation-decision process (as identified during the discussion on this question). Indicate against the (✓) marked items the time/period at which it occured and major sources of information)

1) The farmer felt the need for a shift from old variety to some new variety

2) Turned the mind to the new idea

3) Availability of innovation inputs to the individual with reference to proximity

4) Availability of innovation inputs to the individual with reference to his purchasing capacity

5) Came to know vaguely of the existence of the innovation but lacked information on its attributes

6) Felt that the innovation might be able to satisfy his needs

7) Developed interest in the practice and sought for information

8) Being exposed to the new idea

9) Obtained certain initial knowledge on the innovation especially on its cost-benefit aspects

10) Obtained information on "Why" of the innovation

11) Obtained information for proper use of innovation

12) Grasped mentally all the relevant aspects of the innovation

13) Formed a favourable or unfavourable attitude towards the innovation

14) Made mental evaluation of the information so far gained about the applicability of the practice in his present and anticipated future situation

15) Applied the practice actually on a small scale in order to determine its utility in his own situation

16) Engaged in activities which led to a choice to adopt or reject the innovation

17) Firmly believed in the applicability of the innovation in his own situation

18) Decided to use the practice continuously on full scale

19) Farmer carried out the information in his field situation more or less on a permanent basis

20) Being satisfied with reference to the need he felt earlier

21) Sought reinforcement for the innovation-decision he has made but he might reverse his previous decision if exposed to conflicting message about the innovation

22) Integration of innovation into the individual's routine and achieving a terminal relationship

23) Put aside the innovation as not to be practised in his field situation

24) Decided to cease using the innovation in order to adopt a better idea which superseded it

25) Decided to cease using an idea as a result of dissatisfaction with its performance

APPENDIX III

QUESTIONNAIRE FOR DEVELOPING SUGARCANE VARIETY ACCEPTABILITY INDEX

SUGARCANE BREEDING INSTITUTE
(INDIAN COUNCIL OF AGRICULTURAL RESEARCH)
COIMBATORE - 641 007
(TAMIL NADU)

Dr. K. MOHAN NAIDU,
Director,

Dated 29.4.1983

D.O.No.16(5)-1/83-Tech.

Dear Sir,

I am writing this to seek your valuable help in evolving an index required for studying the acceptability of new sugarcane varieties as a part of a research project of Thiru S.Amalraj, Extension Scientist of this Institute. The project is entitled, "Threshold in innovation-decision on sugarcane varieties". This instrument will help him to give appropriate weightages to different types of positive and negative forces influencing the acceptance of newly released sugarcane varieties.

Keeping in view your expertise and experience in sugarcane development, we seek your mature and accurate judgement in developing this index. Guidelines for giving weightages are given at appropriate places in the following pages. I shall appreciate if you could return the filled in questionnaire at your earliest convenience.

With regards,

Yours sincerely,
Sd. xxx
(K.MOHAN NAIDU)

To

GUIDELINES FOR ASSIGNING SCORES

Please read the definition of threshold as developed for this study and the example given here before assigning weightages (scores) to various aspects.

Definition

Threshold level of an individual is the point at which the benefits of adoption of a new sugarcane variety outweighs the drawbacks in such adoption.

Illustration

A farmer may be growing a particular sugarcane variety in his farm. Research and development personnel after testing a new variety in the locality decide to introduce the variety in that area and start taking promotional efforts such as spreading the message about the advantages of growing the new variety, persuading the farmer in their personal contact occasions, announcing premium/subsidy, ensuring easy availability of setts etc. Now, it is for the farmer to decide. He is getting information about the variety from various sources like extension personnel, mass media and his friends and neighbours in addition to his own observations about the performance of the variety in demonstration plots and other farmers' fields. He mentally measures all the advantages and disadvantages of changing the variety grown by him and when

the advantages (benefits) are more than the disadvantages (drawbacks), he decides to adopt the new variety.

This study is focussed on identifying the advantageous and disadvantageous factors influencing the acceptability of a new sugarcane variety and giving appropriate weightages to each factor.

As the findings of this study will help us in suitably formulating/modifying our varietal release/promotional strategies, you may please give adequate attention to different aspects of the index.

YOU MAY PLEASE SEE THAT YOU ARE GIVING SCORES TO ALL ASPECTS OF THE INDEX WITHOUT LEAVING ANY ITEM. If a particular aspect does not deserve any attention, you may give 'O' score to that aspect. You may give scores to each item by putting yourself in the place of a farmer who has to decide about adopting a new sugarcane variety. Each aspect of the new variety is to be compared with that of the existing variety under cultivation.

You may also note that procedure for giving scores in Part-I is entirely different from the procedure in Part-II as could be seen from the examples given at appropriate places.

PART-I

Various aspects that may influence the decision of a farmer to adopt a new sugarcane variety are listed as positive factors and the aspects that may influence the farmer to reject the variety are listed as negative factors. You may assess the degree to which each individual aspect will influence the farmer to adopt the variety in the case of positive factors and the degree to which each individual aspect will influence the farmer to reject the variety in the case of negative factors by giving scores ranging from 0 to 100 to each aspect. Scores may be assigned to each individual aspect separately without bothering about the total quantity of scores assigned to any group of aspects or major factors.

I. Difference in yield

A. Positive aspects

You may please assign scores ranging from 0 to 100 for each item depending upon the extent to which a particular aspect will influence the farmer to adopt the new recommended sugarcane variety.

Example

	Aspect	Score assigned
1.	Plant crop cane yield - increase of 25.1 to 37.5 t/ha	100
2.	Ratoon crop cane yield - increase upto 12.5 t/ha	20
3.	Texture of jaggery is better	50

S.No.	Positive aspects of major factor-I	Score assigned
1.	Plant crop cane yield - increase upto 12.5 t/ha	
2.	Plant crop cane yield-increase of 12.5 to 25 t/ha	
3.	Plant crop cane yield - increase of 25.1 to 37.5 t/ha	
4.	Ratoon crop cane yield - increase upto 12.5 t/ha	
5.	Ratoon crop cane yield - increase of 12.6 to 25 t/ha	
6.	Ratoon crop cane yield - increase of 25.1 to 37.5 t/ha	
7.	Plant crop jaggery yield - increase upto 12.5 q/ha	
8.	Plant crop jaggery yield - increase of 12.6 to 25 q/ha	
9.	Plant crop jaggery yield - increase of 25.1 to 37.5 q/ha	

S.No.	Positive aspects of major factor-I	Score assigned
10.	Ratoon crop jaggery yield - increase upto 12.5 q/ha	
11.	Ratoon crop jaggery yield - increase of 12.6 to 25 q/ha	
12.	Ratoon crop jaggery yield - increase of 25.1 to 37.5 q/ha	
13.	Texture of jaggery is better	
14.	No change in texture of jaggery	
15.	Colour of jaggery is better	
16.	No difference in the colour of jaggery	
17.	Capacity to maintain cane yield even if harvest is delayed is better	
18.	Capacity to maintain cane yield even if harvest is delayed is equal	
19.	Capacity to maintain jaggery yield even if harvest is delayed is better	
20.	Capacity to maintain jaggery yield even if harvest is delayed is equal	
21.	No additional cost is involved in changing the variety (cost of setts, transport etc.)	

B. Negative aspects

You may please assign scores ranging from 0 to 100 for each item depending upon the extent to which any particular aspect will prevent the farmer from accepting the new variety i.e. the degree to which each aspect will pull down the acceptability of a recommended variety.

Example

	Aspect	Score assigned
1.	Plant crop cane yield - decrease of 25.1 to 37.5 t/ha	100
2.	Ratoon crop cane yield - decrease upto 12.5 t/ha	50
3.	Texture of jaggery is poor	75

S.No.	Negative aspects of major factor - I	Score assigned
1.	Plant crop cane yield - decrease upto 12.5 t/ha	
2.	Plant crop cane yield - decrease of 12.6 to 25 t/ha	
3.	Plant crop cane yield - decrease of 25.1 to 37.5 t/ha	
4.	Ratoon crop cane yield - decrease upto 12.5 t/ha	
5.	Ratoon crop cane yield - decrease of 12.6 to 25 t/ha	
6.	Ratoon crop cane yield - decrease of 25.1 to 37.5 t/ha	

S.No.	Negative aspects of major factor - I	Score assigned
7.	Plant crop jaggery yield - decrease upto 12.5 q/ha	
8.	Plant crop jaggery yield - decrease of 12.6 to 25 q/ha	
9.	Plant crop jaggery yield - decrease of 25.1 to 37.5 q/ha	
10.	Ratoon crop jaggery yield - decrease upto 12.5 q/ha	
11.	Ratoon crop jaggery yield - decrease of 12.6 to 25 q/ha	
12.	Ratoon crop jaggery yield - decrease of 25.1 to 37.5 q/ha	
13.	Texture of jaggery is poor	
14.	Colour of jaggery is poor	
15.	Capacity to maintain cane yield even if harvest is delayed is poor	
16.	Capacity to maintain jaggery yield even if harvest is delayed is poor	
17.	Additional cost involved in changing the variety (cost of setts, transport etc) is about Rs. 2500/ha	
18.	Additional cost involved in changing the variety is about Rs.250-500/ha (to plant a nursery crop in his farm)	

II. Difference in duration

A. Positive aspects

You may please assign scores ranging from 0 to 100 for each item depending upon the extent to which a particular aspect will influence the farmer to adopt the new sugarcane variety.

Example

	Aspect	Score assigned
1.	Plant crop duration decreased by three months	70
2.	Ratoon crop duration decreased by one month	20
3.	Early harvest enabling the farmer to get better jaggery prices	50

S.No.	Positive aspects of major factor-II	Score assigned
1.	Plant crop duration - decreased by one month	
2.	Plant crop duration - decreased by two months	
3.	Plant crop duration - decreased by three months	
4.	Plant crop duration - decreased by four months	
5.	Ratoon crop duration - decreased by one month	
6.	Ratoon crop duration - decreased by two months	
7.	Ratoon crop duration - decreased by three months	

S.No.	Positive aspects of major factor - II	Score assigned
8.	Ratoon crop duration - decreased by four months	
9.	Early harvest enabling the farmer to get better jaggery prices	
10.	Early harvest enabling the farmer to take more number of crops in a given time	

B. Negative aspects

You may please assign scores ranging from 0 to 100 for each item depending upon the extent to which any particular aspect will prevent the farmer from accepting the new variety.

Example

	Aspect	Score assigned
1.	Plant crop duration increased by four months	95
2.	Ratoon crop duration increased by one month	20

S.No.	Negative aspects of major factor - I	Score assigned
1.	Plant crop duration - increased by one month	
2.	Plant crop duration - increased by two months	
3.	Plant crop duration - increased by three months	
4.	Plant crop duration - increased by four months	

S.No.	Negative aspects of major factor - II	Score assigned
5.	Ratoon crop duration - increased by one month	
6.	Ratoon crop duration - increased by two months	
7.	Ratoon crop duration - increased by three months	
8.	Ratoon crop duration - increased by four months	

III. Plant characters

A. Positive aspects

You may please assign scores ranging from 0 to 100 for each item depending upon the extent to which a particular aspect will influence the farmer to adopt the new sugarcane variety.

Example

	Aspect	Score assigned
1.	Germination percentage is higher	40
2.	Spininess of leaves is less	50
3.	Lower flowering percentage	60

S.No.	Positive aspects of major factor-III	Score assigned
1.	Germination percentage is higher	
2.	No change in germination percentage	
3.	Higher number of tillers per clump	
4.	Equal number of tillers per clump	
5.	More number of nodes per cane	
6.	Equal number of nodes per cane	
7.	Length of internode is longer	
8.	Length of internode is equal	
9.	Thininess of leaves is less	
10.	Easier to remove leaf sheath	
11.	Lower flowering percentage	
12.	Girth of cane is more	
13.	Girth of cane is equal	
14.	Height of cane is more	
15.	Height of cane is equal	
16.	Less hardiness of cane	

S.No.	Positive aspects of major factor-III	Score assigned
17.	Less brittleness of cane	
18.	Less sprouting of buds in plants	
19.	Less stalk pithiness	
20.	Less lodging	
21.	Utility of plant tops as cattle feed is higher	
22.	Utility of plant tops as cattle feed is equal	
23.	Crop stand of ratoon is better	
24.	Crop stand of ratoon is equal	
25.	Less susceptible to early shoot borer	
26.	Less susceptible to grassy shoot disease	
27.	Less susceptible to smut	

B. Negative aspects

You may please assign scores ranging from 0 to 100 for each item depending upon the extent to which any particular aspect will prevent the farmer from accepting the new variety.

Example

Aspect	Score assigned
1. Germination percentage is lower	40
2. Higher flowering percentage	60

S.No.	Negative aspects of major factor-III	Score assigned
1.	Germination percentage is lower	
2.	Lower number of tillers per clump	
3.	Lower number of nodes per cane	
4.	Length of internode is lower	
5.	Spininess of leaves is more	
6.	Spininess of leaves is equal	
7.	Difficulty in removing leaf sheath is more	
8.	Difficulty in removing leaf sheath is equal	
9.	Higher flowering percentage	
10.	Flowering percentage is equal	
11.	Girth of cane is less	
12.	Height of cane is less	
13.	Hardiness of cane is more	
14.	Hardiness of cane is equal	

S.No.	Negative aspects of major factor-III	Score assigned
15.	Higher brittleness of cane	
16.	Brittleness of cane is equal	
17.	More sprouting of buds in plants	
18.	Equal sprouting of buds in plants	
19.	Stalk pithiness is more	
20.	Stalk pithiness is equal	
21.	More lodging	
22.	Equal amount of lodging	
23.	Utility of plant tops as cattle feed is lower	
24.	Crop stand of setoom is poor	
25.	More susceptible to early shoot borer	
26.	Equally susceptible to early shoot borer	
27.	More susceptible to grassy shoot disease	
28.	Equally susceptible to grassy shoot disease	
29.	More susceptible to smut	
30.	Equally susceptible to smut	

IV. Innovation attributes

A. Positive aspects

You may please assign scores ranging from 0 to 100 for each item depending upon the extent to which a particular aspect will influence the farmer to adopt the new sugarcane variety.

Example

	Aspect	Score assigned
1.	Managerial ability required for planting the variety in correct season is lower	60
2.	Possibility of getting suitable soil conditions required for cultivating the variety is higher	30

S.No.	Positive aspects of major factor-IV	Score assigned
1.	Managerial ability required for planting the variety in correct season is lower	
2.	Managerial ability required for planting the variety in correct season is equal	
3.	Managerial ability required to get the fertilizers in time is lower	
4.	Managerial ability required to get the fertilizers in time is equal	
5.	Managerial ability required to provide irrigation as per the requirements of the variety is lower	
6.	Managerial ability required to provide irrigation as per the requirements of the variety is equal	

S.No.	Positive aspects of major factor-IV	Score assigned
7.	Difficulty in understanding the quantity of fertilizers to be applied at different stages is less	
8.	Difficulty in adopting the recommended spacing is less	
9.	Flexibility of the variety to enable the farmer grow the variety under varying conditions is higher	
10.	Flexibility of the variety to enable the farmer to grow the variety under varying conditions is equal	
11.	Possibility of getting suitable soil conditions required for cultivating the variety is higher	
12.	Possibility of getting suitable soil conditions required for cultivating the variety is equal	
13.	Possibility of getting labour to carry out planting in correct season is higher	
14.	Possibility of getting labour to carry out planting in correct season is equal	
15.	Possibility of getting labour to apply fertilizers in correct time is higher	
16.	Possibility of getting labour to apply fertilizers in correct time is equal	
17.	Possibility of getting labour to harvest the crop in correct time is higher	
18.	Possibility of getting labour to harvest the crop is correct time is equal	

S.No.	Positive aspects of major factor-IV	Score assigned
19.	Efficiency of the variety in reducing the labour requirement is higher	
20.	Efficiency of the variety in reducing the labour requirement is equal	
21.	Consistency of recommendations for the variety with the past experiences of the farmer is higher	
22.	Consistency of recommendations for the variety with the past experiences of the farmer is equal	

B. Negative aspects

You may please assign scores ranging from 0 to 100 for each item depending upon the extent to which any particular aspect will prevent the farmer from accepting the new variety.

Example

	Aspect	Score assigned
1.	Managerial ability required for planting the variety in correct season is higher	80
2.	Flexibility of the variety to enable the farmer to grow the variety under varying conditions is lower	50

S.No.	Negative aspects of major factor-IV	Score assigned
1.	Managerial ability required for planting the variety in correct season is higher	
2.	Managerial ability required to get the fertilizers in time is higher	
3.	Managerial ability required to provide irrigation as per the requirements of the variety is higher	
4.	Difficulty in understanding the quantity of fertilizers to be applied at different stages is more	
5.	Difficulty in understanding the quantity of fertilizers to be applied at different stages is equal	
6.	Difficulty in adopting the recommended spacing is more	
7.	Difficulty in adopting the recommended spacing is equal	
8.	Flexibility of the variety to enable the farmer to grow the variety under varying conditions is lower	
9.	Possibility of getting suitable soil conditions required for cultivating the variety is lower	
10.	Possibility of getting labour to carry out planting in correct season is lower	
11.	Possibility of getting labour to apply fertilizers in correct time is lower	
12.	Possibility of getting labour to harvest the crop in correct time is lower	

S.No.	Negative aspects of major factor-IV	Score assigned
13.	Efficiency of the variety in reducing the labour requirement is lower	
14.	Consistency of recommendations for the variety with the past experiences of the farmer is lower	

V. Extension system's promotional efforts

A. Positive aspects

You may please assign scores ranging from 0 to 100 for each item depending upon the extent to which a particular aspect will influence the farmer to adopt the new sugarcane variety.

Example

	Aspect	Score assigned
1.	Premium/subsidy @ Rs. 1250/ha	40
2.	Premium/subsidy @ Rs. 2500/ha	60
3.	Priority given in issuing cutting orders for factory supply is higher	80

S.No.	Positive aspects of major factor-V	Score assigned
1.	Premium/subsidy @ Rs. 750/ha	
2.	Premium/subsidy @ Rs. 1250/ha	
3.	Premium/subsidy @ Rs. 2000/ha	

S.No.	Positive aspects of major factor-V	Score assigned
4.	Premium/subsidy @ Rs.2500/ha	
5.	Persuasion given by extension personnel for growing the variety is more	
6.	Persuasion given by extension personnel for growing the variety is equal	
7.	Extent to which the farmer believes that the extension personnel serve the interest of the farmer is higher	
8.	Arrangements made for facilitating easy availability of setts is more	
9.	Arrangements made for facilitating easy availability of setts is equal	
10.	Priority given in sanctioning credit is higher	
11.	Priority given in sanctioning credit is equal	
12.	Priority given in registration for factory supply is higher	
13.	Priority given in registration for factory supply is equal	
14.	Priority given in issuing cutting orders for factory supply is higher	
15.	Priority given in issuing cutting orders for factory supply is equal	
16.	Recognition given to adopters of the variety through awards is more	
17.	Recognition given to adopters of the variety through awards is equal	

S.No.	Positive aspects of major factor-V	Score assigned
18.	Number of demonstration plots organised on this variety is more	
19.	Number of demonstration plots organised on this variety is equal	
20.	Number of training programmes organised on cultivation of this variety is more	
21.	Number of training programmes organised on cultivation of this variety is equal	
22.	Number of exhibitions and field days organised on cultivation of this variety is more	
23.	Number of exhibitions and field days organised on cultivation of this variety is equal	
24.	Degree to which the field level extension worker has faith on the performance of the variety is more	
25.	Degree to which the field level extension worker has faith on the performance of the variety is equal	

B. Negative aspects

You may please assign scores ranging from 0 to 100 for each item depending upon the extent to which any particular aspect will prevent the farmer from accepting the new variety.

Example

	Aspect	Score assigned
1.	Arrangements made for facilitating easy availability of setts is less	60
2.	Degree to which the field level extension worker has faith on the performance of the variety is less	80

S.No.	Negative aspects of major factor-V	Score assigned
1.	Persuasion given by extension personnel for growing the variety is less	
2.	Extent to which the farmer believes that the extension personnel serve the interest of the farmer is moderate	
3.	Extent to which the farmer believes that the extension personnel serve the interest of the farmer is less	
4.	Arrangements made for facilitating easy availability of setts is less	
5.	Priority given in sanctioning credit is less	
6.	Priority given in registration for factory supply is less	
7.	Priority given in issuing cutting orders for factory supply is less	
8.	Recognition given to adopters of the variety through awards is less	
9.	Number of demonstration plots organised on this variety is less	
10.	Number of training programmes organised on cultivation of this variety is less	
11.	Number of exhibitions and field days organised on the cultivation of this variety is less	
12.	Degree to which the field level extension worker has faith on the performance of the variety is less	

VI. Social factors

A. Positive aspects

You may please assign scores ranging from 0 to 100 for each item depending upon the extent to which a particular aspect will influence the farmer to adopt the new sugarcane variety.

Example

	Aspect	Score assigned
1.	Performance of the variety in fellow farmers' fields is better	75
2.	Opinion of the fellow farmers about the variety is favourable	40

S.No.	Positive aspects of major factor-VI	Score assigned
1.	Appreciation by fellow farmers for adopting the variety is higher	
2.	Appreciation by fellow farmers for adopting the variety is equal	
3.	Performance of the variety in fellow farmers' fields is better	
4.	Opinion of the fellow farmers about the variety is favourable	
5.	Opinion of the fellow farmers about the variety is neutral	
6.	Opinion of the family members about the performance of the variety is favourable	

S.No.	Positive aspects of major factor-VI	Score assigned
7.	Opinion of the family members about the performance of the variety is neutral	
8.	Preparedness of the farmer to change the variety is high	
9.	Preparedness of the farmer to change the variety is moderate	

B. Negative aspects

You may please assign scores ranging from 0 to 100 for each item depending upon the extent to which any particular aspect will prevent the farmer from accepting the new variety.

Example

	Aspect	Score assigned
1.	Performance of the variety in fellow farmers' fields is poor	95
2.	Opinion of the family members about the performance of the variety is not favourable	75

S.No.	Negative aspects of major factor-VI	Score assigned
1.	Appreciation by fellow farmers for adopting the variety is less	
2.	Performance of the variety in fellow farmers' fields is equal	

S.No.	Negative aspects of major factor-VI	Score assigned
3.	Performance of the variety in fellow farmers' fields is poor	
4.	Opinion of the fellow farmers about the variety is not favourable	
5.	Opinion of the family members about the variety is not favourable	
6.	Preparedness of the farmer to change the variety is less	

PART-II

Various positive and negative aspects listed in Part-I are grouped into six major factors. You have to ascertain the contribution of each major factor in making the variety acceptable or rejectable. In this Part-II, you may please assign scores to each of the major factors of the variety acceptability or rejection out of 100, on the basis of their relative importance in making the new variety acceptable or rejectable. The total score given to all the major factors should not exceed 100 for acceptance and similarly in the case of rejection, total score should not exceed 100.

Scores for each major factor may please be given keeping in mind the various aspects included under each major factor as given in Part-I.

Please give scores for major factors in Part-II only after completing Part-I. This will ensure a full understanding of various aspects covered under each major factor.

Scores given in the example may be arbitrary and need not have any impact on your scoring.

Example

S.No.	Major factor	Score for acceptance	Score for rejection
1.	Difference in yield	40	25
2.	Difference in duration	10	10
3.	Plant characters	7.5	10
4.	Innovation attributes	12.5	20
5.	Extension system's promotional efforts	20	5
6.	Social factors	10	30
	Total score	100	100

You may please assign scores in the following table

S.No.	Major factor	Score for acceptance	Score for rejection
1.	Difference in yield		
2.	Difference in duration		
3.	Plant characters		
4.	Innovation attributes		
5.	Extension system's promotional efforts		
6.	Social factors		
	Total score	100	100

APPENDIX IV

LAND UTILISATION PATTERN IN KALLAKURICHI TALUK (1981-1982)

S.No.	Item	Area in ha
1.	Total geographical area	22582
2.	Forest	21750
3.	Barren and uncultivable land	65895
4.	Land put to non-agricultural use	15230
5.	Cultivable waste	13442
6.	Permanent pasture and grazing land	711
7.	Miscellaneous trees and groves	2000
8.	Current fallows	6843
9.	Other fallow lands	7795
10.	Net area sown	77615

APPENDIX V

INTERVIEW SCHEDULE FOR MAJOR PROJECT

TOPIC : Threshold in innovation-decision on sugarcane varieties

Respondent No. .....

I. BACKGROUND INFORMATION

1. Name of the respondent : .....
   S/O : .....
   Village : .....
   Block : .....
2. Age : ..... Years
3. Educational status : Illiterate/Primary/Secondary/College
4. Occupation : .....
5. Farming experience : ..... Years
6. Experience in sugarcane cultivation : ..... Years
7. Soil type : Black clay/Black loam/Red clay/Red loam/Red sandy loam/Alluvial
8. Source of irrigation : Canal/Tank/Open well(Pucca)/Open well (Kutcha)/Bore well
9. Availability of water during summer : Easy/Difficult/Not at all available
10. Area under sugarcane (ha)

	For jaggery	For factory
i. In the current season:		
ii. In the previous season :		

11. Time of planting
    i. Month of planting current season crop
    ii. Month of planting previous season crop

12. Mass media utilisation

i)	Radio listening	: Every day/two to six days a week/once a week/more than once a week/rarely/never
ii)	Reading newspapers	: Every day/two to six days a week/once a week/more than once a week/rarely/never
iii)	Reading magazines/ bulletins	: Regularly/occasionally/ rarely/never
iv)	Seeing motion pictures (number seen during the last year)	: Five or more/four/three/two/ one/none
v)	Participation in the farmers' day and exhibitions (number participated during the last year)	: Three or more/two/one/none

13. Social participation

Organisation	Member	Office bearer at present	Office bearer in the past
1. Cooperative sugar mill			
2. Agricultural credit society			
3. Panchayat			
4. Milk society			
5. Farmers' Association			
6. FDG/Radio club			
7. Others, specify i. ii. iii. iv.			

14. Contact with extension agency:

Codes - Almost every day (OD); Atleast once a week (OW)
Atleast once a fortnight (OF); Atleast once a month (OM); Atleast once in six months (O6); Atleast once a year (OY); Never (N)

A. Department of Agriculture staff		Frequency
i. Assistant Agricultural Officer	:	.....
ii. Agricultural Officer	:	.....
iii. Assistant Director of Agriculture	:	.....
iv. Others (a)	:	.....
(b)	:	.....

B. Sugar mill staff		
i. Cane Assistant	:	.....
ii. Assistant Cane Officer	:	.....
iii. Cane Development Officer	:	.....
iv. Chief Cane Officer	:	.....
v. Others : (a)	:	.....
(b)	:	.....

15. Credit behaviour

i. Did you take crop loan for sugarcane cultivation during last year - Yes/No

ii. If yes, give the source of crop loan : Professional money lender/ Cooperative societies/ Nationalised banks/Government sources/Friends, neighbours and relatives

iii. Mode of payment :

iv. Mode of repayment :

II. EXTENT OF ADOPTION OF CoC 671 SUGARCANE VARIETY

i. Do you cultivate CoC 671 sugarcane variety — Yes / No

ii. If yes, when did you adopt this variety first — .....

iii. Please give the area in which CoC 671 variety was grown as compared to the total area under sugarcane during the following years:

Year	Area under CoC 671 (ha)	Purpose factory/ jaggery	Total area under sugar-cane (ha)	Name of other varieties grown
1983				
1982				

III. STAGES IN INNOVATION-DECISION PROCESS

Please explain the history of the decision making process on CoC 671 sugarcane variety adoption.

(From an informal discussion on the subject, identify the stages and indicate against each stage, the time at which it occurred and major sources of information)

S.No.	Stage	Time	Sources of information
1.	Availability		
2.	Information		
3.	Exploration		

S.No.	Stage	Time	Sources of information
4.	Evaluation		
5.	Rejection		
6.	Reinforcement		
7.	Decision		
8.	Adoption		
9.	Integration		

IV. MEASUREMENT OF [illegible]

Please give your perception about Co 671 sugarcane variety on the following items as compared to the variety grown by you prior to adoption of Co 671 (in case of adopters) or variety grown by you at present (in the case of non-adopters)

A. Difference in yield

1. What is the difference in plant crop cane yield -
   No difference / increase of ... t per ha/decrease of ... t per ha/ not aware

2. What is the difference in ratoon crop cane yield -
   No difference/increase of ... t per ha/decrease of ... t per ha/ not aware

3. What is the difference in plant crop jaggery yield - No difference/increase of ... q per ha/ decrease of .... q per ha/ not aware

4. What is the difference in ratoon crop jaggery yield - No difference/increase of ... q per ha/ decrease of ... q per ha/ not aware

5. Texture of jaggery - Better/no change/poor/not aware

6. Colour of jaggery - Better/no change/poor/not aware

7. Capacity to maintain cane yield even if harvest is delayed - Better/no change/poor/not aware

8. Capacity to maintain jaggery yield even if harvest is delayed - Better/no change/poor/not aware

9. Additional cost involved in changing the variety Rs. ....

B. <u>Difference in duration</u>

1. What is the difference in plant crop duration - No difference/increase of .... months/decrease of ... months/not aware

2. What is the difference in ratoon crop duration - No difference/increase of ... months/decrease of ... months/not aware

3. Possibility of early harvest enabling the farmer to get better jaggery prices - Yes/No

4. Possibility of early harvest enabling the farmer to take more number of crops in a given time - Yes/No

3. Plant characters

1.	Germination percentage	- Higher/no change/lower/not aware
2.	Number of tillers per clump	- Higher/no change/lower/not aware
3.	Number of nodes per cane	- More/no difference/less/not aware
4.	Length of internode	- Longer/same/shorter/not aware
5.	Spininess of leaves	- More/equal/less/not aware
6.	Easiness in removing leaf sheath	- Easier/equally difficult/more difficult/not aware
7.	Flowering percentage	- Higher/equal/lower/not aware
8.	Girth of cane	- More/no difference/less/not aware
9.	Height of cane	- More/no difference/less/not aware
10.	Hardiness of cane	- More/no difference/less/not aware
11.	Brittleness of cane	- Higher/no change/less/not aware
12.	Sprouting of buds in plants	- More/equal/less/not aware
13.	Stalk pithiness	- More/equal/less/not aware
14.	Lodging	- More/no difference/less/not aware
15.	Utility of plant tops as cattle feed	- Higher/equal/less/not aware
16.	Crop stand of ratoon	- Better/equal/poor/not aware
17.	Susceptibility to early shoot borer	- More/no difference/less/not aware
18.	Susceptibility to grassy shoot disease	- More/no difference/less/ not aware
19.	Susceptibility to smut	- More/no difference/less/ not aware

D. Innovation attributes

1. Managerial ability required for planting the variety in correct season - Higher/equal/lower

2. Managerial ability required to get the fertilizers in time - Higher/equal/lower

3. Managerial ability required to provide irrigation as per the requirements of the variety - Higher/equal/lower

4. Difficulty in understanding the quantity of fertilizers to be applied at different stages - More/equal/less

5. Difficulty in adopting the recommended spacing - More/equal/less

6. Flexibility of the variety to enable the farmer to grow the variety under varying conditions - Higher/equal/less

7. Possibility of getting suitable soil conditions required for cultivating the variety - Higher/equal/less

8. Possibility of getting labour to carry out planting in correct season - Higher/equal/less

9. Possibility of getting labour to apply fertilizers in correct time - Higher/equal/less

10. Possibility of getting labour to harvest the crop in correct time - Higher/equal/less

11. Efficiency of the variety in reducing the labour requirement - Higher/equal/less

12. Consistency of recommendations for the variety with the past experiences of the farmer - Higher/equal/less

E. Extension system's promotional efforts

1. Premium/subsidy offered for growing Co 671 sugarcane variety - Rs. ... per ha

2. Persuasion given by extension personnel for growing the variety - More/equal/less

3. Extent to which you believe that the extension personnel serve the interest of the farmer - High/moderate/low

4. Arrangements made for facilitating easy availability of setts - More/no difference/less

5. Priority given in sanctioning credit - Higher/equal/less

6. Priority given in registration for factory supply - Higher/equal/less

7. Priority given in issuing cutting orders for factory supply - Higher/equal/less

8. Recognition given to adopters of the variety through awards - More/no difference/less

9. Number of demonstration plots organised on this variety - More/equal/less

10. Number of training programmes organised on cultivation of the variety - More/equal/less

11. Number of exhibitions and field days organised on cultivation of this variety - More/equal/less

12. Degree to which the field level extension worker has faith on the performance of the variety - More/equal/less

F. Social factors

1. Appreciation by fellow farmers for adopting the variety - Higher/equal/less

2. Performance of CoC 671 variety in fellow farmers' fields - Better/equal/poor

3. Opinion of the fellow farmers about the performance of the variety - Favourable/neutral/not favourable

4. Opinion of the family members about the performance of the variety - Favourable/neutral/not favourable

5. Preparedness of the farmer to change the variety - High/moderate/low