

ADAPTATION BEHAVIOUR OF VEGETABLE GROWERS IN CRISIS SITUATIONS

By

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THESIS

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2002

DECLARATION

I hereby declare that this thesis entitled “**Adaptation behaviour of vegetable growers in crisis situations**” is a bonafide record of research work done by me during the course of research and that this thesis has not previously formed the basis for the award to me of any degree, diploma, associateship, fellowship or other similar title of any other University or Society.

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CERTIFICATE

Certified that this thesis, entitled “**Adaptation behaviour of vegetable growers in crisis situations**” is a record of research work done independently by **Mr. Boban Paul** under my guidance and supervision and that it has not previously formed the basis for the award of any degree, fellowship or associateship to him.



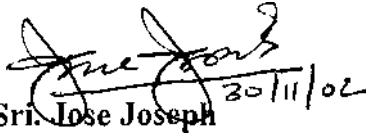
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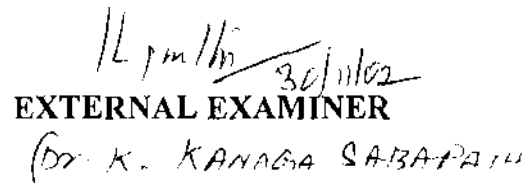
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CONTENTS

CHAPTER	TITLE	PAGE
1	INTRODUCTION	1
2	REVIEW OF LITERATURE	6
3	METHODOLOGY	22
4	RESULTS	29
5	DISCUSSION	60
6	SUMMARY	82
	REFERENCES	
	APPENDICES	
	ABSTRACT	

LIST OF TABLES

Table No.	Title	Page No.
1	The measures taken in anticipation by the farmers for protecting themselves from the impact of a possible crisis	33
2	The measures taken by farmers for mitigating the impact of an already occurred crisis	34
3	Broad classification of crises reported from first season Bitter gourd growers	35
4	Classification of crisis reports due to diseases, crop Bitter gourd - season I	35
5	Classification of nature related crises, crop-Bitter gourd, season I	35
6	Broad classification of crisis reports, crop - bitter gourd, season III	37
7	Classification of reports of disease related crisis, crop - bitter gourd, season III	37
8	Classification of reports of nature related crisis, crop - bitter gourd, season III	38
9	Contingent measures taken against mosaic, crop - bitter gourd, season III	38
10	Broad classification of crisis reports, crop - snake gourd, season I	39
11	Classification of nature related crisis, crop - snake gourd, season I	40
12	Contingent measures taken in case of unexpected price fall, crop - snake gourd, season I	40
13	Broad classification of crisis reports, crop - snake gourd, season III	41

14	Classification of nature related crisis, crop - snake gourd, season III	42
15	Classification of disease related crisis, crop - snake gourd, season III	42
16	Contingent measures taken in the case of unexpected price fall, crop - snake gourd, season III	42
17	Contingent measures taken against mosaic, crop - snake gourd, season III	43
18	Broad classification of crisis, crop - oriental pickling melon, season I	44
19	Classification of nature related crisis, crop - Oriental pickling melon Season I	44
20	Classification of disease related crisis, crop - Oriental pickling melon Season I	45
21	Contingent measures taken in case of unexpected price fall, crop - Oriental pickling melon, season I	45
22	Broad classification of crisis, crop - Oriental pickling melon, Season III	46
23	Classification of nature related crisis, crop Oriental pickling melon, season III	46
24	Contingent measures taken in case of unexpected price fall, crop - Oriental pickling melon season III	46
25	Broad classification of crisis, crop - ash gourd, season I	47
26	Classification of disease related crisis, crop - ash gourd, season I	48
27	Contingent measures taken in case of unexpected price fall, crop - ash gourd, season I	48
28	Broad classification of crisis, crop - ash gourd, season III	49
29	Classification of diseases related crisis, crop - ash gourd, season III	49

30	Contingent measures adopted in case of mosaic, crop - ash gourd, season III	50
31	Broad classification of crisis, crop - cowpea, season I	50
32	Classification of disease related crisis, crop - cowpea, season I	51
33	Contingent measures taken in the case of unexpected price fall, crop - cowpea, season I	51
34	Contingent measures taken against karimpan (<i>Colletotrichum</i> sp.), crop - cowpea, season I	52
35	Broad classification of crisis, crop - cowpea, season III	52
36	Classification of nature related crisis, crop - cowpea, season III	52
37	Classification of disease related crisis, crop - cowpea, season III	53
38	Contingent measures taken in case of unexpected price fall, crop - cowpea, season III	53
39	Contingent measures taken against karimpan, crop -cowpea, season III	53
40	Agencies who made interventions during crisis situation	54
41	Effectiveness of intervention by external agencies in crisis situations	55
42	Analysis of judges rating on methods of adaptation	57
43	Classification of farmers based on level of adaptation	59

LIST OF FIGURES

Figure No.	Title	Between Pages
1	Conceptual diagram	21-22
2.	Map showing the location of the study area	22-23
3	Chart of Blocks and Panchayats selected for the study	22-23
4	Percentage of crises dealt with contingent actions	37-38
5	Share of different agents in creating the crisis, bitter gourd, season - I	37-38
6	Share of different agents in creating the crisis, bitter gourd, season - III	37-38
7	Contribution of diseases in creating the crisis for different crops in different seasons	38-39
8	Contribution of pests in creating the crisis for different crops in different seasons	39-40
9	Share of different agents in creating the crisis, snake gourd, season - I	40-41
10	Share of different agents in creating the crisis, snake gourd, season - III	40-41
11	Contribution of marketing problems in creating the crisis for different crops in different seasons	42-43
12	Share of different agents in creating the crisis, oriental pickling melon, season - I	44-45
13	Share of different agents in creating the crisis, oriental pickling melon, season - III	44-45

14	Share of different agents in creating the crisis, ash gourd, season - I	47-48
15	Share of different agents in creating the crisis, ash gourd, season - III	47-48
16	Share of different agents in creating the crisis, cowpea, season - I	50-51
17	Share of different agents in creating the crisis, cowpea, season - III	50-51
18	Contribution of natural calamities in creating the crisis for different crops in different seasons	51-52
19	Impact of crises on different crops in different seasons	53-54

LIST OF APPENDICES

Appendix No.	Title
I	Block wise and panchayat wise area under vegetable cultivation in Ernakulam district
II	Adaptation behaviour of vegetable growers in crisis situation - schedule for data collection
III	Adaptation behaviour of commercial vegetable growers in crisis situations, Schedule for judge's rating of adaptation methods
IV	Index of adaptability
V	List of respondents

Dedicated
To the younger generation
Of vegetable growers

Introduction

CHAPTER-I

INTRODUCTION

In this modern times, amidst the climatically controlled green houses and mushrooming innovations in agricultural technology, farming of common folk still remains as an intimate game played between man and the nature. In this game of uncertainty, sometimes they fly out in colours and sometimes submit to utter fiasco. They enjoy this game with true spirit of sportsmanship and continue with sustaining enthusiasm. Ever since the game started, man has been adapting himself through time tested methods which were inherited from his ancestors or those identified and developed by their own generation. Thus, he protects himself from the consequences of a bitter failure or mitigate the impact of that failure. It is worthwhile remembering Melkote (1991) maintaining that the subsistence farming which is often considered by men of communication as a character of so called laggards is an insulating mechanism preventing them from subjecting to a disastrous condition in case of a crop failure. A statesman of our welfare state may feel ashamed if he hears that such a method of adaptation still prevails in our times. But it is a fact that such farmers are not rare still.

Kerala is famous for spices and plantation crops from time immemorial. Kerala's farming is particularly designated as homestead farming. This is a self sufficient and sustaining system characterised by a bit of land around the house which supply all the food, food supplements and medicines required by the family. The crops mainly include tubers, fruits and vegetables along with milch animals and birds for eggs. However, with the development of cities and towns, farmers shifted to commercial growing of vegetables to satisfy the requirement of urban people.

Gopalakrishnan (1997) observed that out of the total domestic requirement of vegetables in Kerala, about 60 per cent was brought from the

neighbouring states. The 13 lakh tonnes of vegetables consumed in Kerala had a share of 7 lakhs tonnes produced outside the state. In Kerala there is approximately an area of 78000 hectare under vegetables with a production of 8 lakh tonnes including drumstick and tuber crops.

Gopalakrishnan (1996) stated that important vegetable crops in Kerala include Bitter gourd (*Momordica charantia*), Cowpea (*Vigna anguiculata* var. *sesquipedalis*), Snake gourd (*Trichosanthus anguina*), Oriental pickling melon (*Cucumis melo* var. *Connomon*), Ash gourd (*Benincasa hespida*), Amaranthus (*Amaranthus* sp.), Bhindi (*Abulmoschus esculentus*) and Pumpkin (*Cucurbita moschata*).

Ramegowda (1991) stated that among the natural calamities occurring in India on a regular basis causing death, destruction and distress on a large scale, drought stood very high followed by flood, cyclone and earthquake. As far as the vegetable growers of Kerala are concerned, none of the above appear to be a reason for their crises. For them the crises have its roots on pest and disease outbreaks, unexpected price fall, heavy rainfall and unexpected floods and droughts.

Gopalakrishnan (1997) stated that increasing pest and disease incidence was a threat to crops like bitter gourd, cowpea, snake gourd, bhindi and amaranth. The high production cost of vegetables in Kerala made the farmers highly sensitive to slight fluctuations in the price levels of produce. The reason for high production cost was attributed to the high labour charges prevailing in Kerala. However, this is a matter of controversy.

Singh (2001) stated that our vegetable requirement by 2010 would be 135 million tonnes. Kerala also is supposed to make her own contribution to this all India requirement. However, the vegetable growers being subjected to crises frequently, a boost in production cannot be expected unless they are sufficiently

protected and supported through various measures. This can other wise be carried out by enhancing the crisis management ability of the vegetable growers. For that, one should know what are the major crises prevailing in the vegetable farming sector, how do they manage those crises, what is the rationale behind their action and what do they think about an external agency intervening in their situations of crisis. With this end a study entitled "Adaptation behaviour of vegetable growers in crisis situations" was undertaken with the following objectives.

1. To identify the major crises situations that are faced by the commercial vegetable growers of Kerala.
2. To identify methods of adaptation in such crisis situations.
3. To find out the rationality of those methods of adaptation.
4. To analyse farmers' perception about the intervention by external agencies in helping them for anticipating crises or in mitigating the consequences of the crises.

Scope of the study

The vegetable cultivation has features both favourable and detrimental to farmer's interests. Short duration of most of the vegetable crops is a favourable feature while high perishability of the produce and requirement of a dynamic marketing chain is an unfavourable feature. Limited facilities for export and inadequate storage facilities add to the crisis in vegetable marketing scenario.

However, in recent years, Kerala has intensified its efforts to become self sufficient in vegetable production. Vegetable and Fruits Promotion Council (VFPC - former Kerala Horticultural Development Programme), Department of Agriculture and Kerala State Horticultural Product Development Corporation (KSHPDC) are working to achieve this objective. Besides these agencies, the three-tier panchayat system also has taken interest in promoting vegetable production in their own panchayats. The Department of Agriculture has organised

Haritha Sanghams (vegetable farming groups) for this purpose. This has attracted many youth towards this venture and has become a peoples' project which brought school and college students and employees from various sectors into vegetable production scenario. Provision for subsidies is a major attraction of the programme.

VFPCK is the other organisation involved in brightening the future of vegetable production and marketing scenario in Kerala. This again is through organising Self Help Groups (SHGs) known as *Swashraya Karshaka Sangams* and extending soft loans from commercial banks under their supervision. They also strongly intervene in the vegetable marketing through organising vegetable markets run by the SHGs of farmers (*Swashraya Karshaka Vipanis*).

In spite of all these efforts, crises prevail in the vegetable production and marketing. None of the agencies are able to ensure a reasonable price for all the time. Besides some of the diseases have become a menace which prevent farmers from cultivating certain crops. Bitter gourd cultivation in some places is a typical example. Gopalakrishnan (1997) attributed this to the indiscriminate use of inorganic fertilisers and pesticides.

Limitations of the study

This study was undertaken as part of the post graduate degree programme of four semesters and hence is a single student venture. Both time and money remains a constraint in bringing out an exhaustive study. The problem is very deep and touches the socio-economic and socio-psychological areas of the farmers. The crises and agents creating the crises are readily exposed links of a vicious circle.

This thesis consists of seven chapters including the present one. A review of relevant literature is given in chapter two. The methodology adopted for

this study is given in chapter three. The fourth chapter presents the results of the study and in chapter five a brief discussion about the results is given. The chapter six gives the summary and conclusion of the present study.

Review of Literature

CHAPTER-II

REVIEW OF LITERATURE

In this chapter an attempt is made to build up a theoretical frame work for the study through review of related studies already conducted in the field. The presentation is in the following order.

- 2.1 Concept of crisis
- 2.2 Concept of behaviour
- 2.3 Concept of adaptation
- 2.4 Related studies about adaptation behaviour
- 2.5 Concept of vegetable grower
- 2.6 Intervention by external agencies in crisis situations

2.1 Concept of crisis

The term crisis has been used differently by learned scholars from different disciplines like history, sociology, psychology, management, economics and politics. It is essential to go through these definitions/meanings which were given in the different contexts before operationalising the concept of crisis for the purpose of the present study.

According to Barnard (1938) "crisis is a situation or an event that confronts decision makers with an opportunity for response, either action or inaction".

Hirschman (1958) viewed that crisis might stimulate action and learning on a problem on which insight has been low and which for that very reason has not been tackled as long as it was in acquiescent state.

Parad and Cuplan (1960) defined crisis as a period of disequilibrium, over powering the individuals homeostatic mechanism. During crisis, a person was

faced by a problem which was of basic importance to him because it was linked with his fundamental instinctual needs.

Rapoport (1962) indicated that crisis was said to be produced by a hazardous event which was threatening instinctual needs where persons were more susceptible to influence.

Wiener and Kahn (1962) enumerated the following 12 generic dimensions of crisis: (1) crisis is often a turning point in an unfolding sequence of events and action, (2) crisis is a situation in which the requirement for action was high among participants, (3) crisis threatens goal and objectives of those involved, (4) crisis was followed by an important outcome whose consequences shape the future of the participants, (5) crisis consists of convergence of events that results in a new set of circumstances, (6) crisis produced uncertainties in assessing a situation and in formulating alternatives for dealing with it, (7) crisis reduced control over events and their effects, (8) crisis heightened urgency which often produced stress and anxiety among participants, (9) crisis was circumstances in which information available to participants was usually inadequate, (10) crisis increased time pressures for those involved, (11) crisis was marked by changes in the relation among participants and (12) crisis rised tension among participants especially in political crisis involving nations. Seligman (1963) defined crisis as a grave and sudden disturbance of economic equilibrium.

In the context of organizational crisis, Hermann (1963) identified three dimensions of crisis which included (1) threat to organisational value, (2) restricted response time (3) a situation unanticipated by organisation.

Miller and Isac (1963) reviewed traits of crisis as used in psychological and sociological studies and they elaborated that (1) a crisis situation was acute rather than chronic, although its length was unspecified, (2) crisis resulted in behaviour that was frequently pathological, (3) crisis threatened the goals of

persons involved, (4) crisis was relative; what was crisis for one party or participant might not be for another, (5) crisis causes tension in the organism including physical tension and anxiety.

Cuplan (1964) defined crisis as concentrated periods of disturbances often characterised by intense upset, preoccupation, emotional churning, sense of inadequacy and openness to the input of other people.

Hermann (1965) reported that stress, conflict, tension, panic, catastrophe and disaster were terms used more frequently by social scientists than crisis.

Stoddard (1966) in an analytical model regarded the phenomenon of disaster as a social process of disaster emergence. The main elements are (1) a catastrophic agent creating, (2) a social crisis. The type of crisis would determine for emergent problems depending upon the specific combination of crisis dimensions occurring. The six major dimensions of crisis were (1) focus, (2) directness, (3) controllability, (4) periodicity, (5) transience and (6) scope.

Young (1968) referred crisis to situation which has important implications for stability for some pattern of interaction, system or subsystem.

Robertson (1970) referred that Chinese symbol for word crisis was composed of two characters one meaning 'danger' and the other 'opportunity'. Danger was implicit in crisis but there was also an opportunity for constructive action to solve the problem.

Stallings (1971) derived that a crisis generating event was one which distrusted existing patterns of relationships among members of a social system and/or between the system as a whole and its environment. The term crisis was a label applied to those collective states in which conventional norms were inappropriate as guidelines of group behaviour.

Eysenk and Arnold (1972) on the origin of the term crisis stated that the term came into psychology from medicine. Hippocrates used it for sudden cessation of a state which gravely endanger life.

Walman (1973) proposed the idea that particular stages of development were crisis periods during which the individual was susceptible to change. During times, a person may progress or regress. Intervention of those time consist of aiding the individual to progress.

Giannatti (1975) opined that crisis generally was catastrophic but functionally, it must be free of its apocalyptic implications and understood to be a serious condition.

Lateef (1980) pointed out that the crisis in Darwinion sense was the ruthless challenge to *status quo*, people either drown or learn to swim.

Johnston and Taylor (1986) opined that the term crisis could be substituted by 'problem' without loosing any meaning.

Godlier (1987) stated that crisis was a critical juncture in an irreversible process from which a radical change had become necessary. Crisis was a period of transformation or transition.

According to Ramegowda (1991) "crisis is a situation exacted out of a family or social and or natural environmental factors affecting socio-psychonomic equilibrium of the individual, families and societies".

Parry, G. (2000) stated that the word crisis really meant a point or a time for deciding something, the turning point, the decisive moment.

2.1.1 Crisis and Disaster

Disaster is a term similar to crisis but used in a different context.

New Websters Dictionary and Thesaurus (1991) defined disaster as an adverse happening, sudden misfortune, catastrophe.

Comparing the above said definitions for disaster and crisis, one can delineate the fact that a crisis could occur at individual level, but disaster refers to the society and results from hazards.

Another term commonly used in agricultural research and can be confused with crisis is the constraint. New Websters Dictionary and Thesaurus (1991) constraint as a compelling force or restraining force. It was not a particular incident and resulting situation.

Risk is another related term. New Websters Dictionary and Thesaurus (1991) defined risk as "the possibility of loss, injury or destruction which were involved in the dangerous mission or sometimes that creates or suggests a hazard or adverse chance, a dangerous element or factor often used with qualities to indicate the degree of danger or hazard".

Sharma (1998) opined that disaster was a serious disruption of the functioning of the society, causing wide spread human, material or environmental losses which exceed the ability of the affected society to cope using its own resources. Hazard was a phenomenon that posed a threat to people, structures or economic assets and which might cause a disaster. They could be either man made or naturally occurring in our environment. A disaster was the product of a hazard.

In the present study the crisis of commercial vegetable grower was operationalised as any disturbance in the normal course of production and marketing of vegetables which necessarily result in an economic loss.

2.2 Concept of behaviour

Lamarck (1914) maintained that: (i) every fairly considerable and permanent alteration in the environment of any race of animals worked a real alteration in the needs of that race, (ii) every change in the needs of animals necessitated new activities on their part for satisfaction of those needs and hence new habits and (iii) every new need, necessitated new activities for its satisfaction.

Kaplan (1933) claimed that coping encompassed a wide range of variables. Three broad categories of coping variables were "coping resources, coping styles and coping efforts, where, (i) coping resources were generalized attitudes and skills that were considered advantageous across many situations; they include attitude about self, attitude about world, intellectual skills and interpersonal skills, (ii) coping styles were generalized coping strategies defined as typical, habitual preferences for ways to approaching problems and (iii) coping efforts are specific actions (covert or overt) taken in specific situations that are intended to reduce a given problem".

Murray (1938) proposed an extensive list of psychological needs involved in a wide variety of human functioning. These needs in combination with environmental 'press' permit the construction of hypothesis to explain individual behaviour.

According to Lewin (1948) behaviour was a dynamic balance of forces working in opposite direction, the driving forces and the restraining forces.

One psychological theory which provides a useful frame work to understand individual behavioural change was the personal construct theory advanced by Kelley (1955). He viewed man as a scientist whose ultimate aim is to understand, predict and control the environment or world in which he lives. Like a scientists he sets up hypotheses (constructs), tests them and observes the results.

He thus tries to make sense out of this world by predicting it rather than reacting to it. His system of constructs may be thought of as an internal representation or model of the environment - unique to each individual.

He further noted that the capacity to change vary among the individuals and as well tolerance limits for environmental changes.

According to Theory of Stress and Coping proposed by Lazarus (1966), threat and cognitive appraisal were central elements of human actions. Where threat was defined as the anticipation of harm - which was considered as 'motive thwarting' that is, the individual anticipates that achievement of some goals would be blocked.

Hollander (1967) concluded that there were many ways in which an individual adjusted to difficulties and obstacles. One obvious way of dealing with the barriers was to find an alternative goal, which could be called 'compromise'. Instead of 'X' alternative goal, select 'Y' as a substitute. Another technique of adjustment was withdrawal or escape method. In this case, an individual will deny the desire. Direct aggression was usually thought of as an assault on the barrier. Here the individual striked out verbally or otherwise toward the evident sources of frustration. The fourth type was displaced aggression - which was nothing but attacking others other than barriers.

Encyclopaedia Britanica (1973) described behaviour as an externally apparent activity of a whole organism. Its characteristic was movement. It was the result of internal or external changes called stimuli. It had its roots either at heredity (innate/instinctive behaviour) or psychological process of learning (learned/conditioned behaviour) or both. There are four primitive types of behaviour having obvious adaptive results viz., ingestive behaviour, shelter seeking, sexual and investigatory or exploratory behaviour. In complex animals like man, there may be also other agonistic behaviour (fighting and escaping),

allelomimetic (mutual imitation), epidemetic (care giving), et-epimeletic (care seeking), eliminative (removal of body waste). Behaviour can be social or non-social based on its functions in relation to other members of the society.

Secord and Backman (1974) states that behaviour of an individual is a part of many different factors. Some times these have been classified in to just two categories. Individual and situational. One view is that behaviour springs fully from structured dispositions with in the individual; the other is that an individuals behaviour is determined by the situation he is in.

2.3 Concept of adaptation

Ginsberg and Opper (1969) stated that adaptation included two complementary processes namely assimilation and accommodation. Assimilation is the process by which an individual deals with an environmental event in terms of its correct structure; accommodation is, individual changes in response to environmental demand.

Dimarco (1970) claimed that adjustments involved four stages: i) shock, ii) defensive retreat, iii) acknowledgement, iv) adaptation and change. The third and fourth were considered as active problem solving behaviour.

Caplan (1972) delineated the elements of crisis reaction on three distinguishable stages. They include: i) impact - characterised by the use of most habitual coping mechanisms in response to rising tension and ii) recoil stage - when typical means of coping becomes ineffective, victims may express denial of crisis, withdraw from those around them and develop symptomatic emotional response. The crisis is resolved either by reversal or removal of the precipitating stress or by victims restructuring the situation, learning to cope with new circumstances or by responding to assistance in discovering alternative solutions.

Sartain *et al.* (1973) stated that coping was the way in which we respond to the situations, including the stimuli, threats and promises which face us. Adaptation is similar, though at times carries the connotation of biological accommodation. However, psychological processes can be and often are as fully adaptive as biological ones. In some cases we make what might be called a good adjustment - that is, we cope adequately, we are straight forward and realistic in our investigations of and responses to our circumstances. In other cases, we may lead ourselves to believe things that are not true, not because of the evidence for our conclusions, but even in spite of the lack of it. Such behaviour we call defensive.

The process that best describes how social units adopt policy to mitigate risks to environmental extremes has been defined in a simple ideal type proposed by Slovic *et al.* (1974). The process comprised of four steps in which social units, be they individual, society or intermediates, first, assessed the probabilities of natural environmental extremes; second, reviewed the alternative adjustment policies available to mitigate risk; third, evaluated the impacts of these alternative adjustment strategies in reference to both risk abatement and consequences for other aspects of social life and choose none, one or more adjustment policies.

Folkman *et al.* (1986) reported that there were 8 forms of coping strategies to stress, viz., i) confrontive coping, ii) planned problem solving, iii) social support, iv) distancing, v) self-control, vi) escape avoidance, vii) accepting responsibility and viii) positive reappraisal.

New Webster's Dictionary and Thesaurus (1991) defined adaptation as a gradual process of adjustment to new physical condition exhibited by living organisms.

2.4 Related studies in adaptation behaviour

Skrabanek *et al.* (1964) studied the adjustments of 217 rural households in Mill County Texas to drought from 1945 to 1957. Their adjustments observed

were: change in residence, migration off the farm, reduction in cotton and peanut production, shift from cattle to sheep and goats and increased off-farm employment.

Wolpert (1966) revealed that the decision to migrate was one form of coping mechanism or adaptation to ecological disharmony.

Norman (1967) found that largely because of the long dry season and relatively limited amounts of irrigated land, a fairly substantial proportion of farmers' time in the Savanna areas of West Africa was devoted to off-farm occupation. The month wise distributions of time devoted to farm and off-farm occupations was negatively correlated.

The work of Kates (1971) based on research in United States illustrated the importance of a personal experience of extreme weather leading to responsive action.

Laya (1975) summarised the evidence provisionally derived from the interviews with farmers and livestock owners of the Sahel. Some of reactions of farmers to drought identified were: attempts by farmers to diversify crops, adoption of other varieties, land clearance, spacing of seed holes and changes in cropping techniques.

McCloskey (1975) maintained that a number of options existed which the farmers can employ to protect themselves against risk. One of the oldest methods was to farm separate plots. Parcelization of holdings could divide a farmer's land among locations with different local risk characteristics. For example, use of both upland and bottom fields could reduce the likelihood that less than catastrophic weather events would affect crops in both locations identically.

Agriculturists live in areas of unstable weather developed a variety of insurance mechanisms to cope with variable output. They accumulated various

types of assets in good periods which were drawn upon when drought reduced production. They also developed specific migration patterns for cattle and humans (Morris, 1975).

Norman and associates (1976) observed that in Savanna (Sokoto area) farmers go on off-season migration to find work during the long dry season.

Chamala and Crouch (1977) studied the patterns of adaptation and factors associated with economic success in the wool industry in North Westland, Australia. They identified that selling sheep, taking off-farm work, growing some irrigated pasture and cutting down family expenditure and selling wethers early were the main management strategies followed by graziers for coping with drought condition.

Blakeslee (1978) revealed that to adapt to the drought, Indians in Eastern Nebraska, store a year supply of dried corn. A crop that failed was replaced by appeals to kin or friends through interband trade system or by resorting to increased hunting and food gathering.

The study by Kgathi and Opschoor (1979) confirmed that people react by not ploughing or ploughing a smaller acreage, raised cash to buy food through cattle sales and support from relatives and child employment. Large cattle owners tended to sell more cattle. The rich and middle class were generally better able to survive in arable drought because of having the means to neutralize its primary effects.

Bein (1980) reported that drought resistant grains, diversity of grain, seed mixers and soil moisture retention practices were their basic survival technology.

Bharana (1980) opined that social changes during drought years included a breakdown in caste system and increased cooperation among people. Also, people were forced to migrate to find a livelihood.

Jiggins (1986) captured the impact of 1943-44 Bengal famine on women. He reported that distress sale of hut, labour, bullocks, roof sheets, windows and doors, ornaments, furniture, cow, brass and bell metal utensils and mortgage of last room were found among three famine hit cases.

Longhurst (1986) maintained that rural families had a range of strategies to cope with seasonal and inter-seasonal fluctuations in food supply. For landed households the most important seasonal strategies included choice of cropping patterns to spread risks by involving mixed cropping, cultivation of secondary crops, particularly, root crops. Other seasonal coping mechanisms included sale of small assets and livestock, drawing down of stored product and cultivation of supportive social relationships. Off-farm income earning work provided one of the best buffers against seasonal stress.

To mitigate the impact of drought, farmers of Bangladesh used new practices such as irrigation of crops normally grown rainfed, cultivation of famine millets and when rain eventually fell transplanting crops that are normally direct seeded (including replanting to fill gaps in drought affected fields). Crop rotations also were adjusted to compensate for crop losses or late planting and to take advantage of reduced flood levels or changes in market prices (Brammer, 1987).

A study by Fuller (1987) in Sudan area revealed that there had been migration of people from Northern Darfur to Southern Darfur, an area of high rainfall. Many migrants cut wood for sale, and some worked as farm labourers. Other migrants resorted to the use of various kinds of so called 'starvation foods' to supplement their food supply. For example, nuts, thorns and grass roots were being

collected and ground to make a flour. In some areas, migrants dug up ant hills in search of grain that the ants had stored.

Grandin and Lembuya (1987) observed that mobility was the primary strategy adopted to cope with fodder shortage in Kenya. Several producers were also traders and used their access to sell some of their own animals before the drought rather than buying other producer's live stock.

Ibrahim (1988) summarised the results of field work enquiry into peasant adjustment to drought hazard in the semi-arid areas of Sudan. It was found that new crops had replaced the traditional poor yielding late maturing one's.

Taal (1989) inferred that to minimise risk and to cope with stress, households of Gambia adopted the strategies of choice of cropping patterns, crop storage, reduced consumption, off-farm work, asset disposal and community and kinship ties.

2.5 Concept of vegetable grower

Tindal (1968) described a commercial vegetable grower as one who grow his crop for reward and if his marketing was organised on a sound basis, he should be able to make satisfactory profit.

Bonny (1991) defined commercial vegetable grower as one who had taken up cultivation of vegetables mainly for the purpose of market to make profit.

Vinayagam (1998) defined commercial farmer as one who cultivated a crop with the main orientation and intention of preparing the produce for sale in the market for better returns.

Manoj (1998) defined commercial vegetable grower as one who had taken up cultivation of vegetables in an area of at least 50 cents mainly for the purpose of market to make profit.

For the purpose of the present study the commercial vegetable grower was defined as one who cultivated any type of vegetables and offered the whole or major portion of the produce for sale.

2.6 Intervention by external agencies in a crisis situation

Fliegel and Kivlin (1966) found that perception of some of the characteristics of innovations varied between farmers and experts. Correlation coefficients were high in positive direction in case of rate of cost recovery, saving of time and association with dairying. They were moderate in positive direction in case of initial and continuing cost, complexity, mechanical attraction and divisibility for trial. Perception regarding discomfort and complexity were negatively (but not significantly) related between experts and farmers.

Roy and Jaiswal (1969) compared the perception of farmers, extension workers and research workers regarding the selected characteristics of the innovation in relation to adoption. The perception of the three groups of respondents were analyzed with respect to six selected characteristics namely profitability, cost, cultural compatibility, physical compatibility, complexity and communicability of the agricultural innovations. The findings of their study revealed that the farmers perceived different characteristics of the innovation as less favourable for adoption than the research worker and extension personnel.

Ranganath (1978) found that all the drought relief works executed were not satisfactory for majority of respondents. The soil conservation work was not satisfactory for majority of respondents whereas, minor irrigation works was found to be not satisfactory for 43 per cent of people. Majority of beneficiaries of soil conservation work were not satisfied with the method of formation of bunds and structures and many of them were unhappy about non-involvement of local leaders and beneficiaries.

Kantharaju (1980) found that majority of the farmers had perceived sunflower cultivation as moderately favourable to their situation. Further, innovation dimension-wise analysis revealed that perception of majority about initial cost, saving time compatibility with existing practice, complexity, cultural compatibility, observability was highly favourable.

Narasimha Reddy (1981) in a study on evaluation of drought prone areas programme (DPAP) in Ponnai (West) Watershed of Chittoor district reported that majority of beneficiaries were of the view that services and supplies were always punctual. Also, majority of beneficiaries were satisfied with the financial assistance and subsidy provided by the DPAP. Further, majority of the local leaders of the area felt that DPAP had developed good developmental programmes and also working of the DPAP was very good.

Sharma (1998) while discussing about natural disaster management opined that the agencies involved in disaster management come under the categories (1) community organisations, (2) non-governmental organisations, (3) Government.

Sachdeva (1998) stated that although disasters have been a part of life, the need for preparedness, mitigation and management of disasters has been felt only recently. It required education and training of the people, who lived in disaster prone areas. Education was to be given to those who are directly affected by disasters.

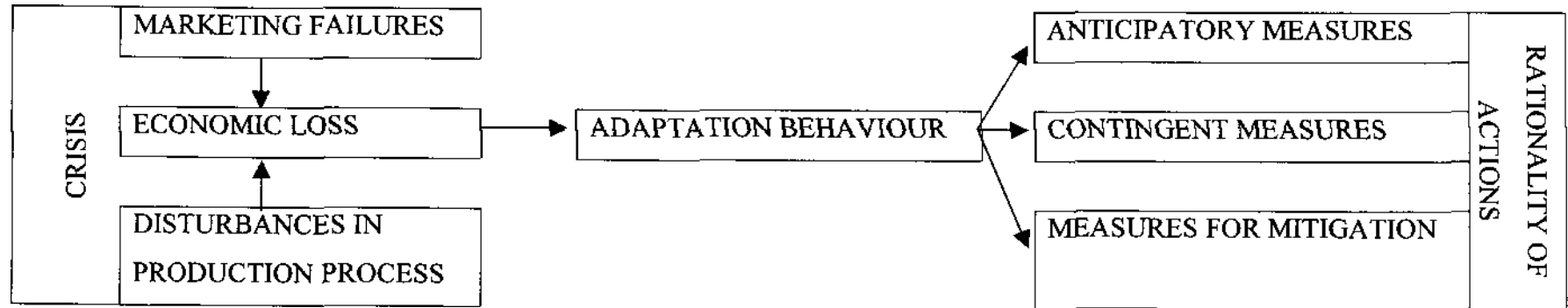
Mohanty (1998) while discussing about role of media in disaster management stated that disaster management had certain communication tasks inherent in it. These were awareness building through forecasting and warning, education and training during the pre-disaster stage, confidence building, adequate and meaningful information on relief measures being undertaken and networking

of local groups and agencies in the disaster stage, and mobilisation of the people for rehabilitation and reconstruction activities during the post disaster stage.

Kiran and Rao (1998) found that only 56.00 per cent of the respondents knew that cyclone disaster preparedness was an activity concerned with individual, community, government and NGOs. About 19.00 per cent viewed it as only an individual activity and 15.00 per cent as solely government activity.

In light of the concepts and theories explained above, adaptation behaviour of commercial vegetable grower was conceptualised for the present study as an action taken by the farmer with an intention either to arrest the development of a disturbance in the normal course of production and marketing of vegetables into a crisis or the action taken to mitigate the crisis or the anticipatory measures taken to protect himself from the impact of a possible crisis.

Fig. 1. Conceptual diagram



Methodology

CHAPTER-III

METHODOLOGY

This chapter comprises the following sub-captions, describing the methods and procedures followed in this research study.

- 3.1 **Research Design**
- 3.2 **Locale of study**
- 3.3 **Selection of sample**
- 3.4 **Selection of variables for the study**
- 3.5 **Operationalization and measurement of variables**
- 3.6 **Methods of data collection**
- 3.7 **Statistical tools used**

3.1 Research design

Research designs are developed to enable the researcher to answer questions as validly, objectively, accurately and economically as possible. The main objective of the study was to analyse the adaptation behaviour of commercial vegetable growers in crisis situations. Ex-post-facto research design was adopted in this study. 'Expost-facto' research is a systematic empirical enquiry in which the scientist does not have direct control over the variables under observation as it had almost occurred or because they are inherently not manipulable (Kerlinger, 1973).

3.2 Locale of study

This study was conducted in Eranakulam district considering the criteria such as more area under vegetable crops, traditional vegetable cultivation, intervention of Vegetable and Fruits Promotion council of Kerala (VFPCCK) and more marketing demand for the produce.

Fig. 2. Map showing the location of the study area

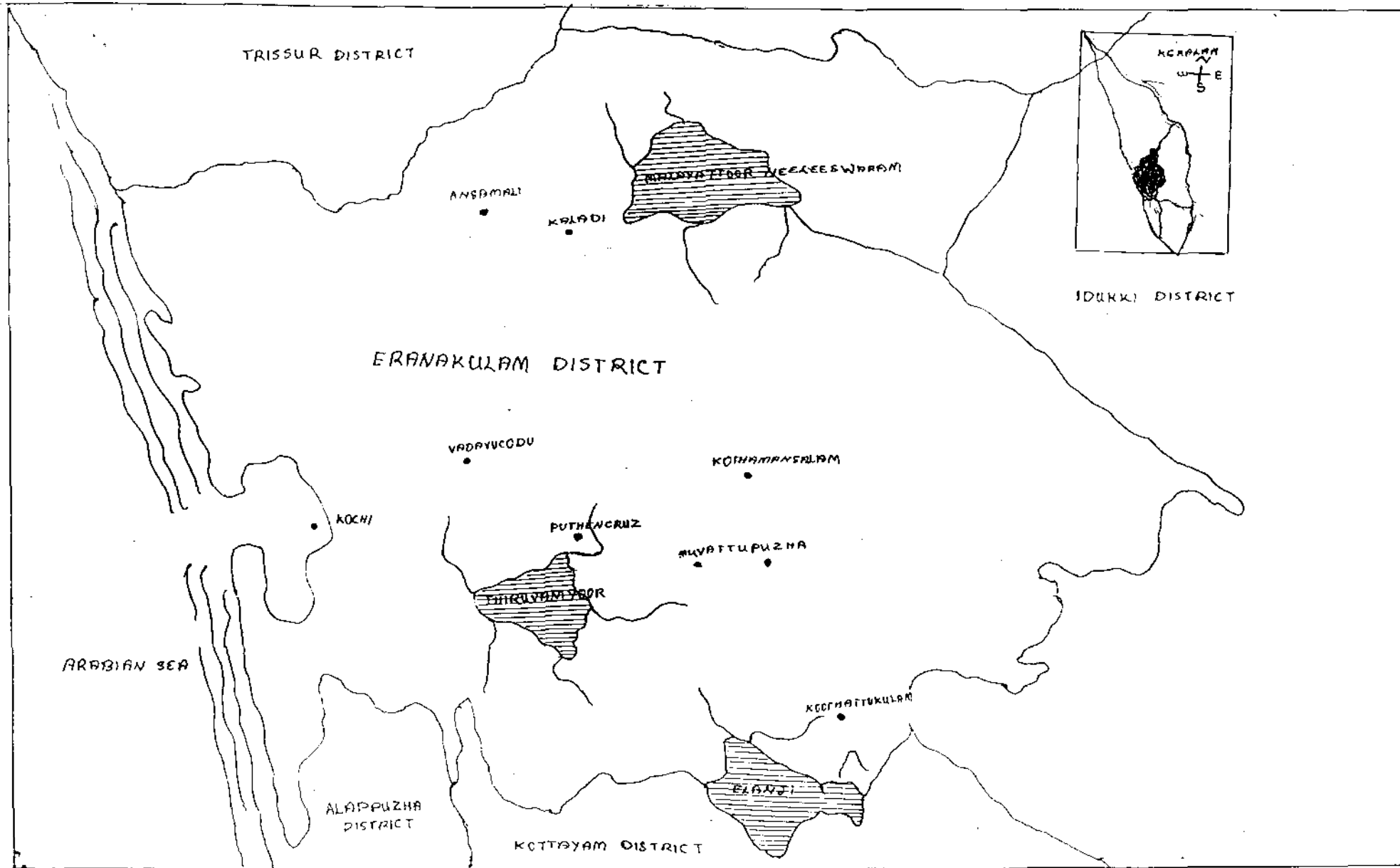
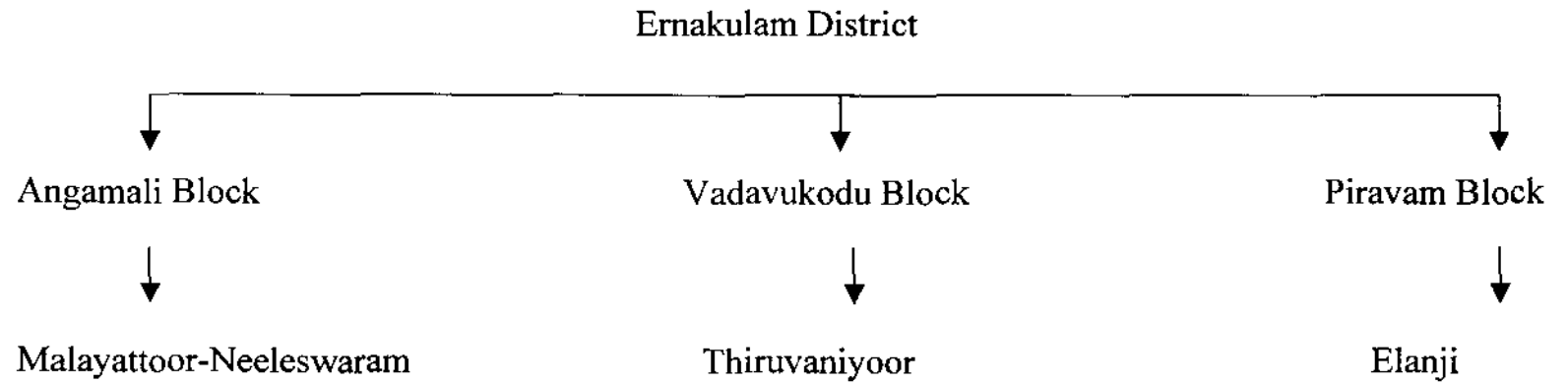


Fig. 3. Chart of blocks and panchayats selected



The area under vegetable crops in all the blocks of Ernakulam district were collected. Three blocks with maximum area in vegetable cultivation in descending order were selected namely Angamali (457 ha), Vadavukode (243 ha), Piravom (242 ha). List of vegetable area in each block and panchayats are furnished in Appendix I. From the three blocks, three panchayats with maximum area in vegetable crops were selected in descending order such as Malayattoor-Neeleswaram (150 ha), Thiruvaniyoor (138 ha) and Elanji (55 ha). Study area and selection of locale are depicted in Fig.2.

3.3 Selection of sample

The selection of sample was done observing a criterion. This criterion was fixed by conducting a survey among the farmers and officials of VFPCCK. Based on the opinion of farmers as well as the officials five vegetable crops namely Bitter gourd (*Momordica charantia*), Snake gourd (*Trichosanthus anguina*), Oriental pickling melon (*Cucumis melo var conomon*), Ash gourd (*Benincasa hespida*), Cowpea (*Vigna anguiculata var sesquipedalis*) were considered as criterion crops. The farmers who cultivated any one of these crops with in the five year period of time prior to the conduct of study formed the respondent. Fifty farmers each from a Panjayat were selected forming a total of 150 respondents for the study.

3.4 Selection of variables for the study

The objectives of the study necessitated the selection of variables namely season, agents creating the crisis, methods of adaptation, perception of farmers about external intervention in crisis situations and adaptation behaviour.

3.5 Operationalisation and measurement of variables

Operationalisation and measurement of variables are explained as follows.

3.5.1 Season

The term season was operationalised as the distinct time periods in an year with in which vegetable cultivation is undertaken. The season of vegetable crops of the study area was decided by the Package of Practice Recommendations of KAU (1998) and these seasons were verified with the farmers as well as the officials of State Department of Agriculture. In the light of discussions, three seasons were identified such as May-June planting, September to December and January to March. The respondents were asked to express the season in which maximum crisis was encountered. Based on the responses, frequency of response under each season was calculated.

3.5.2 The agent creating the crisis

The agent creating the crisis as observed by the farmers which included diseases, pests, natural calamities, marketing problems and seed related issues.

The respondents were asked to give their reasons for the cause of the crisis in vegetable crops as per operationalisation given above. All the responses were recorded and catalogued. The duplication of similar reasons expressed by farmers were refined and grouped.

3.5.3 Methods of adaptation

Wienphl (1972) reported that multi-species holdings were desirable since mortality and recovery rates vary among cattle, goats, sheep and camel.

Jarvis (1974) reported that selling livestock at a lighter weight and feeding growing animals less were adaptive strategies of drought hit farmers.

Borkar and Nadkarni (1975) studied the impact of drought on rural life of two villages in Maharashtra. They reported that scarcity compelled the households to sell their assets and live off their capital as their normal sources of income dry up.

In the above presented literature three types of adaptation behaviour which are anticipatory, contingent and that for mitigation are apparent. This has been verified through the pilot study that such three types of behaviour exists in adaptation of vegetable growers to crisis situations. Therefore the above three steps were adopted at individual level for the present study.

The methods of adaptation was operationalised for the present study as any action of the farmers in anticipation of a crisis for arresting the growth of an issue in to a crisis or to mitigate the impact of an already occurred crisis.

As per the operationalisation, three stages were identified under methods of adaptation.

3.5.3.1 *Contingent measures*

This was operationalised as the action taken by the farmer within the time period between the initiation of a disturbance in the normal process of production and marketing and it develops into a crisis, in his attempt to arrest the development of the crisis and hence the economic loss.

As per operationalisation of the term the action was judged as contingent measure based on the time period in which it was taken and the purpose which it served.

3.5.3.2 *Measures for mitigation*

This was operationalised as the action taken by the farmer to mitigate the impact of an already occurred crisis on his normal living conditions.

As per operationalisation of the term the actions were judged as measure for mitigation based on the fact that they were taken immediately after the crisis has occurred and it served the purpose of mitigating the impact of a crisis in the normal living condition of the farmer.

3.5.3.3 *Anticipatory measures*

This was operationalised as the action taken by the farmer in advance to minimise or nullify the impact of a possible crisis on his normal living conditions.

Based on the operationalisation of the term an action was judged as an anticipatory measure based on the fact that it was adopted in the normal course of production and marketing with an intention of preventing the occurrence of a crisis or minimising or nullifying the impact of a crisis.

After clarifying the above three methods, farmers were extensively interviewed to express the methods of adaptation practised. Each practice was grouped under these methods of adaptation identified.

3.5.4 **Perception of farmers about intervention by external agencies in crisis situations**

Bruner *et al.* (1956) defined perception as a matter of identifying the environmental referent of the sensory input and of anticipating properties.

According to Bhatia (1973) perception is the sensation plus meaning, sensation signifying quality and perception an object suggested by that quality.

For the purpose of the present study the perception of commercial vegetable growers about external intervention was operationalised as the perceptual opinion of the respondents regarding the intervention of an external agency during a crisis situation. This was measured by asking the respondents whether the intervention of the external agency during the crisis situation was available or not and if available the respondents were further asked to express whether the intervention was effective or not. These dichotomous expressions were presented to the respondents and asked them to express their perceived opinion and checked under each item. Based on the frequency of responses the percentage was worked out.

3.5.5 Rationality of adaptation methods

For the purpose of the present study the rationality of adaptation behaviour was operationalised as its scientific nature and effectiveness.

Extensive list of crisis management practices adopted by the farmers in vegetable cultivation was prepared by directly asking the farmers. This list was prepared for all the three methods of adaptation. After collecting the list under each method, those practices which were followed by atleast ten percent of the farmers alone were considered for the study. After selecting these items, the items were presented to scientists of Kerala Agricultural University, officials of the State Department of Agriculture and progressive farmers and asked them to rationalise the practices whether the practice was scientific or not. Considering the judges opinion, those practices which were rated by 60 per cent of the judges and above were selected for the study. The selected items were again presented to the same experts to check in a three-point continuum namely "Most effective", "Effective", and "Least effective". Scores of 'Two', 'One', and 'Zero' respectively were assigned. Accordingly those items which were preferred by 60 per cent of the judges as "most effective" and "effective" were considered as rational. The scores obtained by each of the methods of adaptation were worked out. Based on the scores, the adaptation methods were rank ordered to give relative desirability of a particular method (The schedule is given as Appendix III).

3.5.6 Adaptation Behaviour

Adaptation behaviour was operationalised as the extent of adoption of three methods of adaptation (anticipatory measures, measures for mitigation and contingent measures) or any one of the methods in crisis situation of farmers in vegetable cultivation. The methods regarded by the judges as rational formed the items of the index for measuring the level of adaptation.

3.5.6.1 *Scoring procedure*

The selected item under each method were presented to respondent in a dichotomous response to check whether the practices selected under each method were adopted or not. If adopted a score of ‘one’ was assigned. The index was prepared by using the following formula

$$\text{Adaptation Index} = \frac{\text{The number of practices adopted by the farmer}}{\text{The number of practices applicable to that farmer}} \times 100$$

The adaptation behaviour score of the individual farmer was calculated and the respondents were categorised in to three groups namely ‘High’, ‘Medium’ and ‘Low’ levels of adaptation behaviour using mean and standard deviation (The index is given as Appendix IV).

3.6 **Method of data collection**

A well-structured and pre-tested interview schedule was prepared and used for data collection. Utmost care was taken to avoid ambiguity. The schedule was prepared in English and later translated in to Malayalam and the data was collected (The interview schedule is given as Appendix II).

3.7 **Statistical tools used**

Frequency and Percentage analysis was carried out for making comparisons and interpretation of the results.

Results

CHAPTER-IV

RESULTS

In this chapter the collected data is presented in tables along with illustrations using graphs and diagrams. The results of the analysis is also presented. The order of presentation will be as follows.

- 4.1 Characteristics of the sample population
- 4.2 Methods of adaptation
- 4.3 Intervention by external agents in crisis situations
- 4.4 Rationality of the methods of adaptation
- 4.5 Level of adaptation

4.1 Characteristics of the sample population

Interpreting the responses of farmers without understanding their personal background and features will be meaningless. Hence an attempt was made to analyse the profile of the respondent population. The results are presented under the following sub heads.

Profile of the sample

4.1.1 Age

More than 17 per cent of the respondents belonged to the age group of less than 35; while 29.30 per cent belonged to age group between 35 to 45 and the majority (53.30 per cent) belonged to the age group of more than 45 years.

4.1.2 Education

Majority (53.33 per cent) of the respondents belonged to the group having high school education and 39.33 per cent belonged to the group having

primary education. Another 4.00 per cent were graduates. Rest of the respondents were just literate only.

4.1.3 Occupational status

Majority of the respondents were having farming as their primary occupation and only 7.33 per cent took farming as secondary occupation.

4.1.4 Agricultural background

Majority (96.66 per cent) of the farmers were traditional growers of vegetables and only 3.33 per cent had started vegetable growing recently.

4.1.5 Experience in vegetable growing

Majority (32.00 per cent) of the farmers were having experience between five and eight years, 16.60 per cent between 15 and 20 years, 15.33 per cent below five years and 13.30 per cent between 15 and 20 years.

4.1.6 Vegetable farming group membership

Majority (90.00 per cent) of the farmers were members of VFPCCK self help groups, 18.66 per cent were having both 'Haritha Sangham' and VFPCCK membership. Ten per cent of the respondents did not belong to any of the vegetable farming groups.

4.1.7 Membership in other organisations

Majority (51.00 per cent) of the respondents were not having membership in any organisation other than vegetable farming groups. However, 20.00 per cent of the farmers were members in Milma (Kerala State Co-operative Milk Marketing Federation), 20.66 per cent in primary co-operative societies and 8.66 per cent in PDDP (People's Dairy Development Project).

4.1.8 Family size

Thirty three per cent of the respondents were having four member family, 26.00 per cent having five member family and 18.60 per cent having three member family.

4.1.9 Reading habit

Around 86 per cent of respondents read newspaper regularly and 13.30 per cent did not read any of the publications. A small portion (5.00 per cent) of respondents read farm magazines.

4.1.10 Own land

Around 85.00 per cent of the respondents belonged to the category with holding size up to one hectare, 12.60 per cent up to 2 hectares and 1.73 per cent above 2 hectares.

4.1.11 Area of leased in land

Around 37.00 per cent of respondents leased an area between 0.5 to 1.0 acre while 29.30 per cent did not lease any land. Around 20.00 per cent of farmers were leasing an area between 1.50 to 2.00 acres.

4.1.12 Area under vegetables

Around 44.00 per cent of the farmers cultivate vegetable in an area of 0.50 to 1 acre, while 24.00 per cent in an area up to 0.50 acre and 20.00 per cent in an area between 1.50 to 2.00 acres and 15.00 per cent of the farmers in an area between 1.00 to 1.50 acres. Also there was a small portion (8.60 per cent) of the respondents cultivating vegetable in an area of 2.50 to 3.00 acres.

4.2 Methods of adaptation

4.2.1 Anticipatory measures

In table 1 the anticipatory measures adopted by farmers in expectation of a possible crisis are presented. The first 10 items are more frequently used by farmers compared to the rest 15 items in the table. The percentage of respondents utilising each of the items are also shown.

4.2.2 Measures of mitigation

The table 2 lists out the measures of mitigation adopted by farmers after the occurrence of a crisis. The majority(66.66) utilised the first method and the second method by 22.00 per cent.

4.2.3 The crisis and contingent measures

In this part the reports of crisis from farmers and contingent measures taken by them are presented in tables. The crisis and contingent measures should go together as they deal with the root causes of the crises such as pest and disease incidence, natural calamities or price fall. This was different from the measures taken in anticipation or measures of mitigation which aim at handling an unexpected economic loss or already occurred economic loss. The crisis and contingent actions are classified crop wise and season wise as variations occur in these two directions.

4.2.3.1 Bitter gourd (*Momordica Charantia*)

Out of the total 150 respondents, 141 have been cultivating the crop during some season or other for the past five years. From these farmers there were 54 reports of crisis in the first season and 86 reports in the third season.

Table 1. The measures taken in anticipation by the farmers for protecting themselves from the impact of a possible crisis

N = 150

No.	Anticipatory measures	F	%
1	Crop diversification in vegetables	137	91.33
2	Crop rotation with seasonal crops other than vegetable crops	59	39.33
3	Vocational diversification by other enterprises	56	37.33
4	Crop diversification with perennial crops	50	33.30
5	Mixed cropping in vegetables	48	32.00
6	Vocational diversification with other jobs	38	25.33
7	Employing maximum family labour to minimise hired labour	29	19.33
8	Crop diversification with annual crops other than vegetables	17	11.33
9	Adjusting planting time to get yield during high price season	17	11.33
10	Adjusting planting time to protect plants from adverse climatic conditions (soil and climatic)	8	5.33
11	Joint leasing of land and operations	7	4.66
12	Sowing on mounds to avoid problems due to waterlogging	7	4.66
13	Remaining without further expansion of farming business	5	3.33
14	Prophylactic sprayings	5	3.33
15	Obtaining advance orders from shop keepers	5	3.33
16	Share cropping	4	2.66
17	Maintaining regular supply to some shopkeepers	3	2.00
18	Cultivating crop which require less labour	2	1.33
19	Sowing on auspicious days (<i>Thiruvathira Njattuvela, Aswathi, Bharani, Karthika</i>) for better yield	2	1.33
20	Covering fruits to protect from fruitfly	2	1.33
21	Early harvest	1	0.66
22	Organic farming	1	0.66
23	Resorting to cultivation of low risk crops (<i>Amorphophalous, Colocasia</i> etc.)	1	0.66
24	Refrain from institutional loans	1	0.66
25	Burning trashes in the basin to prevent pest and disease attack	1	0.66

Table 2. The measures taken by farmers for mitigating the impact of an already occurred crisis

N = 150

No.	Measures for mitigation	F	%
1	Compensate with profit from other crops	144	66.60
2	Loan renewal by paying interest	33	22.00
3	Avail government subsidies	25	16.66
4	Loans on land and gold mortgage	20	13.30
5	Obtained new institutional loans	5	3.33
6	Sell out land/gold	4	2.66
7	Reuse of panthal materials even after three years	3	2.00
8	Loans from friends and relatives	3	2.00
9	Extend productive period of crop by giving better management	2	1.33
10	Minimise family expenses	1	0.66
11	Advances from vegetable shop keepers	1	0.66
12	Obtained sanction for instalment repayment of loans	1	0.66
13	Utilise their own savings	1	0.66
14	Minimise cultivation	1	0.66
15	Obtain exemption from land rent	1	0.66
16	Resorted to seed production	1	0.66

Crises, Season I

Table 3. Broad classification of crises reported from 1st season Bitter gourd growers

No.	Agencies	F	Percentage
1.	Diseases	20	37.03
2.	Natural calamity	12	22.22
3.	Pests	10	18.51
4.	Marketing related	8	14.81
5.	Seed related	4	7.43
6.	Total	54	100.00

Table 3 shows the number of crisis reports, the factors involved and percentage share of each factor. The major share (37.00 per cent) was that of diseases followed by natural calamities. As table 4 illustrates, 75.00 percentage of the disease incidence was that of mosaic.

Table 4. Classification of crisis reports due to diseases, crop Bitter gourd - season I

No.	Agencies	F	Percentage
1	Mosaic	15	75.00
2	Fusarium wilt	4	20.00
3	Little leaf	1	5.00
4.	Total	20	100.00

From Table 5 it can be noted that heavy rain induced low productivity, 'panthal' lodging and monsoon failure were the major nature related crises reported.

Table 5. Classification of nature related crises, crop-Bitter gourd, season I

No.	Agencies	F	Percentage
1.	Heavy rain induced stunting and reduction in yield	4	36.37
2.	Panthal lodging	3	27.27
3.	Heavy rain induced yellowing	2	18.18
4.	Monsoon failure	2	18.8
5.	Total	11	100.00

Contingent measures, Season I

In case of mosaic incidence in first season bitter melon, 73.30 per cent of the farmers did not take any contingent actions. Some (6.67 per cent) adopted distress spraying with all available chemicals. Some others (20.00 per cent) had taken a more justifiable decision of replacing the crop.

Out of the four farmers who reported fusarium wilt, only one farmer attempted soil drenching with fytolan and rest of the farmers took no action. The disease of little leaf was reported by a single respondent and he did not take any contingent measure. Similarly, in case of fruit fly attack, six farmers out of 9 did not take any action and the rest three tried out some pesticides.

There was a single report of crop damage caused by birds. But the problem was left untackled.

Again in dealing with the problem of unexpected price fall, five farmers (71.44 per cent) out of seven did not take any action. Some (14.28 per cent) took their produce to distant markets.

The nature related crises like heavy rain induced stunting and reduction in yield, 'panthal' lodging and monsoon failure were left uncared. However, one farmer out of two farmers who reported yellowing due to heavy rains replaced the crop. The farmer who reported water logging had constructed drainage canals.

The main seed related crisis was due to low germination percentage. Another farmer reported that the seeds he bought had not shown the varietal characteristics. He replaced the crop.

Season II

The number of reports of crisis from the second crop season was negligible. This may be due to the following facts. In second season, the cultivated area under vegetable is less compared to first and third season. The first season

with its abundant rainfall, has the advantage of bringing up the garden land under vegetable cultivation. At the same time, during the summer season where rainfall was scanty, there would be more area under cultivation as large area of rice fallows having enough residual moisture and facilities for irrigation would be available. In the second season, the area under cultivation is the irrigated land or 'Myals' (not low lands, but sufficient water will be there). Therefore, during the second season, total area under vegetable cultivation is reduced. But there may not be much climatic problems. Pest and disease incidence are low during the second crop season hence reports of crisis are too low from the second season. As the percentage share of crisis reports from the second season for each crop was less than 10 per cent, the season was not considered for analysis.

Crises, Season III

Table 6. Broad classification of crisis reports, crop - bitter gourd, season III

No.	Agencies	F	Percentage
1.	Diseases	67	77.92
2.	Marketing related	9	10.46
3.	Natural calamities	7	8.14
4.	Pests	3	3.48
5.	Total	86	100.00

Table 6 categorizes the agents of crises and its percentage share in creating the menace. Strikingly, marketing related problems, natural calamities or the pest incidence were negligible while 76.13 per cent contribution to the issue was made by diseases.

Table 7. Classification of reports of disease related crisis, crop - bitter gourd, season III

No.	Agencies	F	Percentage
1.	Mosaic	60	89.56
2.	Little leaf	5	7.46
3.	Blackening of fruit	1	1.49
4.	Phyllody	1	1.49
5.	Total	67	100.00

Fig. 4. Percentage of crises dealt with contingent actions

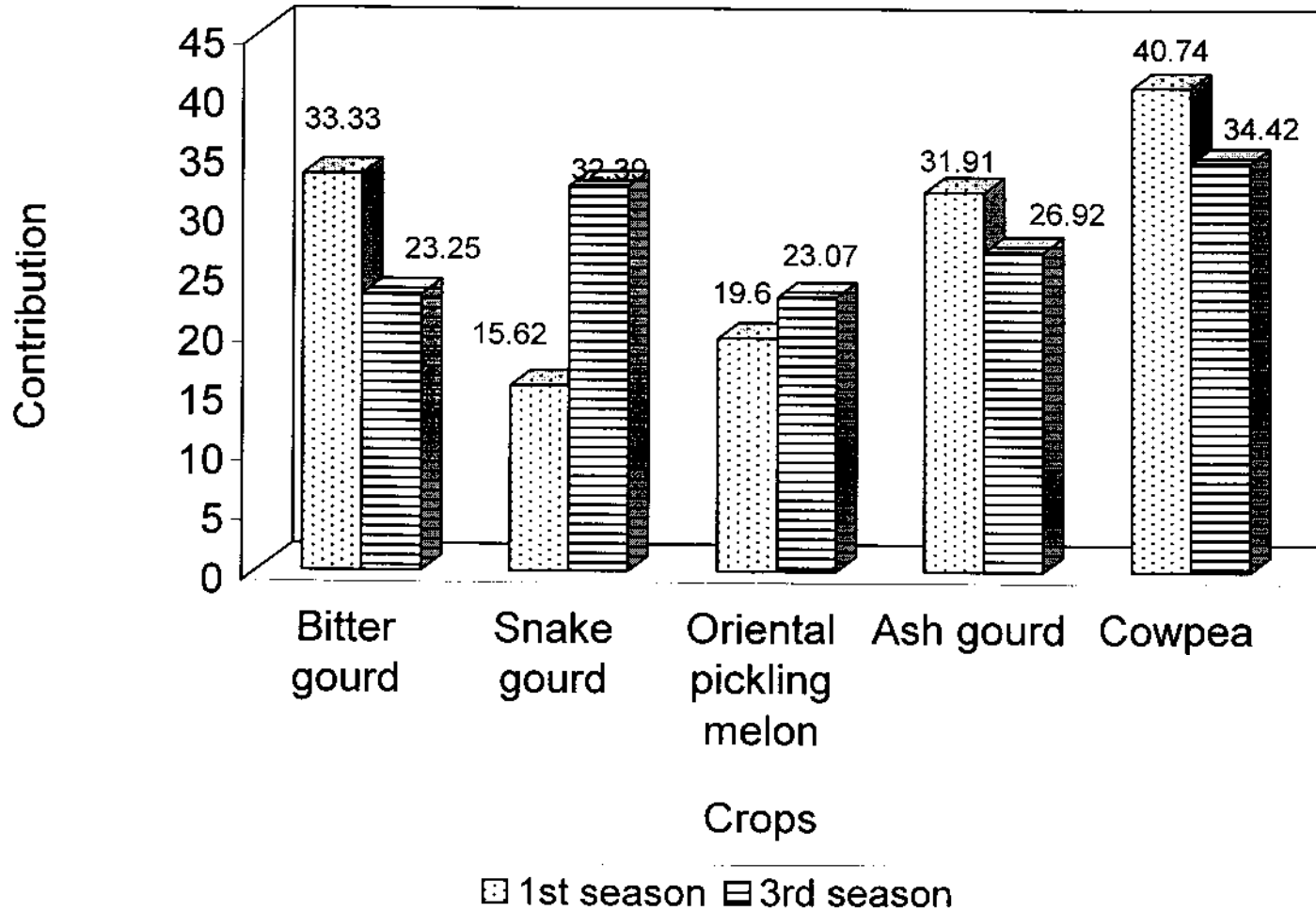


Fig. 5. Share of different agents in creating the crisis, bitter gourd, season 1

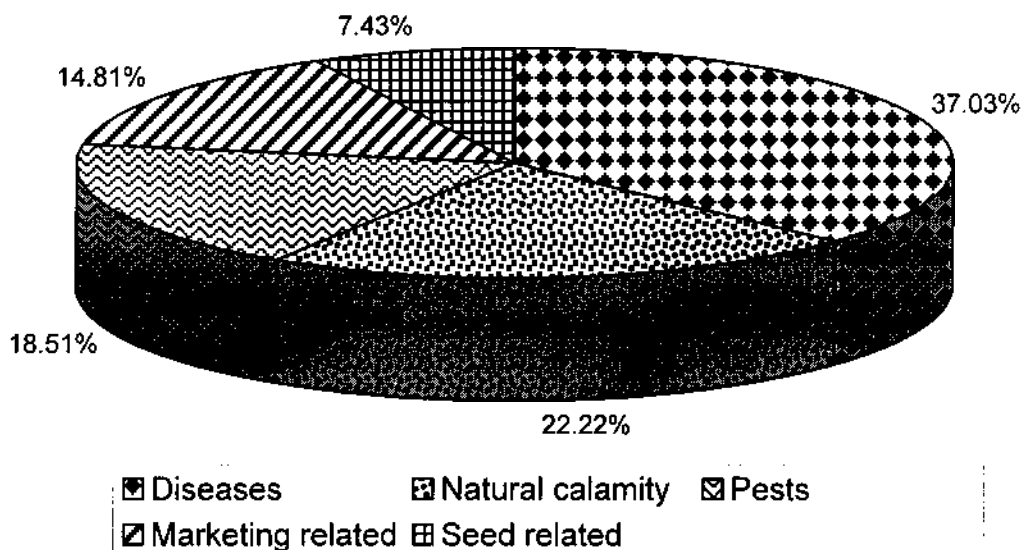
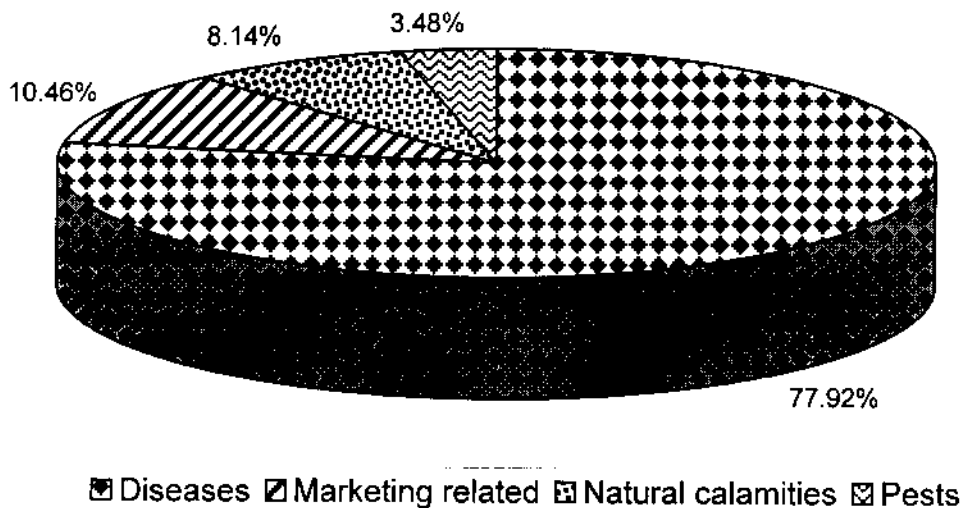


Fig. 6. Share of different agents in creating the crisis, bitter gourd, season 3



From table 7 it is evident that mosaic was the major disease (86.90 per cent) causing crisis for bitter gourd cultivation during the third crop season.

With respect to marketing related crises, eight out of nine reports were that of unexpected price fall and one was that of lack of customer preference for the produce.

Table 8. Classification of reports of nature related crisis, crop - bitter gourd, season III

No.	Agencies	F	Percentage
1.	Drought	6	85.71
2.	Flooding due to heavy summer showers	1	14.39
3.	Total	7	100.00

Nature related issues were drought, affecting six out of 7 respondents and a single report of flooding by summer showers. The only report of pest related crisis was that of fruit fly.

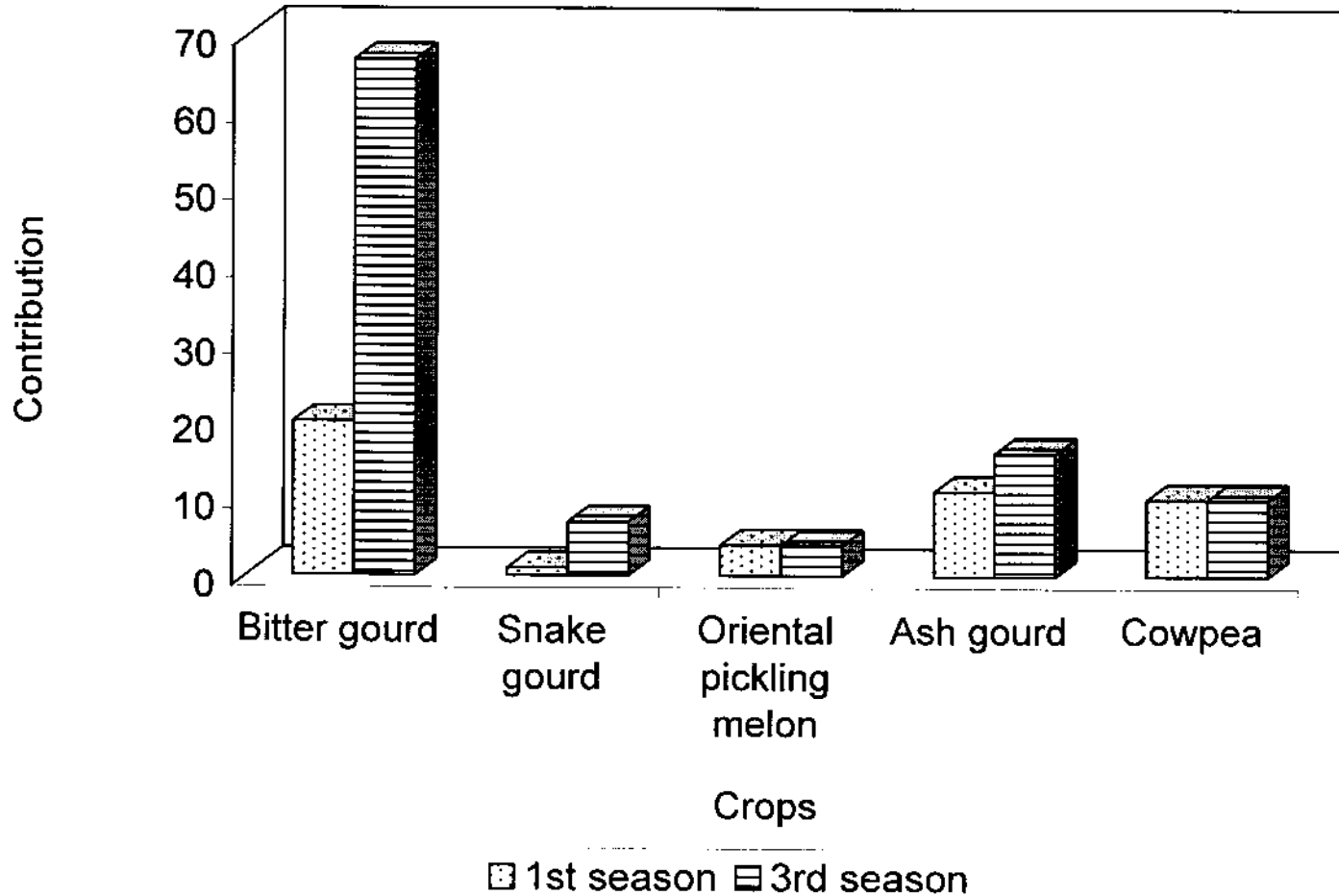
Methods of adaptation, Season III

Table 9. Contingent measures taken against mosaic, crop - bitter gourd, season III

No.	Actions	F	Percentage
1.	Insecticide sprays to control vector	7	11.66
2.	Replace with some other crop	1	1.67
3.	Chemical sprays given by shopkeeper	1	1.67
4.	Neem oil + garlic mixture spray	1	1.67
5.	Fytolan + neem oil + garlic mixture spray	1	1.67
6.	Give better management	1	1.67
7.	Use yellow traps to control vector	1	1.67
8.	Neem cake application on the basin	1	1.67
9.	No action	46	76.16
10.	Total	60	100.00

Table 9 enlists the different contingent measures adopted by farmers.

Fig. 7. Contribution of diseases in creating the crises for different crops in different seasons



In the case of little leaf, one respondent had tried neem oil garlic mixture and dithane M-45 and Bavistin alternately. However the remaining four respondents did not take any action.

Again in dealing with unexpected price fall, six out of eight farmers did not take any contingent action. One farmer had transported the produce to distant market and another farmer resorted to grading of the produce before sales and switched over to seed production for a short period.

In dealing with drought, majority of the farmers did not care to take any action. The other report of natural calamity was the flooding of field by summer showers and no action was taken against it.

Two farmers out of three reporting fruit fly attack had attempted spraying of insecticides as it was effective during summer season. The diseases 'blackening of fruits' and phyllody were left untackled.

4.2.3.2 Snake gourd (*Trichosanthus anguina*)

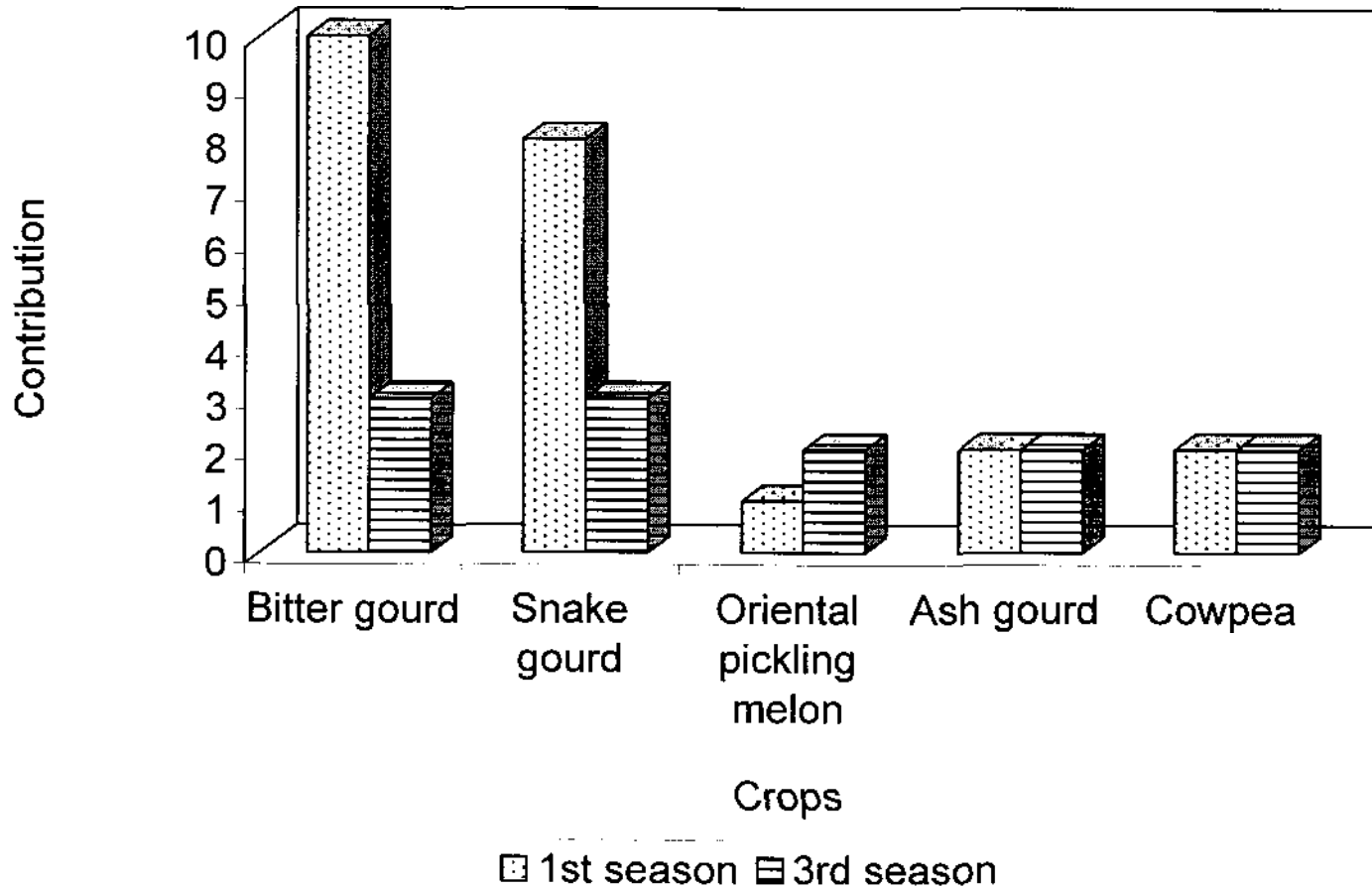
Out of 150 respondents, 144 were cultivating the snake gourd for the past five years in some season or other.

Crises, Season-I

Table 10. Broad classification of crisis reports, crop - snake gourd, season I

No.	Agencies	F	Percentage
1.	Market related	11	34.38
2.	Natural calamities	11	34.38
3.	Pests	8	25.00
4.	Diseases	1	3.12
5.	Seed related	1	3.12
6.	Total	32	100.00

Fig. 8. Contribution of pests in creating the crises for different crops in different seasons



The 32 reports of crises from the season I were broadly categorized into five groups as in table 10. The majority of the reports belonged to the category 'market related crises' and natural calamity (34.38 per cent each). The share of pests, diseases and seed related problems were very low.

Table 11. Classification of nature related crisis, crop - snake gourd, season I

No.	Agencies	F	Percentage
1.	Panthal lodging	5	45.46
2.	Low production due to heavy rain	3	27.27
3.	Water logging	2	18.18
4.	Yellowing due to heavy rain	1	9.09
5.	Total	11	100.00

There was an equal share for natural calamities. Out of 11 reports 5 were that of 'panthal' lodging (45.46 per cent). Heavy rain and wind were causing the the 'panthal' lodging. This was particularly serious in the case of snake gourd as the whole shoot itself is very heavy.

The major pest of snake gourd was fruit fly (7 reports out of 8). The only other pest was birds.

Only one farmer had reported disease related crises and it was the fusarium wilt. The single reported seed related crisis was that of low germination.

Contingent measures, Season I

Table 12. Contingent measures taken in case of unexpected price fall, crop - snake gourd, season I

No.	Actions	F	Percentage
1.	Transporting the produce to distant markets	2	18.19
2.	Pooling the produce from neighbouring farmers and transporting to distant market for sales.	1	9.09
3.	No action	8	72.72
4.	Total	11	100.00

Fig. 9. Share of different agents in creating the crisis, snake gourd, season 1

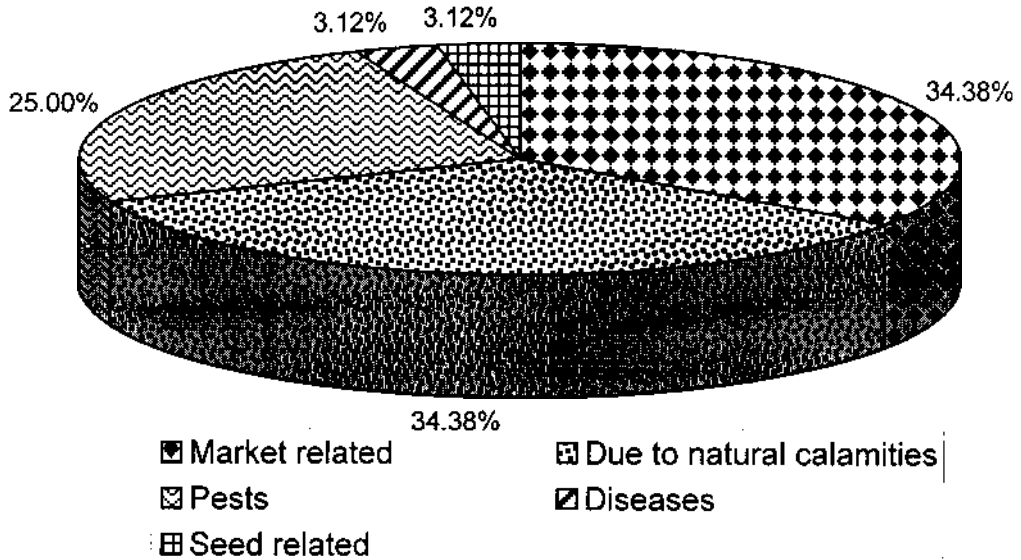
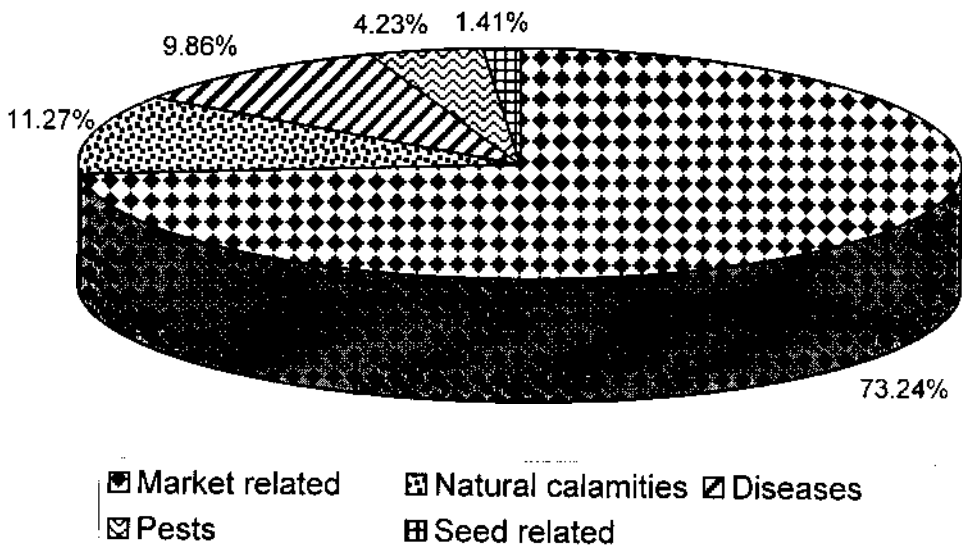


Fig. 10. Share of different agents in creating the crisis, snake gourd, season 3



With respect to the unexpected price fall, 'no action' was the response for the majority of the cases (72.72 per cent). However, there were reports of transporting to distant markets for sale (Table 12). Sometimes, they pool the produce from neighbouring farmers and transport to distant market. With respect to the incidence of fruit fly, majority did not care to take any contingent measures. Two out of seven farmers had done distress sprayings using chemicals even though it was not effective in the rainy season. Bird problem also was left uncared.

The disease incidences were not severe and fusarium wilt was left uncared. However, as the germination percentage was low, the farmer replaced the crop with cowpea.

Among the natural calamities reported, no action was reported in the case of 'panthal' lodging. Low production due to heavy rain, water logging and heavy rain induced yellowing also were left uncared.

Crises, Season III

Table 13. Broad classification of crisis reports, crop - snake gourd, season III

No.	Agencies	F	Percentage
1.	Market related	52	73.24
2.	Natural calamities	8	11.27
3.	Diseases	7	9.86
4.	Pests	3	4.23
5.	Seed related	1	1.40
6.	Total	71	100.00

A broad classification of the crisis reports are given in table 13. The share of market related crisis was 73.23 per cent. Fifty out of fifty two market related crises were due to unexpected price fall and the rest two were that of 'no demand for the produce'.

Table 14. Classification of nature related crisis, crop - snake gourd, season III

No.	Agencies	F	Percentage
1.	Flooding heavy summer showers	5	62.50
2.	Drought	2	25.00
3.	Panthal lodging	1	12.50
4.	Total	8	100.00

Flooding due to heavy summer showers was a problem where cultivation was under taken in rice fallows. It accounted for five out of eight nature related crises (Table 14).

Table 15. Classification of disease related crisis, crop - snake gourd, season III

No.	Agencies	F	Percentage
1.	Mosaic	5	71.43
2.	Fusarium wilt	2	28.57
3.	Total	7	100.00

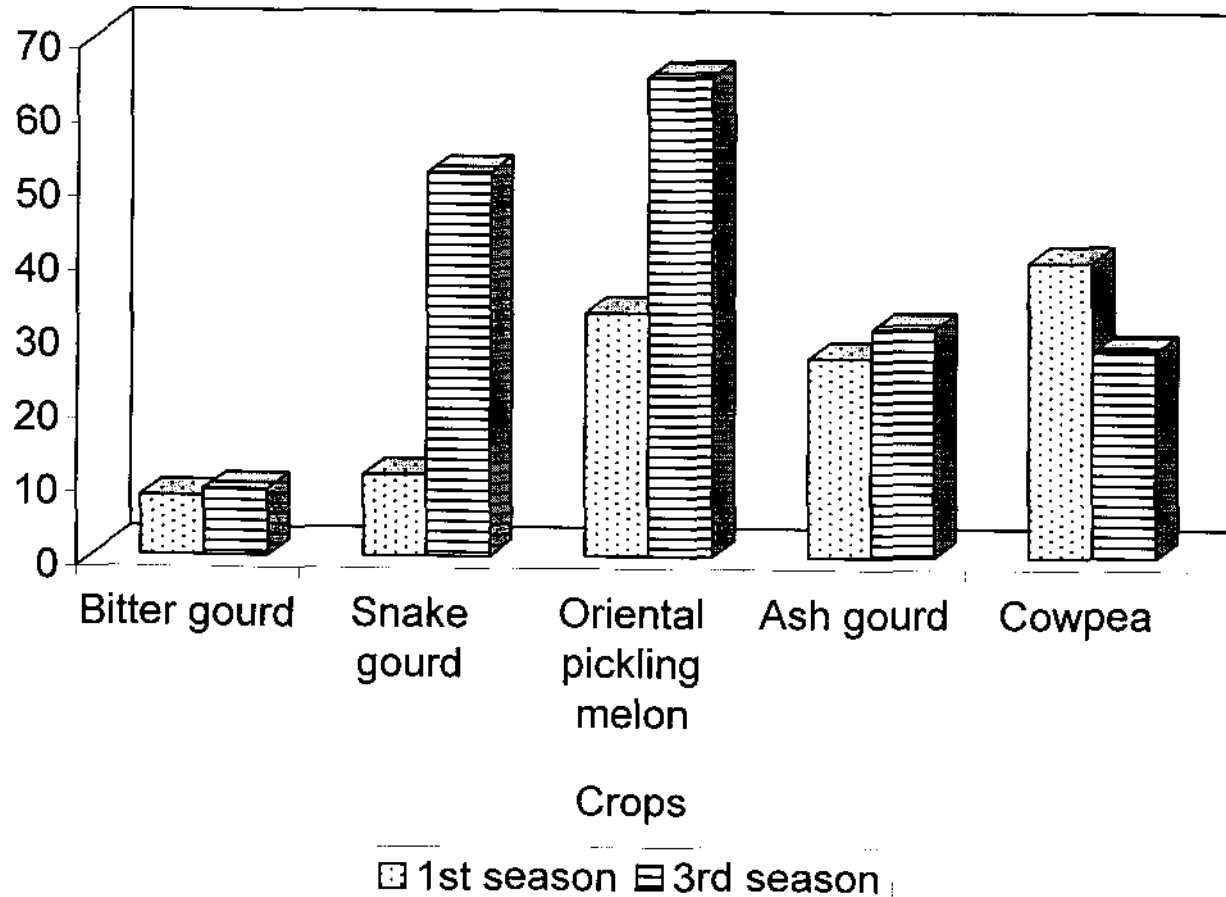
The main disease reported was mosaic. There was one report each about fruit fly attack, root borer attack, birds infestation and lack of germination.

Contingent measures, Season III

Table 16. Contingent measures taken in the case of unexpected price fall, crop - snake gourd, season III

No.	Actions	F	Percentage
1.	Increase yield the through giving better management	5	10.00
2.	Extend the productive period through better management	1	2.00
3.	Pooling of produce from neighbouring farmers and transport to distant market	1	2.00
4.	Transporting to distant markets for sales	1	2.00
5.	Establishing personal contacts with shopkeepers	1	2.00
6.	No action	41	82.00
6.	Total	50	100.00

Fig. 11. Contribution of marketing problems in creating the crises for different crops in different seasons



The contents of the table 16 give an exhaustive list of measures taken for tackling the unexpected price fall. Majority of the farmers did not take any action. Still, 10.00 per cent of farmers tried to increase yield by giving better management.

Establishing personal contact with shopkeepers was another practice for dealing with marketing issues. The weather problems, panthal lodging, flooding etc. were not dealt with any contingent actions. The lodged panthal, was uncared as the re-erection was expensive and the crop proves no more productive in a cost effective way.

Both the farmers struck with drought had been able to install pump set for irrigation.

Table 17. Contingent measures taken against mosaic, crop - snake gourd, season III

No.	Actions	F	Percentage
1.	Spray Dimecron to control vector	1	20.00
2.	Chemical sprays as per recommendations from VFPCCK	3	60.00
3.	No action	1	20.00
4.	Total	5	100.00

Again, in dealing with mosaic 8.00 per cent of farmers had made necessary sprays to control the vector (Table 17).

For the problem of fusarium wilt both, the farmers have adopted soil drenching. The chemical control was effective in the case of diseases and pest to some extent. Even though the menace of fruit fly was serious, it did not touch the mark of crisis as it was effectively controlled by chemicals. Problem of root borer was also treated with soil application of the chemical - furadan.

The two farmers who reported no 'demand for the produce', one farmer each reporting bird's infestation and lack of germination left the issues uncared.

4.2.3.3 Oriental Pickling melon (*Cucumis melo var connomon*)

Out of the 150 respondents, 143 had cultivated oriental pickling melon during the past five years in some season or other.

Crises, Season I

Table 18. Broad classification of crisis, crop - oriental pickling melon, season I

No.	Causal agencies	F	Percentage
1.	Marketing related	33	64.71
2.	Natural calamities	13	25.49
3.	Disease related	4	7.84
4.	Pest related	1	1.96
5.	Total	51	100.00

The 51 reports of crises from the first season are categorized as shown in Table 18. The major share (64.70 per cent) was contributed by market related problems.

Table 19. Classification of nature related crisis, crop - Oriental pickling melon season I

No.	Agencies	F	Percentage
1.	Heavy rain included low producted	7	53.84
2.	Water logging	3	23.08
3.	Flood	3	23.08
4.	Total	13	100.00

Natural calamities also play major role in creating crises and among them heavy rain induced low productivity had the major share (Table 19).

Fig. 12. Share of different agents in creating the crisis, crop - oriental pickling melon, season 1

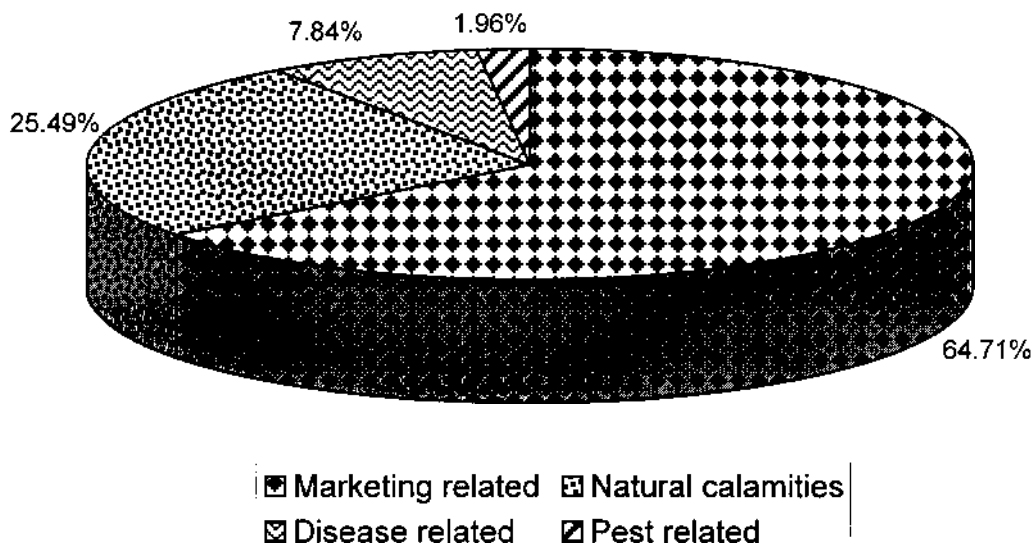


Fig. 13. Share of different agents in creating the crisis, oriental pickling melon, season 3

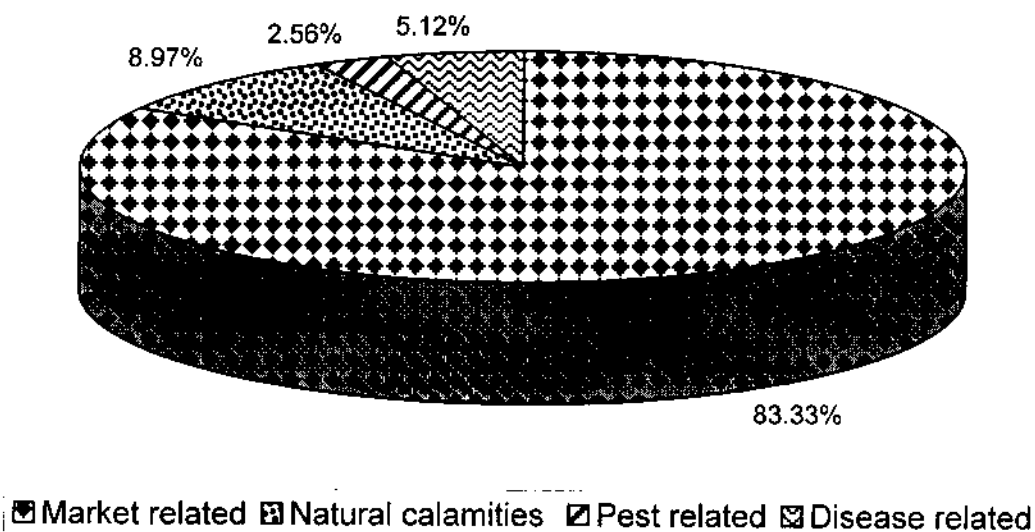


Table 20. Classification of disease related crisis, crop - Oriental pickling melon season I

No.	Agencies	F	Percentage
1.	Fruit rot	2	50
2.	Fusarium wilt	1	25
3.	Mosaic	1	25
4.	Total	4	100.00

There were reports of fruit rot, fusarium wilt and mosaic during the season (Table 20). However the only pest related crisis was attributed to fruit fly and there were three reports.

Contingent measures, Season I

Table 21. Contingent measures taken in case of unexpected price fall, crop - Oriental pickling melon, season I

No.	Actions	F	Percentage
1.	Transport to distant markets	2	6.45
2.	Sell directly to acquainted shopkeepers	2	6.45
3.	Pooling of produce from neighbours and transport to distant markets	2	6.45
4.	Sell out to agencies from distant market	1	3.23
5.	Engage in informal agreements with shopkeepers	2	6.45
6.	No action	22	70.97
7.	Total	31	100.00

With regard to natural disturbances, there were seven reports of heavy rain induced low production, three reports of water logging and three reports of flood. None of the farmers claimed to have taken any contingent measures.

Among the four reports of disease related crises, two attributed it to fruit rot and one to mosaic and there were no contingent action. However in the case of Fusarium wilt, the farmer had tried out lime application at the basin.

The menace of fruit fly was dealt with insecticide sprays and 'Ocimum trap' or 'Pazhakkeni', the two measures recommended by extension personnel.

Crises, Season III

Table 22. Broad classification of crisis, crop - Oriental pickling melon, season III

No.	Agencies	F	Percentage
1.	Market related	65	83.35
2.	Natural calamities	7	8.97
3.	Pest related	2	2.56
4.	Disease related	4	5.12
5.	Total	78	100.00

The 78 reports of crisis from third season are categorized as shown in Table 22. Again, the market related crises had the major share. Marketing related crises was that of unexpected price fall.

Table 23. Classification of nature related crisis, crop Oriental pickling melon, season III

No.	Agencies	f	Percentage
1.	Drought	3	42.86
2.	Yield reduction	2	28.57
3.	Heavy summer showers	2	28.57
4.	Total	7	100.00

Contingent measures, Season III

Table 24. Contingent measures taken in case of unexpected price fall, crop - Oriental pickling melon, season III

No.	Actions	f	Percentage
1.	Direct transport to distant market during night on headload	3	5.00
2.	Pool produce from neighbouring farmers and transport to distant market	3	5.00
3.	Direct selling to vegetable shopkeeper	2	3.33
4.	Sell out to agencies from distant markets	1	1.67
5.	No action	51	85.00
7.	Total	60	100.00

The problem of fruit fly was dealt with insecticide sprayings and trap. The incidence of mosaic attack was left uncared.

Out of the seven reports of natural disturbances, three attributed it to the drought. Two of them managed to install pumpsets. Two farmers attributed it to reduction of yield due to unfavourable climatic condition and had not taken any measures. Another two attributed it to heavy summer showers and taken no measures.

4.2.3.4 Ash gourd (*Benincasa hespida*)

Crises, season I

There were 124 farmers who cultivated ash gourd.

Table 25. Broad classification of crisis, crop - ash gourd, season I

No.	Agencies	F	Percentage
1.	Market related	27	57.44
2.	Disease related	11	23.40
3.	Nature related	6	12.77
4.	Pest related	2	4.26
5.	Seed related	1	2.13
6.	Total	47	100.00

The 47 reports of crises from first season are categorized as in table 25. In case of Ash gourd the market related issues had the major share. Out of 27 reports, 24 were that of unexpected price fall and the rest were that of 'no demand for the produce'. Second most important issue, was the diseases and not the natural calamities. It acquired a share of 23.40 per cent. The report of diseases were slightly different compared to other crops discussed. Fusarium wilt formed the main disease (Table 26). Mosaic also had made its appearance.

Fig. 14. Share of different agents in creating the crisis, ash gourd, season 1

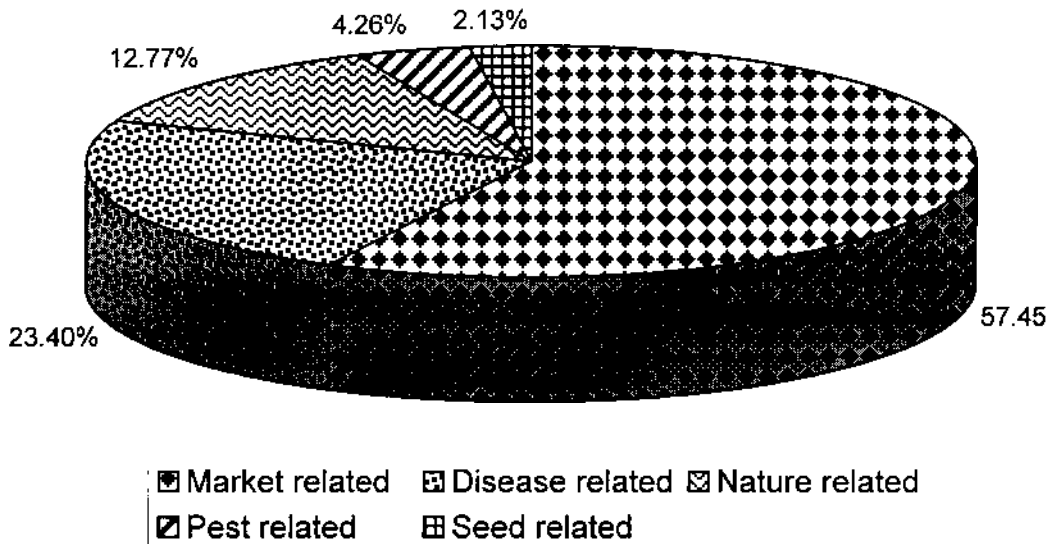


Fig. 15. Share of different agents in creating the crisis, ash gourd, season 3

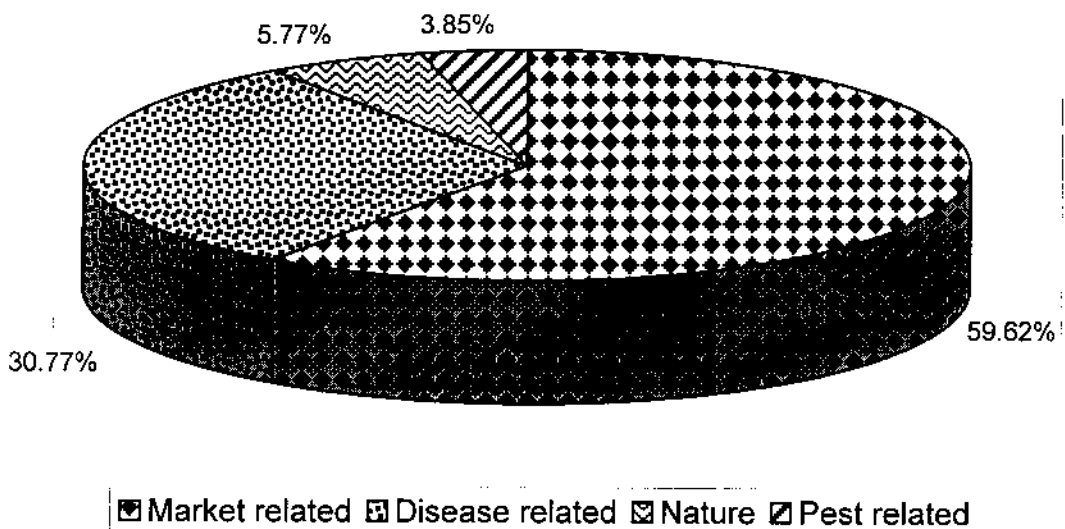


Table 26. Classification of disease related crisis, crop - ash gourd, season I

No.	Agencies	F	Percentage
1.	Fusarium wilt (<i>Fusarium</i> sp.)	5	45.45
2.	Fruit breaking and rotting	4	36.36
3.	Mosaic	2	18.19
4.	Total	11	100.00

The only pest reported was fruit fly and there were two cases. A single report of low germination of seed also was there.

Contingent measures, Season I

Table 27. Contingent measures taken in case of unexpected price fall, crop - ash gourd, season I

No.	Actions	F	Percentage
1.	Transport to distant markets	2	8.33
2.	Increase yield through better management	2	8.33
3.	Pool the produce from neighbouring farmers and transport to distant market	1	4.17
4.	No action	19	79.17
5.	Total	24	100.00

The measures listed out in Table 27 describes how farmers tackled unexpected price fall. Adjusting of harvesting time is reported to be practiced in situations of no demand for the produce.

Fusarium wilt was controlled by spraying bordeaux mixture drenching by two farmers out of five. In case of four reports of fruit breaking and rotting, no contingent measures were adopted and same was the reaction in the case of two reports of mosaic disease.

The fruit fly attack was left uncared. The crop was replaced with cowpea (*vigna anguiculata*) in case of low germination percentage.

Crises, Season III

Table 28. Broad classification of crisis, crop - ash gourd, season III

No.	Agencies	F	Percentage
1.	Market related	31	59.61
2.	Disease related	16	30.77
3.	Nature	3	5.77
4.	Pest related	2	3.85
5.	Total	52	100.00

Table 28 categorizes the reports of crises from third season. The pattern remained almost same as that of first season. However, the share of market related issues showed slight increase. The aggression of mosaic and little leaf became severe in the hot season. The major share of diseases was covered by mosaic (87.50 per cent) and the rest by little leaf (Table 29).

Table 29. Classification of diseases related crisis, crop - ash gourd, season III

No.	Agencies	F	Percentage
1.	Mosaic	14	87.50
2.	Little leaf	2	12.50
3.	Total	16	100.00

There were 3 reports of nature related crises where it was attributed to adverse climate conditions of summer heat and unexpected summer showers inducing low production and crop loss. The only pest involved in two reports of pest related crises were fruit fly.

Contingent measures, Season III

The contingent measures adopted to tackle the marketing related issues were same as those discussed in the earlier crops and seasons. However, few farmers tried to tackle the incidence of mosaic with neem cake application at the basin and fungicide sprays.

Table 30. Contingent measures adopted in case of mosaic, crop - ash gourd, season III

No.	Actions	F	Percentage
1.	Neem cake application at the basin	1	9.09
2.	Fytolan/bavistin sprays	1	9.09
3.	No action	9	81.82
4.	Total	11	100.00

The little leaf disease was controlled by adding 'ash from blacksmith's kin' at the basin of the plants.

In the case of fruit fly attack both the farmers adopted chemical sprays recommended by VFPCCK.

4.2.3.5 Cow Pea (*Vigna anguiculata* Var. *sesquipedalis*)

Cow pea is different from the former crops discussed as it is not a cucurbit. It is a leguminous vegetable crop and forms the part of tasty dishes in Kerala. "Achinga payar", the tender pods normally fetches high price. There were 138 farmers who cultivated cowpea.

Crises, Season I

Table 31. Broad classification of crisis, crop - cowpea, season I

No.	Agencies	F	Percentage
1.	Marketing related	40	74.07
2.	Disease related	10	18.51
3.	Pest related	2	3.71
4.	Natural calamities	2	3.71
5.	Total	54	100.00

Table 31 categories the crisis reports based on causal agents. The major share was constituted by market related issues (74.08 per cent). The next category, (diseases) had only a share of 18.50 per cent. However, it was a problem that

Fig. 16. Share of different agents in creating the crisis, cowpea, season 1

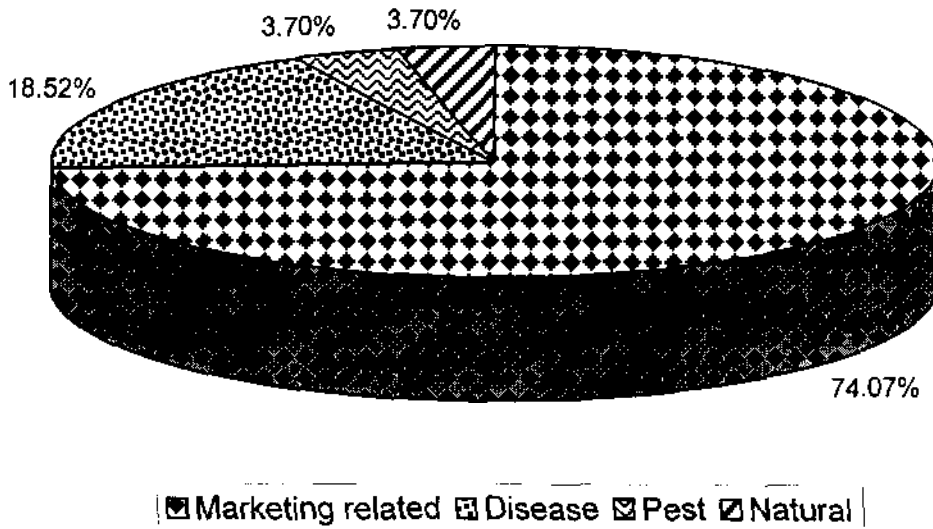
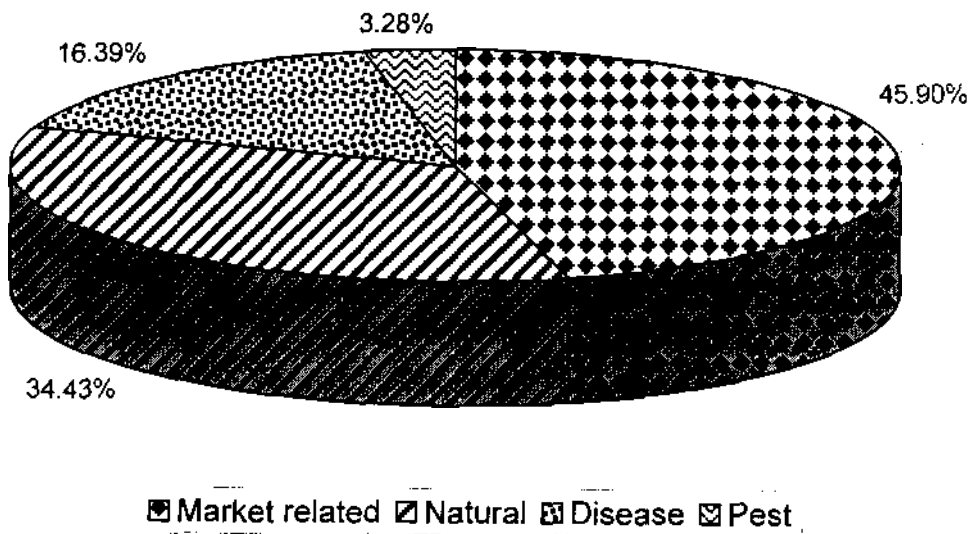


Fig. 17. Share of different agents in creating the crisis, cowpea, season 3





require the attention of the extension and research personnel. The disease 'karimpan' (*Colletotrichum* sp.) was spreading fast over a wide area of cow pea growing tract (Table 32). Leaf miner and borer were the pests reported and had only a share of 3.71 per cent. Another 3.71 per cent reported nature related problems which included panthal lodging and low production due to heavy rain.

Table 32. Classification of disease related crisis, crop - cowpea, season I

No.	Agencies	F	Percentage
1.	Karimpan (<i>Colletotrichum</i> sp.)	8	80.00
2.	Fusarium wilt	2	20.00
3.	Total	10	100.00

Contingent measures, Season I

The Contingent measures with respect to unexpected price fall are given in the Table 33.

Table 33. Contingent measures taken in the case of unexpected price fall, crop - cowpea, season I

No.	Actions	F	Percentage
1.	Pool the produce from neighbouring farmers and transport to distant markets	7	17.50
2.	Transport to distant market	6	15.00
3.	Maintaining constant contact with shopkeepers for ensuring sales	1	2.50
4.	Increase yield through better management	1	2.50
5.	No action	25	62.50
6.	Total	40	100.00

Table 34 lists out the actions taken against the fungal disease 'karimpan' (*Colletotrichum* sp.).

Fig. 18. Contribution of natural calamities in creating the crises for different crops in different seasons

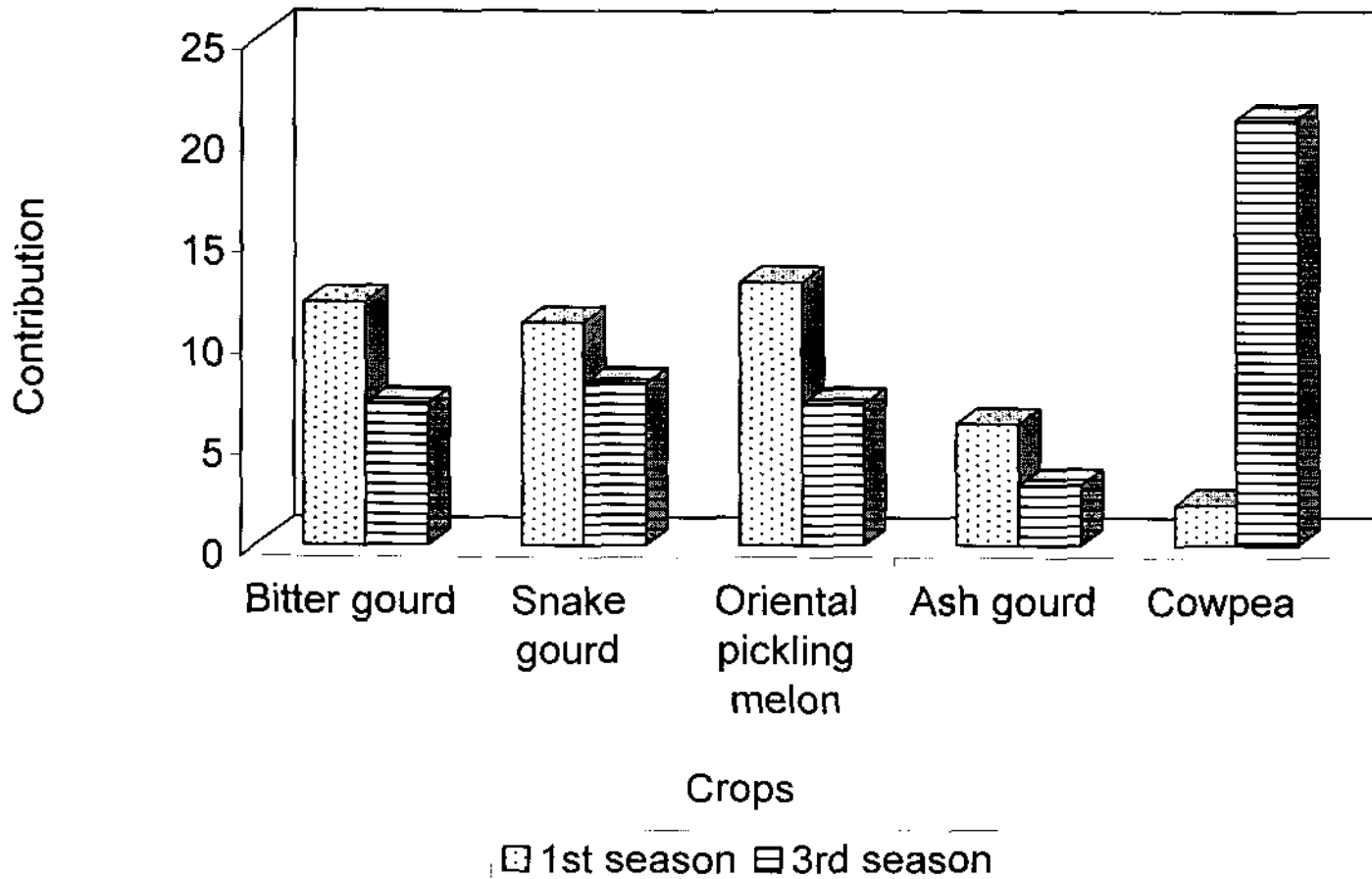


Table 34. Contingent measures taken against karimpan (*Colletotrichum* sp.), crop - cowpea, season I

No	Actions	F	Percentage
1.	Fungicide sprays	3	37.50
2.	Bavistin spray / BM spray	2	25.00
3.	Emisan / Fytolan spray	1	12.50
4.	No action	2	25.00
5.	Total	8	100.00

The majority had resorted to fungicide sprays. Mosaic and fusarium wilt were left uncared.

With regard to pest incidence, one farmer had sprayed tobacco decotion.

In both cases of nature related crises, no action had been taken.

Crises, Season III

Table 35. Broad classification of crisis, crop - cowpea, season III

No.	Agencies	F	Percentage
1	Market related	28	45.90
2	Natural calamities	21	34.43
3	Disease related	10	16.39
4	Pest related	2	3.28
5	Total	61	100.00

In the third season, majority of reports attributed the crisis to the unexpected price fall (Table 35). However, the problem had a minor share compared to first season. The natural calamity came next with a share of 34.40 per cent. It may be noted that in the first season its share was only 3.70 per cent (Table 36).

Table 36. Classification of nature related crisis, crop - cowpea, season III

No.	Agencies	F	Percentage
1	Flower shedding due to summer showers	17	80.96
2	Drought	2	9.52
3	Low production	2	9.52
4.	Total	21	100.00

The diseases include (Table 37) 'karimpan', fusarium wilt and mosaic with 'karimpan' disease having the major share. During the summer, it could be seen that mosaic had made its appearance and the wilt incidence was reduced. The pests were same as those of the first season i.e., borers and leaf miners.

Table 37. Classification of disease related crisis, crop - cowpea, season III

No.	Agencies	F	Percentage
1	Karimpan (<i>Colletotrichum</i> sp.)	7	70.00
2	Fusarium wilt	1	10.00
3	Mosaic	2	20.00
4.	Total	10	100.00

Contingent measures, Season III

Table 38. Contingent measures taken in case of unexpected price fall, crop - cowpea, season III

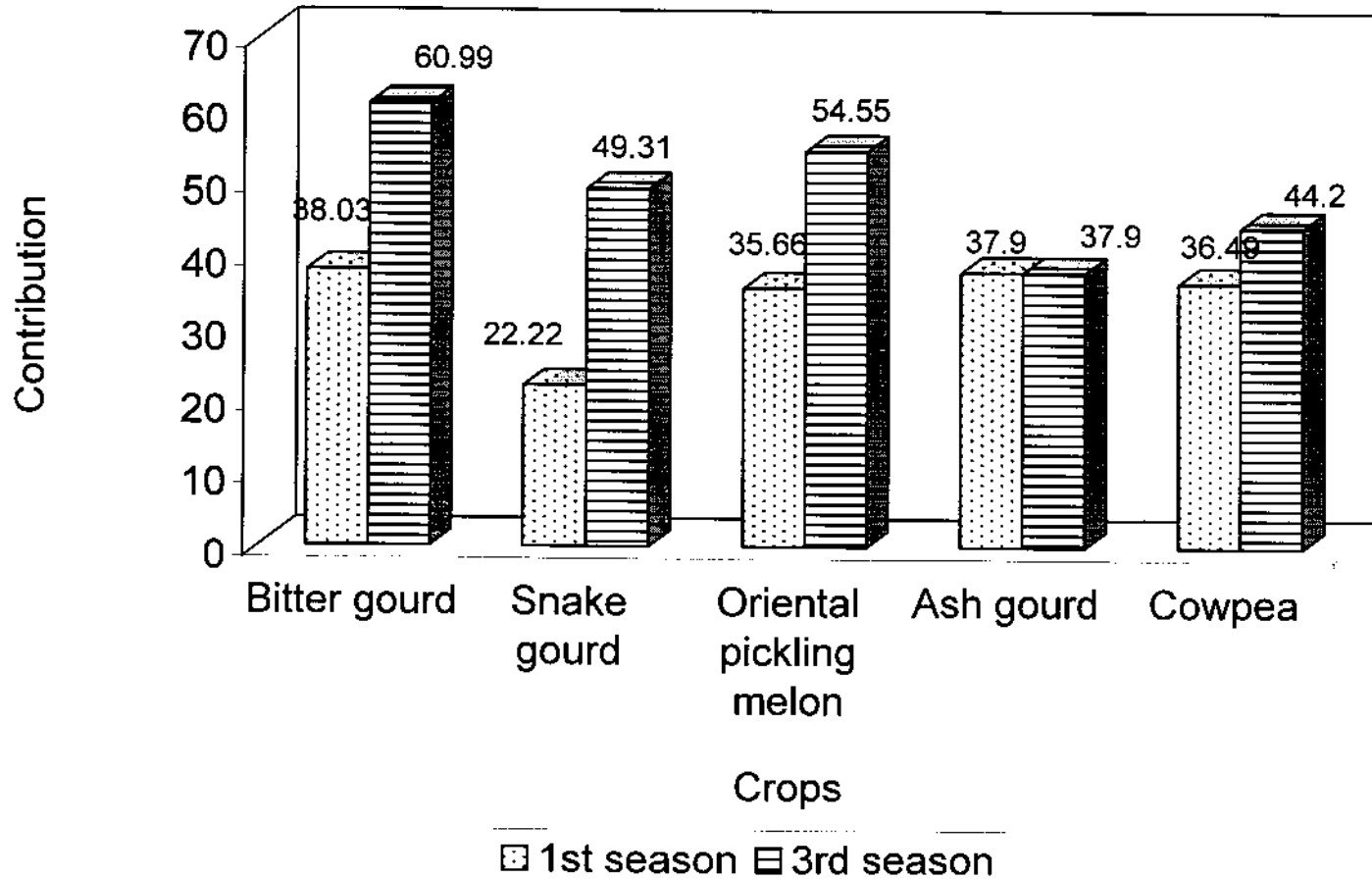
No	Actions	f	Percentage
1	Transport to distant markets	7	25.00
2	Better management for high yield	1	3.57
3	Sold out to neighbours	1	3.57
4	Pool the produce from neighbouring farmers and transport to distant market	2	7.14
5	No action	17	60.72
6.	Total	28	100.00

Table 38 lists the contingent measures taken in case of unexpected price fall. 'Increasing yield through better management' again was a practice during the third season. Selling out to neighbours was a practice followed by small farmers when there was no transporting facility available.

Table 39. Contingent measures taken against karimpan, crop -cowpea, season III

No.	Actions	F	Percentage
1	Bavistin spray	2	28.57
2	Bordeaux mixture spray	2	28.57
3	Fungicide spray	2	28.57
4	Neem oil garlic mixture spray	1	14.29
5	No action	0	
6.	Total	7	100.00

Fig. 19. Impact of crisis on different crops



The 'karimpan' disease was controlled mainly by spraying fungicides. One farmer has used neem oil garlic mixture sprays. In case of two reports of mosaic related crisis no action was taken. In a single case of fusarium wilt, soil drenching using Bordeaux mixture had been adopted.

Out of the 21 reports of nature related crisis, 17 reports were of flower shedding due to summer showers and no action had been taken. However the two farmers reporting drought had managed to install pump sets.

The issues of low production, leaf miner and borer attack were left unattended.

4.3 Intervention by external agents in crisis situations

The two agencies reported to have made interventions in crisis situations were the VFPCCK and the Department of Agriculture. The results were as follows:

4.3.1 Intervention: Whether they made an intervention?

From Table 40 it can be noted that VFPCCK and Department of Agriculture were the only two agencies who intervened in the crisis situations. Majority claimed that VFPCCK had intervened (98.00 per cent) and a minority reported the intervention of Department of Agriculture.

Table 40. Agencies who made interventions during crisis situation

Agency	No. of farmers who stated the intervention	N = 150 (%)
1. VFPCCK	147	98.00
2. Dept. of Agriculture	29	19.32

4.3.2 Effectiveness: Whether the intervention was effective?

Table 41 reveals that 83.60 per cent of respondents stated that the intervention of VFPCCK was effective. As much as 96.55 per cent claimed that the intervention of the Department of Agriculture was effective.

Table 41. Effectiveness of intervention by external agencies in crisis situations

Agency	No. of farmers who stated the intervention was effective	N = 150 (%)
1. VFPCCK	123	83.60
2. Dept. of Agriculture	28	96.55

4.4 Rationality of the methods of adaptation

The methods of adaptation which were regarded as rational by at least 60.00 per cent of the judges are presented in the Table 42. It included seven methods of anticipatory adaptation, two methods of mitigation and 18 methods of contingent actions. Methods in each category were ranked based on the total scores obtained by each of the action from thirty six judges.

The average scores obtained by each category viz. anticipatory measures, measures of mitigation and contingent measures were as given below.

Anticipatory measures	- 51.85
Measures for mitigation	- 46.50
Contingent measures	- 39.61

Anticipatory measures

Following were the anticipatory measures regarded as rational by the judges and given in the rank order.

1. Adjusting planting time to get yield at high demand season.
2. Mixed cropping in vegetables.

3. Crop rotation with seasonal crops.
4. Crop diversification in vegetables.
5. Vocational diversification with other enterprises.
6. Crop diversification with annual crops.
7. Minimise use of hired labour by employing maximum family labour.

Measures of mitigation

The following two methods for mitigation of an occurred crises was regarded as rational by the judges.

1. Compensate for the economic loss with profit from the other crops.
2. Loan renewal.

Contingent measures

Following were the rational contingent measures identified based on the judges rating in the rank order.

1. Use of yellow traps to control vector in case of mosaic infection in third season bitter gourd.
2. Spraying bavistin in case of vine blackening disease (*Colletotrichum* sp.) of third season cowpea.
3. Spraying fytolan in case of vine blackening (*Colletotrichum* sp.) of first season cowpea.
4. Pooling of produce from neighbouring farmers and transporting to distant markets for sales in case of unexpected price fall in first season snake gourd.
5. Spraying bordeaux mixture in case of vine blackening disease (*Colletotrichum* sp.) of third season cowpea.
6. Replacing the crop with some other crop in case of mosaic infestation in first season bitter gourd.
7. Spraying neem oil – garlic mixture to control vector in case of mosaic infection in third season bitter gourd.

Table 42. Analysis of rating by judges on methods of adaptation

Sl. No.	Methods of adaptation	Rationality						Scores				Rank
		ME		E		LE		EP	SC	PF	Total	
		F	%	F	%	F	%					
Contingent measures												
1.	Spraying Bavistin in case of vine blackening disease (<i>Colletotrichum</i> sp.) of third season cowpea.	16	44.44	14	38.88	6	16.66	14	11	21	46	1
2.	Use of yellow traps to control vector in case of mosaic infection in third season bitter gourd.	16	44.44	14	38.88	6	16.66	18	11	17	46	1
3.	Spraying Fytolan in case of vine blackening (<i>Colletotrichum</i> sp.) of first season cowpea.	17	47.22	10	27.77	9	25.01	19	8	17	44	2
4.	Pooling of produce from neighbouring farmers and transporting to distant markets for sales in case of unexpected price fall in first season snake gourd.	14	38.88	16	44.44	6	16.66	15	16	13	44	2
5.	Spraying bordeaux mixture in case of vine blackening disease (<i>Colletotrichum</i> sp.) of third season cowpea.	18	50.00	8	22.22	10	27.78	16	6	22	44	2
6.	Replacing the crop with some other crop in case of mosaic infection in first season bitter gourd.	13	36.00	15	41.66	8	22.22	16	10	15	41	3
7.	Spraying neem oil – garlic mixture to control vector in case of mosaic infection in third season bitter gourd.	11	30.55	18	50.00	7	19.45	10	8	22	40	4
8.	Pooling of produce from neighbouring farmers and transporting to distant markets for sales in case of unexpected price fall in first season cowpea.	11	30.55	18	50.00	7	19.45	13	14	13	40	4
9.	Extending productive period of the crop in case of unexpected price fall in third season snake gourd.	13	36.11	14	38.88	9	25.01	15	7	18	40	4
10.	Pooling of produce from neighbouring farmers and transporting to distant markets for sales in case of unexpected price fall in third season snake gourd.	13	36.11	13	36.11	10	27.78	12	15	12	39	5
11.	Pooling of produce from neighbouring farmers and transporting to distant markets for sales in case of unexpected price fall in third season cowpea.	12	33.33	15	41.66	9	25.01	13	10	16	39	5
12.	Pooling of produce from neighbouring farmers and transporting to distant markets for sales in case of unexpected price fall in first season ash gourd.	10	27.77	17	47.22	9	25.01	13	12	13	38	6
13.	Neem cake application at the basin in case of mosaic infection in third season ash gourd.	4	11.00	20	55.55	12	33.33	13	3	12	38	6
14.	Pooling of produce from neighbouring farmers and transporting to distant markets for sales in case of unexpected price fall in third season oriental pickling melon.	8	22.22	21	58.33	7	19.45	11	14	12	37	7

Contd.

Table 42. Continued.

Sl. No.	Methods of adaptation	Rationality						Scores				Rank
		ME		E		LE		EP	SC	PF	Total	
		F	%	F	%	F	%					
15.	Giving better crop management practices in case of mosaic infection in third season bitter gourd.	9	27.00	18	47.22	9	25.00	15	8	14	37	7
16.	Soil drenching with bordeaux mixture in case of <i>fusarium</i> wilt in first season ash gourd.	10	27.77	16	44.46	10	27.77	16	5	15	36	8
17.	Pooling of produce from neighbouring farmers and transporting to distant markets for sales in case of unexpected price fall in first season oriental pickling melon.	8	22.22	20	55.55	8	22.23	9	15	12	36	8
18.	Replacing with some other crop in case of mosaic infection in third season bitter gourd.	11	30.55	15	41.66	10	27.79	12	9	15	36	8
Measures for mitigation												
1.	Compensate for the economic loss with profit from the other crops.	20	55.55	13	36.11	3	8.33	14	16	23	53	1
2.	Loan renewal.	15	41.66	10	27.77	11	30.57	10	16	14	40	2
Anticipatory measures												
1.	Adjusting planting time to get yield at high demand season.	27	75.00	7	19.44	2	5.55	18	19	24	61	1
2.	Mixed cropping in vegetables.	26	72.00	8	22.22	2	5.55	20	16	24	60	2
3.	Crop rotation with seasonal crops.	21	58.00	14	38.88	1	2.77	19	19	18	56	3
4.	Crop diversification in vegetables.	19	52.00	16	44.44	1	2.77	18	20	16	54	4
5.	Vocational diversification with other enterprises.	11	30.56	22	61.11	3	8.33	10	19	15	44	5
6.	Crop diversification with annual crops.	12	33.00	20	55.55	4	11.11	13	17	14	44	5
7.	Minimise use of hired labour by employing maximum family labour.	10	27.77	24	66.66	2	5.57	11	21	12	44	5

ME - Most effective; E - Effective; LE - Least effective; EP - Extension personnel; SC - Scientists; PF - Progressive farmers

8. Pooling of produce from neighbouring farmers and transporting to distant markets for sales in case of unexpected price fall in first season cowpea.
9. Extending productive period of the crop in case of unexpected price fall in third season snake gourd.
10. Pooling of produce from neighbouring farmers and transporting to distant markets for sales in case of unexpected price fall in third season snake gourd.
11. Pooling of produce from neighbouring farmers and transporting to distant markets for sales in case of unexpected price fall in third season cowpea.
12. Pooling of produce from neighbouring farmers and transporting to distant markets for sales in case of unexpected price fall in first season ash gourd.
13. Neem cake application at the basin in case of mosaic infection in third season ash gourd.
14. Pooling of produce from neighbouring farmers and transporting to distant markets for sales in case of unexpected price fall in third season oriental pickling melon.
15. Giving better crop management practices in case of mosaic infection in third season bitter gourd.
16. Soil drenching with bordeaux mixture in case of fusarium wilt in first season ash gourd.
17. Pooling of produce from neighbouring farmers and transporting to distant markets for sales in case of unexpected price fall in first season oriental pickling melon.
18. Replacing with some other crop in case of mosaic infection in third season bitter gourd.

4.5 Level of Adaptation

Below are given the result of measurement of level of adaptation of the respondents.

Table 43. Classification of the farmers based on level of adaptation

Level of adaptation	Score range	Frequency	Percentage
Low	indices less than 30.07	21	14.00
Medium	indices between 30.07 and 53.72	98	65.33
High	indices greater than 53.72	31	20.67

Discussion

CHAPTER-V

DISCUSSION

In this chapter a brief discussion about the results presented in the previous chapter is given. The order of presentation is as follows:

- 5.1 Characteristics of the sample population
- 5.2 Anticipatory measures
- 5.3 Measures for mitigation
- 5.4 The crises and the contingent measures
- 5.5 Intervention by external agents in crisis
- 5.6 Rational methods of adaptation
- 5.7 Level of adaptation

5.1 Characteristics of the sample population

The background information regarding the sample population obtained from the results presented in the previous chapter is as follows. Majority of the farmers were above the age of 45 years, fairly educated, with farming as their major occupation and they traditionally cultivated vegetables. They had an experience in vegetable growing ranging between five to 20 years. Majority of the respondents were members of vegetable farming groups and half of them were not having membership in any other organisations. Majority were small families with five members. They read newspapers regularly. Interestingly, only five per cent of them read farm magazines.

With regard to the holding size, majority were small farmers. A considerable number of farmers leased land ranging between 0.20 to 0.40 ha. Majority of the respondents cultivated vegetable in an area of 0.2 to 0.4 ha at a time.

5.2 Anticipatory measures

Loss and gain appear to be inevitable in vegetable farming. When the various factors aptly come together, an unexpected bumper gain may be obtained. At the same time, they are also bound to suffer heavy losses unexpectedly. Still they are able to continue with the vegetable farming, by taking short breaks. This is only because of certain anticipatory measures they take knowingly or unknowingly. Sometimes it may be a practice inherited from their ancestors. The practices are presented in the Table 1. However, it may be noted that these anticipatory measures were of two types. Certain measures could be adopted by all the farmers while some measures could not be adopted by all the farmers as the resources might not be sufficient.

It is seen from Table 1 that 91.33 per cent of the respondents had adopted the method of diversifying the vegetable crops they cultivate. This has helped them to tide over the situations of crisis due to crop damage or unexpected price fall. Naturally this opens a way for a measure of mitigation i.e., compensating the loss from one crop with profit from the other crop.

The other important method adopted by 39.33 per cent of the farmers was crop rotation with seasonal crops. The seasonal crops included banana, paddy, spices like ginger, turmeric and cassava and the like crops. While crops like banana and spices ensured a reasonable profit at any cost, the farmers resorted to paddy cultivation as the land was unfit for other crops during the rainy season. The method proved not only helpful for compensating losses but also cared for the sustainability of farming and pest control.

As much as 37.33 per cent of the respondents engaged themselves in other enterprises for enhancing their income, at the same time insulating themselves from the impact of a crisis. The other prominent enterprise was the

rearing of milch animals. There were a few farmers engaged in running vegetable and spice shops.

Out of the total respondents, 33.30 per cent adopted the method of diversifying farming with perennial crops. The crops mainly included rubber, coconut, nutmeg, arecanut, and vanilla. However, it may be noted that this was a method that can be adopted only by farmers having enough land and resources.

Almost an equal number of respondents (32.00 per cent) were adopting the method of mixed cropping. Most commonly adopted method was the planting of both Oriental pickling melon (*Cucumis melo*) and ash gourd (*Benincasa hespida*) at a single planting point and later, after one and a half month, sowing cowpea. This had also the benefit of intensifying the farming activity.

Vegetable being a crop which require constant care, a vegetable grower engaging in other occupations may be undesirable. But 25.33 per cent of the total respondents were engaged in some other activities. The activities included rubber tapping, daily wage work when time permits, driving, etc. However, none of them were regularly employed outside the vegetable farming.

The method of minimising the hired labour by employing maximum family labour was adopted by 19.33 per cent of the respondents. The human labour being the costly input in Kerala, this was an important method. However, in some of the jobs where there was too much work to do or skilled labourers are required, hiring becomes unavoidable. However, there was no farmer who hired labour for whole of the operations.

Another 11.33 per cent of respondents resorted to crop diversification with seasonal crops like, banana, ginger, turmeric etc.

An equal number of respondents (11.33 per cent) resorted to the method of adjusting planting time to get yield during high demand season. This was done in two ways. One group of farmers preferred production in abundance than high price and the other group preferred high price than production in plenty. The majority belonged to the former group were passionately involved in vegetable farming. The latter group preferred to produce during the risky season. In Kerala high demand season starts from the festival season of *Onam*, lasting up to November-December when the *Sabarimala* season ends. The latter group of farmers preferred to produce when other farmers were not bringing produce to the market. This requires cultivation in adverse climatic conditions and the prices will be high enough to compensate for the low production. Production during the South West monsoon season (June-July) is an example.

The adjustment of planting time is not only based on the requirement of festival season, but also done based on the information regarding the planting in other regions which contribute produce to the same market. Thus, this becomes a point where effective intervention is possible by collecting and supplying the planting data from different regions.

Adjusting planting time to protect plants from adverse climatic and soil conditions was adopted by 5.33 per cent of the respondents. However, this method cannot be generalised as the problem varies from place to place.

Joint leasing in and carrying out operations jointly was a highly potential anticipatory method of adaptation. However, the method was adopted only by 4.66 per cent of the respondents. The groups were having either two members or at the most 6 to 7 members. This method has the advantage of sharing the impact of crisis among the members.

Sowing on mounds to save crop from possible water logging was adopted by 4.66 per cent of the respondent. This again was specific to certain farmers.

Prophylactic spraying also was an anticipatory measure taken by the farmers. Only 3.33 per cent of the farmers reported that they adopt prophylactic sprayings.

Another 3.33 per cent of the farmers had the practice of obtaining advance orders from shopkeepers. Even though this can be put forward as a suggestion, personal tactics was a main factor in making such a commitment by the shopkeepers. Sometimes, the price offered may be low, but question of 'no demand for the produce' can be avoided.

Around 3.33 per cent of the respondents in the study had decided to remain without any further expansion or commercialisation of their farming activity. They had the background of suffering heavy losses in vegetable farming and failed to gain any assistance from the society. They had ventured in to vegetable farming raising the capital through loans and the crop loss forced them to sell part of their holdings.

Another 2.66 per cent of the respondents were engaged in share cropping. The usual practice was that the land and inputs other than labour would be contributed by the land owner and labour by the partner. The crop or returns were shared based on a predetermined condition. It was said that the labour cost comes about half of the investment and the partner would be entitled to get half of the returns normally. This method helped both the land owner and the partner as labour was a crucial factor which determine the gain or loss of the farming business.

Maintaining constant supply of certain type of vegetables to few shop keepers was a practice adopted by 2.00 per cent of the respondents. This also involved some personal tactics and prevented the question of 'no demand for the produce'.

Sowing only on an auspicious day was practiced by 1.33 per cent of the respondents. The days suggested by them were *Thiruvathira Njattuvela*, the day of *Aswathy*, *Bharani* and *Karthika* (day names in a Malayalam month). It is believed that the stars have influence over the fate of universe on those particular days. Even though the scientific base was unknown, still some of the farmers strongly stick to this.

Another 1.33 per cent cultivated only crops which required less labour and which did not need 'panthal' making. This naturally reduced the investment and a heavy impact if a crop loss occurred.

Covering fruits using plastic or paper sleeves to protect from fruit fly attack was a practice followed by 1.33 per cent of the respondents. This usually applies to snakeguard (*Trichosanthus anguina*) and bitter gourd (*Momordica charantia*) only.

Burning trashes in the basin before sowing and adopting organic farming were two practices reported by 0.66 per cent of respondents each. They expected pest control through these methods.

Another 0.66 per cent of respondents reported that they cultivated low risk crops such as Colocasia (*Colocassia esculentus*), Amorphophalous (*Amorphophallus companulates*) and they refrained from institutional loans. Instead they raised capital through loans from friends and relatives.

5.3 Measures for mitigation

Majority (66.60 per cent) of the respondents compensated for a loss by the profit obtained from other crop or income from other enterprises or other vocations. This was quiet normal and a practice without any harm or negative implications. This was made possible only because they had taken the precautionary measures of crop diversification and vocational diversification.

The second best alternative was the renewal of loans already taken. This was practiced by only 22.00 per cent of the respondents. This was strongly encouraged by the VFPCCK and at the same time it was ensured that the farmer continue with vegetable cultivation even after suffering the loss.

Another 16.66 per cent of respondents compensated for the loss suffered through availing government subsidies. This was a common practice in places where '*Harithasanghams*' are in operation. While providing subsidies are a controversial issue among statesmen and economists, it was a fact that subsidies are a relief to a farmer when they suffer a loss.

Obtaining loans on land and gold mortgage was a practice reported by 13.30 per cent of the respondents. This was availed by paying a heavy interest. However, it is an easy way to resort as the people are more reluctant to obtain loans from friends and relatives because of the false pride. Also obtaining institutional loans require cumbersome procedures.

However, 3.33 per cent of the respondents resorted to institutional loans on other grounds when they suffered crop loss. Usually such farmers owned costly immovable assets or large holdings which were mortgaged to get loans.

Some of the farmers who obtained loans on land and gold mortgage were pushed into further crisis by not being able to pay back the amount and

interest. This naturally resulted in selling out of part of their holdings or gold assets. Such reports came from 2.66 per cent of the respondents.

Re-use of 'panthal' materials even after 3 years was practiced by 2.00 per cent of the respondents. However, this required careful procurement of quality 'panthal' materials and its careful handling and preservation.

Another 2.00 per cent of respondents resorted to loans from friends and relatives.

Extending the productive period of the crop was a practice reported by 1.33 per cent of the respondents. This distributes the fixed costs across a few more months. This is in contradiction to modern farming where intensive production in shorter periods is practiced. The practice was common in snakeguard (*Trichosanthus anguina*). Naturally this may require varieties which have a longer productive period. The practice included adding more soil at the basin and applying both organic and inorganic fertilisers along with proper irrigation.

Minimising family expenses, obtaining exemption from paying land rent, obtaining permission for repayment of loans in installments were the practices reported by 0.66 per cent respondents each in case of a crop loss. Minimising cultivation for a while and resorting to seed production were the other two practices reported by 0.66 per cent of respondents each.

Some farmers had utilised their own life savings for compensating the crop loss and some have obtained advances from vegetable shopkeepers for further production.

5.4 The crises and contingent measures

In this session the crises and the contingent actions taken by farmers are discussed together.

5.4.1 Bitter gourd (*Momordica charantia*)

Crises, Season I

In bitter gourd the viral disease had grown as a serious problem. Many of the farmers had given up the bitter ground cultivation since the past few seasons.

The occurrence of natural calamities is not rare in Kerala, especially during the first season. Heavy rain induced low productivity, 'panthal' lodging and monsoon failure were the major nature related crises reported. This was quite different from other Indian states where the crises have its roots on cyclones and other such phenomenon.

As in the case of many cucurbits crops, fruit fly attack was severe in bitter gourd also. Out of 10 reports of pest related crises, nine was that of fruit fly attack and a single report was that of bird's menace.

As far as bitter gourd is concerned, the marketing problems are not at all serious in the first season. The only factor involved was the unexpected price fall and its share was only 14.80 per cent.

With regard to seed related crises, low germination percentage created problems as reported by three farmers out of four (75.00 per cent). Ensuring quality and varietal characteristics of seeds are difficult because the farmers some times, are forced to buy seeds from unknown persons.

Contingent measures, Season I

The responses with regard to the contingent actions are curious and reveals the particular nature of crisis in which no actions prove worth to a large extent. Fig. 4 shows the percentage of crises that were dealt with some kind of contingent actions. In first season cowpea, 40.74 per cent of the crises were tried with one or other actions and in case of first season bitter gourd 33.33 per cent of

the crises were dealt with some or other means. In all the other crops and seasons the percentage of crises dealt with contingent actions were less than the above two.

In case of mosaic incidence in first season bitter gourd, 73.30 per cent of the farmers did not take any contingent actions. Some (6.67 per cent) adopted distress spraying with all available chemicals. Some others (20.00 per cent) had taken a more justifiable decision of replacing the crop. The control was not possible once the viral disease infects the plant. However, disease can be controlled to a some extent from spreading by the use of yellow traps for trapping the spreading agent – white fly (*Bemisia tabacci*). As the VFPCCK has started intervening by giving popularity to the idea of yellow trap, some had put it on a trial basis.

Even though data regarding the soil and climatic factors at the time of occurrence had not been collected, some informal informations were provided by farmers. The disease did not appear when the cultivation was undertaken on virgin land for three or four years. In other land, whenever there was a break in rainfall for one or two days the incidence was aggravated. The above two facts give ground for two inferences. One is that, with continued intensive cultivation, the soil health ruins and thereby the plant health also. This creates a conducive situation for the occurrence of the disease. The depletion of soil organic matter and excess use of chemicals and fertilizers in turn lead to death of the soil. Another factor is that, with the cessation of the rainfall, activity of the vector (white fly) increases.

During the first season most of the farmers do not care to make necessary sprayings to control pests and diseases. This was because of the fact that, chemical sprays or use of traps may not be much effective due to incessant rains. There was a single report of crop damage to crop caused by birds. But the problem was left uncared.

Again in dealing with the problem of unexpected price fall, five farmers (71.44 per cent) out of seven did not take any action. The VFPCCK 'Swashraya Vipanis' were able to tackle this problem to some extent. Still the issue remained live and some (14.28 per cent) farmers took their produce to distant markets. The delaying of harvesting as one of the farmers had claimed to practice was not always possible. The delaying of harvesting for more than two or three days will adversely affect the quality of the produce.

Fortunately the problem of low germination percentage of seeds make its appearance in the beginning of the crop itself giving the farmer a chance to try with another crop or with new seeds.

Crises, Season III

From table 7 it was evident that the major disease was nothing but the mosaic which had 86.90 per cent share among different diseases. This illustrates the depth of the mosaic problem.

There was a single report of flooding (Table 8) by summer showers. Flooding occurred in the low lands whenever the monsoon made its invasion slightly earlier as a continuation of summer showers.

Contingent measures, Season III

The contents of the Table 9 highlights the way in which individuals behave themselves in situations of crises. Insecticide sprays to control vector was a common practice and popularized by extension personnel. However, majority of the respondents did not take any action. This should not be regarded as ignorance or carelessness. It should be remembered that the vegetable farmers of the sample area were under the constant vigil of the extension personnel. Still, this happened, because they had lost faith in the existing control measures as they were not working properly.

Figures 5 and 6 provide for a comparison between crisis aspects of bitter gourd cultivation in the first and third seasons. The above discussion can be summarized as follows.

- (1) In both the seasons the main source of crises were diseases.
- (2) In the third season the impact of disease was more than double than that of first season
- (3) From figure 7 it can be concluded that the third season bitter gourd was the crop worst affected by diseases compared to other crops under study.
- (4) From figure 8 it can be concluded that first season bitter gourd was the crop worst affected by pests in comparison with other crops under study.
- (5) From figure 4 it can be concluded that the first season bitter gourd was taken care with contingent actions and in this aspect the crop was next only to the crop cowpea.

5.4.2 Snake gourd (*Trichosanthus anguina*)

Crises, Season I

In this season market related issues and natural calamities played equal role in creating the crises. The one and only market related crisis was the 'unexpected price fall'. The crop snake gourd fetched the lowest price compared to other commonly cultivated vegetables. Sometimes it went up to a situation where there was no demand for the produce.

Contingent measures, Season I

With respect to measures for tackling the pricefall majority did not take any action (72.72 per cent). However, there were reports of transporting to distant markets for sale. Bumper production verbally creates market glut. The only way out was to transport the produce where there was demand (Table 12). Sometimes, they pool the produce from neighbouring farmers and transport the produce to

Thrissur or Thiruvananthapuram where journey of more than two hours and four hours respectively are required. While pooling, they did not limit to snake gourd only, but gathered all types of vegetables. Consequently some business minded farmers had bought small trucks for transporting the produce and put it into other services during the off-season. Even VFPC Swasraya Vipanis cannot perform this in large scale due to some reason or other. Perhaps the formal organizational set up of the sangams may be limiting their activity.

Crises, Season III

A broad classification of the crisis reports are given in table 13. The share of market related crisis was 73.23 per cent. In the third season where natural calamities, pests and disease incidence are too low, farmers accept this crop as their favorite and this in turn results in large scale production which leads to price fall.

Table 15 is a warning not only to farmers but also to all agencies concerned in promoting vegetable production. The virus disease, 'mosaic' can lead to the same fate of bitter gourd cultivation unless timely intervention is made.

Contingent measures, Season III

The method of tackling unexpected price fall by 10.00 per cent was by increasing the yield. Increasing the yield through giving better management may worsen the situation of price fall. However, when there was no strong aggression of natural calamities, pest and diseases, and where the crop responds well to better management, certain farmers did not hesitate to produce more.

The other contingent measure was to extend the productive period of the crop. This was an excellent practice as the price fluctuated from month to month or week to week in the case of snake gourd, if the extension of the crop for one or two month in addition was possible. This also distributed the fixed cost across a few

more months. The practice required the use of traditional seeds. The management practices included addition of both organic and inorganic manures, irrigation and raising soil around the base.

Figures 9 and 10 provides for a comparison between crises of two seasons. The above discussion can be summarized as follows.

- (1) During first season both market related issues and natural calamities play an equal role in creating crises.
- (2) During the third season nature related crises diminishes to around one third of that of first season.
- (3) The market related issues becomes double during third season compared to the first season.
- (4) From figure 7 it can be noticed that the crop which was lowest affected by diseases was the first season snake gourd.
- (5) From figure 8 it can be noted that the crop that was affected second most by pest was the first season snake gourd.
- (6) With regard to crops worst affected by marketing related issues, third season snake gourd was next only to third season oriental pickling melon (Fig. 11).
- (7) As far as the care during the crises situation was concerned, the third season snake gourd received a care next to cowpea, and first season bitter gourd (Fig. 4).

5.4.3 Oriental Pickling Melon (*Cucumis melo* var. *connomon*)

Crises, Season I

Here also the marketing related issues were the most serious. The produce came up in large quantities. The consumption did not go up with increase in production. This created a market glut. The produce was not consumed in large proportions, but had some aesthetic relevance as it is an item in the '*Vishukkani*'.

Contingent measures, Season I

With respect to unexpected price fall, the measures adopted were almost same as those practiced in the case of the previously discussed crops (Table – 21). Selling out to agencies from distant market was a sort of distressed action. Engaging in formal agreements with shopkeepers was a practical solution, but better worked only in ‘no demand for the produce’ situations.

Crises, Season III

In this case also, the market related crises have the major share. The other categories had negligible shares. More than 92.00 per cent of the marketing related crises were that of unexpected price fall.

Contingent measures, Season III

As far as unexpected price fall was concerned, most of the contingent measures adopted were the same as discussed in the previous crops (Table 24). Some farmers reported that they took the produce on head and transported to distant markets.

The above discussion can be summarized with the help of figures 12 and 13 as follows.

- (1) In both the seasons, marketing related issues formed the major source of crisis.
- (2) In the third season the marketing related problems became more serious compared to first season.
- (3) The nature related crises came down by one third of the first season during the third season.
- (4) The crop was least affected by diseases compared to other crops under study except in the case of first season snake gourd (Fig. 7).

- (5) The pest related crises were less compared to bitter gourd and snake gourd and its share was almost equal with ash gourd and cowpea in this respect.
- (6) Oriental pickling melon was the crop worst affected by marketing related issues (Fig. 11).
- (7) It was the crop where the farmers cared least in situations of different crises and the only crop came above oriental pickling melon in this respect was the first season snake gourd (Fig. 4).

5.4.4 Ash gourd (*Benincasa hespida*)

Crises, season I

Here again the marketing problems created the crises. The second most important issue was that of diseases.

Contingent measures, Season I

Contents of the Table 27 describes how farmers tackled unexpected price fall. Most of the measures were same as those discussed earlier. Adjusting of harvesting time was reported to be practiced in situations of no demand for the produce. This was a practice possible only in case of kumbalam. The product does not loose quality for a reasonable period even if the harvesting is delayed for a while or stored for some time.

Crises, Season III

Here again the pattern of disease creating agents remained same as that in the previous season. The major issues were unexpected pricefall and the diseases.

Contingent measures, Season III

Here again, most of the actions were similar to that of the previous season.

With the help of figures 14 and 15 the above discussion can be summarized as follows.

- (1) In both the season the market related crises were more serious in the case of ash gourd.
- (2) The second most important source of crisis in both the season was the diseases.
- (3) There was a slight increase in both market related crisis and disease related crisis during the third season compared to first season.
- (4) Nature related problems were less during the third season compared to first season.
- (5) From figure 18 it can be inferred that ash gourd was the crop least affected by natural calamities compared to other crops under study with the exception of first season cowpea
- (6) From figure 7, 8 and 11 it can be concluded that ash gourd was a crop which was not affected to the extremes by any of the factors such as diseases, pests, marketing problems and natural calamities.
- (7) From figure 4 it can be noted that ash gourd was a crop cared in situations of crisis development at a reasonable level.

5.4.5 Cowpea (*Vigna anguiculata*, *V. sesquipedalis*)

Crises, Season I

From Table 31 it can be noted that the major share of the crises was constituted by market related issues (74.08 per cent). The next category, diseases had only a share of 18.50 per cent. The disease, though, now affects only a small number of farmers, has a potential for devastation.

Contingent measures, Season I

The Contingent measures with respect to unexpected price fall are given in the Table 33. Some farmers had resorted to increase the yield through better

management. In case of 'Achinga payar', the harvest cannot be delayed. The operation should take place once in two days or maximum once in three days. Otherwise the quality will be affected as the pods will develop fibers. Such a product will be fetching lower price. However, normally a 'no demand' situation does not occur in case of cowpea. From 'Onam', the festival of Kerala, onwards to the *Sabarimala* pilgrim season and extended to the summer, the demand exists.

Table 34 lists out the actions taken against the fungal disease 'karimpan'. Majority of the farmers had resorted to fungicide sprays. However, the situation was grave and in many cases it was not effectively controlled. Mosaic and fusarium wilt were left uncared.

Crises, Season III

It may be noted that in the first season the nature related problems had only a share of 3.70 per cent. Here it attained a second position with 34.43 per cent (Table 36). The main issue related to nature was heavy summer showers during flowering stage leading to the shedding of flowers. Incidentally, some farmers claimed that the crop had flowered again and they escaped from a crop loss.

Contingent measures, Season III

Table 38 lists the contingent measures taken in case of unexpected price fall. 'Increasing yield through better management' again was a practice during the third season. From this, it can be inferred that the crop is still promising.

The 'karimpan' (*Colletotrichum* sp.) disease was fast growing to an uncontrollable situation. However, it is striking that nobody had reported that they did not take any action or abandoned the crop.

The figures 16 and 17 provided for a comparison. The following points may be inferred.

- (1) During the first season cowpea, marketing related problems were most serious.
- (2) During third season, the marketing related problems came down almost by half.
- (3) During the second season, severity of nature related issues almost doubled.
- (4) From figure 18 it is seen that third season cowpea was the worst affected crop by natural calamities in comparison with other crops under study.
- (5) From figure 4 it is evident that cowpea was the most cared crop under situations of crises.

5.5 Intervention by external agencies in crises situations

The two agencies reported to have made interventions in crisis situations were the VFPCCK and the Department of Agriculture.

5.5.1 Intervention: Whether they made an intervention?

From Table 40 it can be noted that VFPCCK and Department of Agriculture were the only two agencies who intervened in the crisis situations. Majority (98.00 per cent) claimed that VFPCCK has intervened and a minority reported the intervention of Department of Agriculture. This was because of the fact that VFPCCK was acting extensively in the three sample panchayats. The Department was supposed to take care of vegetable farmers along with other farmers. However, the intervention was strongly experienced only in the panchayats where the scheme of 'Harithasangams' are in operation.

5.5.2 Effectiveness: Whether the intervention was effective?

Table 41 reveals that 83.60 per cent of respondents stated the intervention of VFPCCK as effective. As much as 96.55 per cent claimed that the intervention of the Department of Agriculture was effective. The VFPCCK was intervening in every operation from seeding to marketing. Even though they have

established '*Swashraya vipanis*', the price cannot be kept stable due to a number of forces like organised pressures from the wholesalers and retailers purchasing from the '*vipanis*' and activities of some members who dare to sell their produce outside the *Swashraya vipani*. The intervention of the Department of Agriculture was through subsidies and it was 100 per cent effective whenever there was a crop loss.

5.6 Rational methods of adaptation

The average scores obtained by each category viz., anticipatory measures, measures of mitigation and contingent measures were as given below.

Anticipatory measures	- 51.85
Measures for mitigation	- 46.50
Contingent measures	- 39.61

From comparison of the above values it was evident that the judges gave prime importance to anticipatory measures. The proverb 'prevention is better than cure' was applicable here also. They were considered as most desirable as adoption of these methods does not require any additional input but proper planning and allocation of the resources would be sufficient. This would simply insure the farmer from the impact of a crisis in one way or other.

The judges regarded the methods for mitigation of the impact of a crisis as the second most important method. The crises in vegetable farming being inevitable in one season or other, farmers will have to adopt some measures as part of their adaptation to mitigate the crisis.

The contingent measures secured third rank with respect to judges rating of rationality. Irrespective of season and crop, the issue of 'unexpected price fall' was tackled by pooling of produce from neighbouring farmers and transporting to distant markets.

Judges regarded adjusting planting time so as to get yield during high demand season as the most desirable measure with a total score of 61.

The second most important measure was mixed cropping in vegetables with a total score of 60. The method not only act as an insurance against crisis but also intensify farming activity.

Crop rotation with seasonal crops such as banana, spices crops like ginger and turmeric, paddy, tapioca etc. were regarded as the third most important measure with a total score of 56. The method not only insulates the farmer against crises but also sustains the productivity of soil and control pests and diseases.

Crop diversification in vegetable was the next most important method. This was a practice adopted by more farmers than the crop mixings as the latter was not possible with crops which need panthals.

Crop diversification with annual crop such as ginger, turmeric, banana, paddy etc. was regarded as the next most important method.

The practice of vocational diversification by other enterprises such as rearing milch animals, running cottage industries etc. and minimising hired labour by the maximum use of family labour were the other two important anticipatory measures indicated as important by the judges.

Measures of mitigation

The most important method of mitigation was compensating the loss using the profit from other crops or enterprises with a total score of 53. The practice required proper adoption of at least few of the anticipatory measures.

The other important measure for mitigation was the renewal of loans with a total score of 40. The practice ensured the cultivation process going on with out any interruption.

Contingent measures

Use of yellow trap for the control of vector transmitting mosaic in third season bitter gourd and application of Bavistin for the control of Vine blackening disease (*Colletotrichum* sp.) in third season cowpea attained the highest score of 46.

5.7 Level of Adaptation

The results of the measurement of the level of adaptation of the respondents revealed that majority of the respondents (65.33 per cent) belonged to the medium level of adaptation followed by high level (20.67 per cent) and low level (14.00 per cent).

Any farmer who has considerable experience in vegetable farming will be practicing some of the methods of adaptation. This made them practice few of the methods even unknowingly. But to reach a higher level of adaptation their resources will not be sufficient as majority of them were having a holding size of 0.2 to 0.4 hectare.

Higher level of adaptation required not only time and willingness but also material resources. Naturally, the number of farmers in higher level of adaptation become less.

As much as 14.00 per cent of the farmers belonged to the low level of adaptation category. This was because of fact that the adaptation level was very much related to the experience of the farmer. In the respondent population, new farmers were very less. The new comers were very reluctant to practice adaptation methods if there was no proper guidance as their only intention would be to make maximum profit out of the crop. This lead to monocropping of high value crops like bitter gourd and cowpea and ended up in crises.

Summary

CHAPTER-VI

SUMMARY

Kerala, the southern most state of India is well known for the production of spices and plantation crops. In the last two or three decades the commercial cultivation of vegetables also was started in the state. Still a major portion of state's requirement of vegetables are met by import from neighbouring states. The Kerala government and its agencies such as the Department of Agriculture and the Vegetable and Fruits Promotion Council of Kerala are trying to increase vegetable production in the state. It was in this context the present study was undertaken with the following objectives:

1. To identify the different crisis situations encountered by commercial vegetable growers.
2. To identify the methods of adaptation in those crisis situations.
3. To study the rationality behind those methods of adaptation.
4. To study the perception of commercial vegetable growers about the external intervention of developmental agencies in crisis situations.

The study was conducted in Ernakulam district which was a traditional vegetable growing area. More over the activities of Department of Agriculture and vegetable and Fruits Promotion Council of Kerala are intensive in the district for the promotion of vegetable production. A two stage sampling technique was adopted to select three panchayats. Three blocks in the district with maximum area under vegetables formed the first stage and one panchayat each from the selected blocks formed the second stage. From the selected panchayats fifty vegetable growers each were identified and they formed the respondents for the study.

Pre-tested and well structured interview schedule was used to collect data. The respondents were asked to reveal the experiences of crisis in vegetable farming during the past five years.

The crops selected based on the pilot study were bitter gourd (*Momordica charantia*), snake gourd (*Trichosanthus anguina*), oriental pickling melon (*Cucurmis melo*), ash gourd (*Benincasa hespida*) and cowpea (*Vigna anguiculata* and *V. sesquipedalis*). Data were collected by classifying crop wise and season wise. The data regarding methods of adaptation were delineated as anticipatory measures, measures for mitigation and contingent measures. The rationality of the methods of adaptation was studied by the rating from three groups of respondents which included scientist, extension personnel and progressive farmers. An index was developed for measuring the level of adaptation.

For the present study, the crisis of commercial vegetable grower was defined as any disturbance in the normal production and marketing process of vegetables which necessarily result in an economic loss.

The salient findings are as follows:

1. The important anticipatory measures were adjusting planting time to get yield at high demand season, mixed cropping in vegetables, crop rotation with seasonal crops and crop diversification in vegetables
2. The important methods for mitigation were compensating for the economic loss with the profit from other crops and loan renewal by paying interests.
3. In dealing with unexpected price fall and no demand situation, farmers used to pool their produce and transport to distant markets for sales.
4. With regard to the crises:

The major crisis encountered by bitter gourd was created by diseases like Mosaic followed by natural calamities.

In snake gourd the major crises were created by natural calamities and unexpected price fall.

In oriental pickling melon and ash gourd the crisis was due to unexpected price fall in both the seasons.

In cowpea also marketing problems were serious and natural calamities play an equally important role in creating the crisis.

Intervention by external agencies

With regard to external intervention in crisis situations, majority (98.00%) reported that VFPCCK has made interventions and a minority (1.33%) reported that Department of Agriculture was making interventions.

With regard to effectiveness of interventions, 83.66 per cent reported that intervention of VFPCCK was effective. Ninety six per cent of the farmers who reported that the Department of Agriculture was making intervention rated it as effective.

With regard to level of adaptation 14.00 per cent belonged to lower category, 65.33 per cent belonged to medium category and 20.67 per cent belonged to high category.

Implications of the study

The study reveals the fact that crises are part of the vegetable farming activity. Higher the profit potential of the crop, the more will be the attention paid to it. This some times leads to excess adoption of technology. As the intensification of the farming activity increases and profit maximisation is brought about through improper and im-balanced adoption of technology, sustainability of farming decreases. Even if the above factors are not prevalent, unexpected happenings like natural calamities occur. Thus, the crises becomes inevitable. Still, the activity continues without much interruption. This is made possible only because the farmers adapt themselves to the situations using methods either derived or acquired by them or inherited from their predecessors. Among these

methods anticipatory measures are of prime importance as rated by the experts including extension personnel, scientists and progressive farmers.

The adaptability index reveal that majority of the farmers belong to medium level of adaptation. This is justified in the context where majority of the farmers belonged to experienced group and possessed medium level of material resources.

Most of the farmers perceive that the VFPCCK and Department of agriculture are able to intervene in crisis situations effectively. Both of these organisation should be careful in orienting farmers, especially the new comers, towards modern methods of farming.

Suggestions for further studies

Further probing in to the following aspects may prove useful.

1. Exploring the supply-demand relationships which actually exists in different locations and in different seasons.
2. Study the impact of changing food habits of Kerala state on vegetable farming.
3. Explore ways and means for obtaining produce in large quantity of uniform quality for export and processing by diversifying vegetable cultivation.

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References

REFERENCES

- Barnard, C.I. 1938. *The Functions of Executive*. Harvard University Press, Cambridge, p.171
- Bein, F.L. 1980. Response to drought in the Sahel. *J. Soil Wat. Conserv.* 35: 121-124
- Bharana, L.P. 1980. Socio-economic consequences of drought in arid tract - Case study. (ed. Mann, H.S). *Arid-zone Research and Development*. Jodhpur, India. p.155
- Bhatia, H.R. 1973. *General Psychology*, Oxford and IBH publishing Co., New Delhi, p.414
- Blakeslee, D.J. 1978. *Assessing the Central Plains Tradition in Eastern Nebraska: Content and Outcome*. Report of the Office of the Iowa State Archaeologist, University of Iowa, 11: 156
- Bonny, B.P. 1991. Adoption of improved agricultural practices by commercial vegetable growers of Ollukkara block in Thrissur district. M.Sc. (Ag.) thesis, Kerala Agricultural University, Trichur, India. p. 127
- Borkar, U.V. and Nadkarni, M.V. 1975. *Impact and Drought on Rurallife*. Popular Prakashan, Bombay, p.140
- Brammer, H. 1987. Drought in Bangladesh - lessons for planners and administrators. *Disasters*. 11: 21-29
- Bruner, J.S., Goodnow, J. and Austin, G.A. 1956. *A study of Thinking*, Wiley, New York, p.240
- Caplan, G. 1972. *Preventive Approach of Community Mental Health*. Harward University, Cambridge, pp.74-83
- Chamala, S. and Crouch, B.R. 1977. *Patterns of Adaptation and Factors Associated with Economic Success in the Wool Industry*. Department of Agriculture, University of Queensland, Brisbane, Australia, pp.107-111
- Cuplan, G. 1964. *Principles of Preventive Psychiatry*. Basic Books Inc., New York, p.230
- Dimarco, N.J. 1970. Stress and adaptation in cross cultural transition. Ph.D. thesis. Western Reserve Univ., USA, p.123

- Encyclopaedia Britannica. 1973. *Encyclopaedia Britannica* inc. William Benton, Publisher, Chicago. 3: 395-397
- Eysenck, H.J. and Arnold, W., 1972. *Encyclopaedia of Psychology*. Herder and Herder, USA, p. 233
- Fliegel, F.C. and Kivlin, J.E. 1966. Farmers' perception of farm practices attributes. *Rur. Sociol.* 31: 197-206
- Folkman, S., Lazarus, R., Green, R. and DeLongis, A. 1986. Appraisal, coping, health and symptoms. *J. Personality Social Psychology* 50: 571-579
- Fuller, T.D. 1987. Resettlement as desertification control measure: A case study in Darfur region, Sudan - Part I: review of the problem. *Agric. Admin. Ext.* 25: 215-234
- Giannatti, G. 1975. Crisis of industrial society. *Rassegna Italiana di Sociologia.* 16: 369-378
- Ginsberg, H. and Opper, S. 1969. *Piagets theory of Intellectual Development - An Introduction*. Prentice Hall Inc., Englewood Cliffs, New Jersey, p.236
- Godelier, M. 1987. Introduction : the analysis of transition process. *Int. Social Sci. J.* 114: 447
- Gopalakrishnan, T.R. 1996. 'Horticulture vikasanam, Keralathile sadhyathakal'. *Mathrubhumi Karshika varshikappathippu*, Mathrubhumi Printing & Publishing Co. Ltd., Kozhikkode. p. 235
- Gopalakrishnan, T.R. 1997. 'Keralathile pachakkari krishi'. *Janapatham*, Department of Public Relations, Government of Kerala, Thiruvananthapuram, p. 47
- Grandin, B.E. and Lembuya, P. 1987. *The Impact of the 1978 drought on Olkarkar group Ranch, Kajiado, Kenya*. Paper Pastoral Development Network, Overseas Development Institute, U.K. No.23e. p. 14
- Hermann, C.F. 1963. Some consequences of crisis which limit the viability of organisations. *Adm. Sci. Quart.* 8: 61-82
- Hermann, M.G. 1965. Stress, self esteem and defensiveness in an inter-nation simulation. Ph.D. Dissertation, North Wester University, U.S.A., p.85
- Hirschman, A.O. 1958. *The strategy of Economic Development*. New Haven, Yale Univ. Press, USA, p. 176

- Hollander, E.P. 1967. *Principles and Methods of Social Psychology*, Oxford University Press, London, p. 217
- Ibrahim. 1988. Drought Attitude and crop diffusion among peasant farmers of Sudan. *Geography* 73: 71-73
- Jarvis, L.S. 1974. Cattle as capital goods and ranchers as portfolio managers: an application to the argentine cattle sector. *J. Political Econ.* 82: 489-520
- Jiggins, J. 1986. Women and seasonality: coping with crisis and calamity. *IDA Bulletin* 17: 56
- Johnston, R.J. and Taylor, P.J. 1986. *A World in Crisis*. (ed. Basil, B.). Oxford and New York, p.241
- Kaplan, H.B. 1933. *Psychological Stress: Trends in Theory and Research*. Academic Press, New York, p.124
- Kantharaju, J. 1980. A study of knowledge, extent of adoption and appropriateness of sunflower technology among growers. M.Sc.(Agri.) thesis, U.A.S., Bangalore, p. 77
- Kates, R.W. 1971. National Hazard in Human Ecological Perspective: Hypothesis and Models. *Economic Geography*. 47: 438-51
- KAU. 1998. *Package of Practices Recommendations - Crops 96*. Directorate of Extension, Kerala Agricultural University, Thrissur, p.267
- Kelley, G.A. 1955. *The Psychology of Personnel Constructs*. Vol.1. W.W. Norton and Co., Inc., New York, p.217
- Kerlinger, F.N. 1973. *Foundations of Social Rresearch*. Surjit Publications, 7-k, Kothapur Road, Kamalanagar, Delhi-7, p.714
- Kiran, S. and Rao, S.B.V. 1998. A study of knowledge possessed by the farmers about cyclone disaster prepairedness. *J. Ext. Edn.* 9: 16-18
- Kgathi, D.L. and Opschoor, J.B. 1979. Drought impacts and adaptations: Socio-economic aspects of the 1979 Kgatlong drought, NIR Research Notes, National institute of Development and Cultural Research, Univ. College of Botswana, No.6., p.162
- Lamarck, J.B. 1914. *Zoological Philosophy*. MacMillan Publishing Co., London, p.277
- Lateef, N.V. 1980. *Crisis in the Sahel: A Case Study in the Development Co-operation*. Westview Press, Colorado, p.127

- Laya, D. 1975. Document: Interviews with farmers and livestock owners in the Sahel, Daker, Senegal. *African Environment*, 1: 49-93
- Lazarus, R.S. 1966. *Psychological Stress and Coping Process*. McGraw Hill, New York, p.214
- Lewin, K. 1948. *Resolving Social Conflicts*. Harper and Row, New York, p.172
- Longhurst, R. 1986. Household food strategies in response to seasonality and Famine. *IDS Bulletin*, 17: 27-37
- Manoj, M. 1998. Gaps in adoption of plant protection practices by commercial vegetable growers of Thrissur district. M.Sc. thesis Kerala Agricultural University, Trichur, India, p.131
- McCloskey, D.N. 1975. *English Open Fields as Behaviour Towards Risks*. Agricultural Economics Workshop Report. Univ. of Chicago, USA., p.76
- Melkote, S.R. 1991. *Communication for Development in the third world, theory and practice*. Sage Publications India Pvt. Ltd., New Delhi. p.271
- Miller, K. and Isac, I. 1963. The concept of crisis: Current status and mental health implications. *Human Org.* 22: 195-201
- Mohanty, B.B. 1998. Role of media in disaster management. *Ind. J. Adult Edn.* 9: 43-54
- Morris, M.D. 1975. Weather Instability, Food Scarcity and Famine Policy. *Zeitschrift fur Auslands ehe. Landwirtschaft* 14: 317-330
- Murray, H.A. 1938. *Explorations in Personality*. New York, Oxford. p.228
- New Websters Dictionary and Thesaurus. 1991. Book essentials inc. New York. 10016, p.1024
- Norman, D.W. 1967. An economic study of three village in zaria Province. Part I: Land and Labour Relationship, Samaru Misc., Paper No.19, Institute for Agricultural Research, Samaru, Nigeria, p.77
- Norman, D.W., Fine, J.C., Goddard, A.D., Koreker, W.J. and Pryor, D.K. 1976. A Socio-economic Study of three villages in the Sokolo close-settlement zone, part 2, Input-output study, Vol.1, Text (Mimeo), Institute for Agricultural Research, Samaru, Nigeria, p.174
- Parad, H.J. and Cuplan, G. 1960. A frame work for studying families in crisis. *Social Work*, 5: 3-15

- Parry, G. 2000. *Coping with crises*, The British psychological society, University press (India) Ltd., 3-5-819, Hyderguda, Hyderabad, p.126
- Ramegowda, R.L. 1991. Crisis management by farmers, an analysis. Ph.D. thesis, University of Agricultural Science, Bangalore, p. 127
- Ranganath, M. 1978. Evaluation of scarcity relief work relating to agricultural development including some selected management aspects. M.Sc.(Agri.) thesis, U.A.S., Bangalore, p. 89
- Rapoport, L. 1962. Working with families in crisis - an exploration in preventive intervention. *Social Work*, 7: 48-56
- Reddy, N.U. 1981. Evaluation of the drought prone areas programme in ponnai (West) watershed of Chittoor district, Andhra Pradesh. M.Sc.(Agri.) thesis, U.A.S., Bangalore. p. 86
- Robertson, F.R. 1970. Housing - crisis or opportunity? *Extn. Serv. Rev.*, 41: 16
- Roy, N.K. and Jaiswal. 1969. Characteristics of agricultural innovations as perceived by farmers. extension workers and research workers. *Manas : The J. Scient. Psychol.*, 16: 25-32
- Sachdeva, J.L. 1998. Role of adult education in creating awareness of natural disaster management. *Ind. J. Adult Edn.*, 9: 40-42
- Sartain, North, Strange and Chapman. 1973. *Psychology - Understanding Human Behavior*. Mc Grow Hill, Koyahasha Ltd., New Delhi, p. 461
- Secord, P.F. and Backman, C.W. 1974. *Social Psychology*. Mc Graw Hill International Book Company, New Delhi, p.553
- Seligman, E.R.A. 1963. *Encyclopaedia of Social Sciences*. Vol.3, The Macmillan Company, New York, p.544
- Sharma, V.K. 1998. Natural disaster management - an over view. *Ind. J. Adult Edn.*, 9: 5-17
- Singh, K. 2001. *Inaugural address. XIXth group meeting of AICRP on vegetables*. Indian Institute of Vegetables Research, Varanasi, India, pp.15-17
- Skrabanek, R.L., Banks, U.J. and Bowles, G.K. 1964. *Farmers Adjustment to Drought in a Texas Country*. Texas Agricultural Experiment Station, B-1005, College Station, Texas, p.77

- Slovic, P., Kunreuther, H and White, G. 1974. Decision process, Rationality and Adjustment to Natural Hazards, (ed. White, G.), *Natural Hazards: Local, National, Global* Oxford University Press, New York, pp. 187-204
- Stallings, R.A. 1971. A comparative study of community as crisis management systems, Columbus. Ph.D. Dissertation, The Ohio State University, Columbus, p. 129
- Stoddard, E.R. 1966. Toward a sociological contribution to disaster research. *Roky Int. Soc. Sci. J.* 3: 181-191
- Taal, H. 1989. How farmers cope with risk and stress in rural Gambia. *IDS Bulletin* 20(2): 16-21
- Tindal, H.D. 1968. *Commercial vegetable growing*. Oxford Tropical Hand Books, Nairobi, p.230
- Vinayagam, S. 1998. Entrepreneurial behaviour of agri-business operators in Kerala. Ph.D. thesis, Kerala Agricultural University, Trichur, India, p. 155
- Walman, B.B. 1973. *Dictionary of Behavioural Science*. Van Nostrand Reinhold Company, New York, p.384
- Wiener, A.J. and Kahn, H. 1962. *Crisis and Arms Control*. Harmon on Hudson, New York, p. 178
- Wienphl, J. 1972. Turkana Herds Under Environmental Stress. *Nomadic People* 17: 59-87
- Wolpert, J. 1966. Migration as an adjustment of environmental stress. *J. Soc. Issues* 22: 92-102
- Young, O.R. 1968. *The Politics of Force*. Princeton Univ. Press, Princeton, pp.6-15

Appendices

APPENDIX - I
Block wise area under commercial vegetable cultivation in Ernakulam District

Sl. No.	Block	Area
1	Angamaly	457 ha
2	Vadavukodu	243 ha
3	Piravom	242 ha
4	Perumbavoor	234 ha
5	Muvattupuzha	229 ha
6	Parakkadavu	135 ha
7	Vypeen	106 ha
8	Alangadu	79 ha
9	Kothamangalam	76 ha
10	Paravoor	65.5 ha
11	Keezhmadu	64.0 ha
12	Mulamthuruthy	58.0 ha
13	Palluruthy	50.0 ha
14	Kalamassery	41.0 ha
15	Vyttila	30.0 ha

Area under vegetable cultivation in each of the panchayats of leading Blocks

Angamali Block (457 ha)

Sl. No.	Panchayat	Area
1	Malayattoor - Neeleswaram	150 ha
2	Manjapra	85 ha
3	Thuravoor	80 ha
4	Angamali	30 ha
5	Kaladi	30 ha
6	Karukutty	25 ha
7	Ayyampuzha	20 ha
8	Kunjoor	16 ha
9	Mukkannoor	15 ha

Vadavukode Block (243 ha)

Sl. No.	Panchayat	Area
1	Thiruvaniyoor	138 ha
2	Aikkaranadu	45 ha
3	Muzhuvannoor	20 ha
4	Kunnathunadu	20 ha
5	Vadavukodu	10 ha
6	Poothrikka	10 ha

Piravam Block (243 ha)

Sl. No.	Panchayat	Area
1	Piravam	55 ha
2	Elanji	55 ha
3	Koothattukulam	40 ha
4	Thirumarady	32 ha
5	Ramamangalam	30 ha
6	Pampakkuda	30 ha

Source : Basic data register (1998). PAO Office, Ernakulam

APPENDIX - II
ADAPTATION BEHAVIOUR OF VEGETABLE GROWERS IN CRISIS SITUATION - SCHEDULE FOR DATA COLLECTION

Respondent No. : Name and Address :

Age :

Occupational status of farming : Education :

Family income :

Agricultural background : Traditional/Recent

Experience in vegetable farming :

Own land :

Leased in land :

Vegetable area :

Farming group membership :

Other organization membership :

Family structure :

Male	Female	Adult	Children

1) Bitter gourd (*Momordica charantia*)

Season	Crisis	Method of adaptation
May - June		
September		
January		

2) Snake guard (*Trichosanthus anguina*)

Season	Crisis	Method of adaptation
May - June		
September		
January		

3) Oriented pickle melon (*Cucumis melon var. conomon*)

Season	Crisis	Method of adaptation
May - June		
September		
January		

4) Ash gourd (*Benincasa hespida*)

Season	Crisis	Method of adaptation
May - June		
September		
January		

5) Cowpea (*Vigna anguiculata* var. *sesquipedalis*)

Season	Crisis	Method of adaptation
May - June		
September		
January		

APPENDIX - III
ADAPTATION BEHAVIOUR OF VEGETABLE GROWERS IN CRISIS SITUATIONS
SCHEDULE FOR JUDGE'S RATING OF ADAPTATION METHODS

Sir,

Below are given the major crisis encountered by commercial vegetable growers and the contingency action taken by them as it occurred. Kindly rate the action of the farmers as scientific or not, its effectiveness in a three point continuum ranging from more effective (2), effective (1), less effective (0) and please give your comments on the rationality of that action in the adjacent column provided (The crisis of commercial vegetable growers is defined for the study as any disturbance encountered by them in the normal course of production and marketing of vegetables resulting necessarily in an economic loss).

Crop - Bitter gourd (*Momordica charantia*)

Season - 1 (May-June to August-September)								
No.	Crisis was created by	Contingent action	Scientific		Effectiveness			Rationality behind that action
			Y	N	3	2	1	
1	Fruit fly attack	Chemical sprays as per availability						
		Insecticide sprays						
2	Mosaic	Chemical sprays as per availability						
		Replace with some other crops						
		Spray insecticides given by shop keeper						
3	Unexpected Price fall	Transport to distant markets and sell						

6) Farmers perception on external intervention

Sl. No.	Agency	Made interventions		Effective	
		Y	N	Y	N
1	Grama Panchayat				
2	Block Panchayat				
3	Jilla Panchayat				
4	State Govt.				
5	Central Govt.				
6	VFPC				
7	Ag. Dept.				
8	Other Govt. agencies				
9	Voluntary organizations				
10	Religious organizations				

APPENDIX - III
ADAPTATION BEHAVIOUR OF VEGETABLE GROWERS IN CRISIS SITUATIONS
SCHEDULE FOR JUDGE'S RATING OF ADAPTATION METHODS

Sir,

Below are given the major crisis encountered by commercial vegetable growers and the contingency action taken by them as it occurred. Kindly rate the action of the farmers as scientific or not, its effectiveness in a three point continuum ranging from more effective (2), effective (1), less effective (0) and please give your comments on the rationality of that action in the adjacent column provided (The crisis of commercial vegetable growers is defined for the study as any disturbance encountered by them in the normal course of production and marketing of vegetables resulting necessarily in an economic loss).

Crop - Bitter gourd (*Momordica charantia*)

Season - 1 (May-June to August-September)								
No.	Crisis was created by	Contingent action	Scientific		Effectiveness			Rationality behind that action
			Y	N	3	2	1	
1	Fruit fly attack	Chemical sprays as per availability						
		Insecticide sprays						
2	Mosaic	Chemical sprays as per availability						
		Replace with some other crops						
		Spray insecticides given by shop keeper						
3	Unexpected Price fall	Transport to distant markets and sell						

Season – 3 (January-February to April-May)							
1	Mosaic	Insecticide sprays					
		Replace with some other crops					
		Chemical spray given by shop keeper					
		Vep oil-garlic mixture spray					
		Use of yellow trap					
		Give better crop management practices					
		Spray fytolan + Vep oil garlic mixture					
		Neem cake application at the basin					

Crop – Snake gourd (*Trichosanthus anguina*)

Season – 1 (May-June to August-September)							
1	Fruit fly attack	Chemical sprays as per availability					
2	Unexpected Price fall	Transport to distant markets and sell					

		Pooling of produce from neighbouring farmers and transport to distant markets for sales.							
3	Panthal loading								
4	Heavy rain induced low production								

Season - 3 (January-February to April-May)									
1	Unexpected Price fall	Give better management practices to increase yield							
		Transport to distant markets and sell							
		Establish personal contact with vegetable shop keepers to sell the produce							
		Extend the productive period through better management							
		Pooling of produce from neighbouring farmers and transport to distant markets for sales.							

Crop – Oriental pickle melon (*Cucumis melo* var. *conomon*)

Season - 1 (May-June to August-September)									
1	Unexpected Price fall	Transport to distant markets and sell							

		Pooling of produce from neighbouring farmers and transport to distant markets for sales.						
		Sell out to agents from distant vegetable markets						
		Engage in informal agreements with vegetable shop keepers establishing acquaintance						
		Sell directly to vegetable shop keepers						
2	Low yield							

Season – 3 (January-February to April-May)								
1	Unexpected Price fall	Direct selling to vegetable shop keepers						
		Transport to distant markets on head load during night for safe						
		Pooling of produce from neighbouring farmers and transport to distant markets for sales.						
		Sell out agents from distant vegetable markets						

Crop – Ash gourd (*Benincasa hespida*)

Season – 1 (May-June to August-September)							
1	Unexpected Price fall	Increase yield through better management					
		Pooling of produce from neighbouring farmers and transport to distant markets for sales.					
		Transporting to distant markets for sales					
2	Chodu Cheeyal (Fusarium wilt)	Soil drenching with Bordeaux mixture					

Season – 3 (January-February to April-May)							
1	Mosaic	Neem cake application at the basin					
2	Unexpected Price fall	Transport to distant markets on head load during night for safe					

Crop – Cowpea (*Vigna anguiculata* var. *sesquipedalis*)

Season – 1 (May-June to August-September)							
1	Unexpected Price fall	Pooling of produce from neighbouring farmers and transport to distant markets for sales.					

		Transporting to distant markets for sales						
		Increase yield through better management						
2	Karimban (Vine blackening) – Colletotrichum sp.	Spray fungicides						
		Spray Bordeaux mixture						
		Spray Emisan						
		Spray fytolan						

Season – 3 (January-February to April-May)								
1	Unexpected Price fall	Increase yield through better management						
		Transport to distant markets for sales						
		Pooling of produce from neighbouring farmers and transport to distant markets for sales.						
		Sell out to neighbours						

2	Karimban (Vine blackening) – Colletotrichum sp.	Spray bavistin						
		Spray Bordeaux mixture						
		Spray any fungicide						
3	Flower shed due to summer showers							

Following are the measures taken by farmers for mitigating the impact of occurred economic loss due to the crisis.

No.	Action taken	Scientific		Effectiveness			Rationality behind that action
		Y	N	3	2	1	
1	Compensate with profit from other crops						
2	Loan renewal						
3	Loans on land and gold mortgage						
4	Government subsidies						

Following are the measures taken by farmers to insulate themselves from the impact of possible economic loss due to a crisis.

No.	Action taken	Scientific		Effectiveness			Rationality behind that action
		Y	N	3	2	1	
1	Mixed cropping in vegetables						
2	Crop diversification in vegetables						
3	Crop diversification with perennial crops						
4	Crop rotation with seasonal crops						
5	Crop diversification in annual crops						
6	Vocational diversification by other enterprises (Rearing milch animals etc.)						
7	Vocational diversification by other jobs (Daily wage work etc.)						
8	Adjust planting time to get yield during high demand season						
9	Minimise hired labour use by employing maximum family labour						

APPENDIX - IV
Index of adaptability

Sl. No.	Items	OS	NS
	Contingent measures		
1.	Spraying Bavistin in case of vine blackening disease (<i>Colletotrichum</i> sp.) of third season cowpea.		
2.	Use of yellow traps to control vector in case of mosaic infection in third season bitter gourd.		
3.	Spraying Fytolan in case of vine blackening (<i>Colletotrichum</i> sp.) of first season cowpea.		
4.	Pooling of produce from neighbouring farmers and transporting to distant markets for sales in case of unexpected price fall in first season snake gourd.		
5.	Spraying bordeaux mixture in case of vine blackening disease (<i>Colletotrichum</i> sp.) of third season cowpea.		
6.	Replacing the crop with some other crop in case of mosaic infection in first season bitter gourd.		
7.	Spraying neem oil – garlic mixture to control vector in case of mosaic infection in third season bitter gourd.		
8.	Pooling of produce from neighbouring farmers and transporting to distant markets for sales in case of unexpected price fall in first season cowpea.		
9.	Extending productive period of the crop in case of unexpected price fall in third season snake gourd.		
10.	Pooling of produce from neighbouring farmers and transporting to distant markets for sales in case of unexpected price fall in third season snake gourd.		
11.	Pooling of produce from neighbouring farmers and transporting to distant markets for sales in case of unexpected price fall in third season cowpea.		

12.	Pooling of produce from neighbouring and transporting to distant markets for sales in case of unexpected price fall in first season ash gourd.		
13.	Neem cake application at the basin in case of mosaic infection in third season ash gourd.		
14.	Pooling of produce from neighbouring farmers and transporting to distant markets for sales in case of unexpected price fall in third season oriental pickling melon.		
15.	Giving better crop management practices in case of mosaic infection in third season bitter gourd.		
16.	Soil drenching with bordeaux mixture in case of <i>fusarium</i> wilt in first season ash gourd.		
17.	Pooling of produce from neighbouring farmers and transporting to distant markets for sales in case of unexpected price fall in first season oriental pickling melon.		
18.	Replacing with some other crop in case of mosaic infection in third season bitter gourd.		
	Methods for mitigation		
1.	Compensate for the economic loss with profit from the other crops.		
2.	Loan renewal.		
	Anticipatory methods		
1.	Adjusting planting time to get yield at high demand season.		
2.	Mixed cropping in vegetables.		
3.	Crop rotation with seasonal crops.		
4.	Crop diversification in vegetables.		
5.	Vocational diversification with other enterprises.		
6.	Crop diversification with annual crops.		
7.	Minimise use of hired labour by employing maximum family labour.		
	Total		

OS - Obtained scores; NS - Non applicable scores

APPENDIX - V
LIST OF RESPONDENTS

1	Shibi. B.V. Vembilimattathil Chemmanadu, Varikkoli	15	K.P. Mathai, Kollinal, Kokkappilli, Thiruvaniyoor
2	K.V. Alias Kollamkudiyil, Monuppilly, Thiruvaniyur	16	K.P. Alias Kollinal, Kokkappilli, Thiruvaniyoor
3	Poulose.P. Puthenveettil Puthencruz, Thiruvaniyur	17	T.K. Paulose Thachethu, Kokkappilli, Thiruvaniyoor
4	Jimmy.C. Vargheese, Chennath, Thiruvaniyur	18	P.K. Parameswaran Nair Puthenpurakkal, Baktanandapuram, Thiruvaniyoor
5	Varghese.T.V., Thilakkattu, Chemmadu, Varikkoli, Thiruvaniyur	19	C.M. Yohannan, Chennath, Baktanandapuram, Thiruvaniyoor
6	Jose.E.Y., Ichikkamandanathu, Varikkoli, Thiruvaniyur	20	Cletus A.J. Adakkaparambil, Kokkappilli, Thiruvaniyoor
7	P.P.Poulose Paramelil veedu, Varikkoli, Thiruvaniyur	21	K.O. George Kothamattathil, Thiruvaniyoor
8	Alias.M.V., Madathikkudi, Varikkoli, Thiruvaniyur	22	E.K. Yohannan Elampillil, Baktanandapuram, Thiruvaniyoor
9	Jose.P.T., Pallichirayil Varikkoli, Thiruvaniyur	23	C.V. Varghese Chemoth, Baktanandapuram, Thiruvaniyoor
10	T.K.Poulose, Kottarathil Kokkappilli, Thiruvaniyoor	24	P.R. Prakash Perumanathu, Baktanandapuram, Thiruvaniyoor
11	Babu, T.P. Thachethu Kokkappilli, Thiruvaniyoor	25	C.K. Yohannan Chakkumthadathil, Kuzhiyara, Thiruvaniyoor
12	Varghese.P. Mekkarayil, Kokkappilli, Thiruvaniyoor	26	P.K. Ramakrishnan Plackal, Kokkappilli, Thiruvaniyoor
13	Paily Pathrose Kottarathil, Kokkappilli, Thiruvaniyoor	27	M.V. Yacob Madaviledathu, Kokkappilli, Thiruvaniyoor
14	T.K. Baby, Thachethu, Kokkappilli, Thiruvaniyoor	28	K. Raghavan Plackal, Kokkappilli, Thiruvaniyoor

29	Narayanan kutty Perumanathu, Kokkappilli, Thiruvaniyoor	43	K.I. Paulose Kunnupillikkarayil Baktanandapuram, Thiruvaniyoor
30	Paily Kuriako Chennoth, Chemmanadu, Thiruvaniyoor	44	Ouseph, K.C. Chennoth, Baktanandapuram, Thiruvaniyoor
31	Alias M.P. Manalil, Chemmanadu, Thiruvaniyoor	45	K.M. Varghese Kannapparambil Nadukurizu, Thiruvaniyoor
32	M.P. Mathai Manalil, Chemmanadu, Thiruvaniyoor	46	E.V. John Illikkal, Athani, Thiruvaniyoor
33	A.M. Abraham Andikkulathil, Chemmanadu, Thiruvaniyoor	47	K.P. Paily Kannapparambil, Marangattully, Thiruvaniyoor
34	Narayanankutty, Kizhakkumali, Manappilli, Thiruvaniyoor	48	T.S. Chandrasekharakkuruppu, Puthenveedu, Baktanandapuram, Thiruvaniyoor
35	Georges, K.J. Kokkattu, Kuzhiyara, Chottanikkara	49	C.P. Alias Chennoth, Chemmanadu, Thiruvaniyoor
36	Itteera Paulose Mantharakkal, Chemmanadu, Thiruvaniyoor	50	Chacko Ouseph Vanirepara, Kodumpoor, Vennikulam, Thiruvaniyoor
37	Varkey Joseph Mattathil, Chemmanadu, Thiruvaniyoor	51	A.J. Babu Asariparambil, Perumpadavom, Elanji
38	C.P. Paily Cherukattu, Chemmanadu, Thiruvaniyoor	52	K.E. Paily Kattupuraikkal, Perumpadavom, Elanji
39	Paily Paulose, Thelakkattu Chemmanadu, Thiruvaniyoor	53	K.E. Yohannan Koottupuraikkal, Perumpadavom, Elanji
40	Kuttappan, P.S. Perumanathu, Kokkappilly Chemmanadu, Thiruvaniyoor	54	E.P. Suku Edapparambil, Perumpadavom, Elanji
41	M. Kuriakose, Muthanatel, Baktanandapuram, Thiruvaniyoor	55	K.P. Kuriachan Parakkadavu, Perumpadavom, Elanji
42	Saju Paulose, Thelakkattu, Baktanandapuram, Thiruvaniyoor	56	K.S. Paulose Kunneal, Perumpadavom, Elanji

57	P.K. Thankappan Paranthadathil, Perumpadavom, Elanji	71	P.U. Abraham Pukkunnel, Perumpadavom, Elanji
58	K.P. Joseph Kalappuraikkal, Perumpadavom, Elanji	72	Ouseph Malattel, Perumpadavom, Elanji
59	Raghavan, P.K. Palachathuruthel, Perumpadavom, Elanji	73	George P.U. Pukkunnel, Perumpadavom, Elanji
60	E.P. Paulose Parumthotathil, Perumpadavom, Elanji	74	Kuriakose, Scaria Pukkunnelmalayil, Perumpadavom, Elanji
61	P.C. Paulose Parumthotathil, Perumpadavom, Elanji	75	Punnuse Paily Thettalil, Perumpadavom, Elanji
62	Kunjunju, P.K. Palakkathurathil, Perumpadavom, Elanji	76	Baby, P.K. Pukkunnel, Perumpadavom, Elanji
63	E.P. Soman Edapparambil, Perumpadavom, Elanji	77	Kurien kuriakose Pulickel, Perumpadavom, Elanji
64	P.P. Varkey Palickal, Perumpadavom, Elanji	78	C.T. Mathew Chempakapparambil, Perumpadavom, Elanji
65	Alexander, S.V. Veliathamali, Perumpadavom, Elanji	79	John Markose Kollamparambil, Perumpadavom, Elanji
66	P.C. Paulose Paramthuruthil, Perumpadavom, Elanji	80	Shaju John Kollamparambil, Perumpadavom, Elanji
67	A.P. Raghavan Edapparambil, Perumpadavom, Elanji	81	K.U. Abraham Karaletu, Perumpadavom, Elanji
68	Markose, K.M. Kuttarakkunnel, Perumpadavom, Elanji	82	P.K. Paulose Pulichel, Perumpadavom, Elanji
69	Xavier, V.F. Veliathumalil, Perumpadavom, Elanji	83	E.P. Thankappan Edapparambil, Perumpadavom, Elanji
70	K.E. Scaria Kattuparakkal, Perumpadavom, Elanji	84	Mohanan, V.K. Mamparayil, Perumpadavom, Elanji

85	Johny Agasty Chempakamayil Perumpadavom, Elanji	100	Baby John Kannaplath, Mutholapuram, Elanji
86	Varghese K.U. Karaletu, Perumpadavom, Elanji	101	K.V. Joseph Kidangen, Neeleswaram
87	Abraham, P.K. Pulickal, Perumpadavom, Elanji	102	Davis, P. Kunnuran, Naduvattam
88	K.V. Peter Kochirayil, Mutholapuram, Elanji	103	A.V. Chacko Alappadan, YMA
89	P.K. George Padinjarekkattu, Mutholapuram, Elanji	104	C.V. Johny Chittel, Neeleswaram
90	Pathrose Agusthy Puvathunkal, Mutholapuram, Elanji	105	M.P. Joseph Manikkathan Neeleswaram
91	Sasikumar, M.R. Medialil, Mutholapuram, Elanji	106	K.V. Johny Menacheril Neeleswaram
92	Tomy Mathew Madikkuzhy, Mutholapuram, Elanji	107	K.P. Varghese Kallinan, Naduvattam
93	Saju Joseph Chempakamayil, Mutholapuram, Elanji	108	M.A. Varghese Manikkathan, Naduvattam
94	Seby Joseph Kilinjilikkattu, Mutholapuram, Elanji	109	P.C. Baby Pullan, Naduvattam
95	Agusthy John Poovathinkal, Mutholapuram, Elanji	110	Saji, K.V. Kidangen, Naduvattam
96	P.K. Jose Padinjarekkattu, Mutholapuram, Elanji	111	M.A. Jose Manickathan, Naduvattam
97	V.M. Sarasappan Chalakkal, Mutholapuram, Elanji	112	Pappu, U. Kallan, Naduvattam
98	Varkey Kurien Muttappally, Mutholapuram, Elanji	113	K.D. Varghese Karingal, Naduvattam
99	Johny Joseph Kolathunkal, Mutholapuram, Elanji	114	P.C. Koruthu Pullan, Naduvattam

115	Vareethu, C. Manichathan, Naduvattam	135	Thomas, E.O. Edassery, Malayattoor
116	M.C. Thomas Madassery, Kottamum	136	Devis Madassery, Kottamum
117	T.C. George Thuppathil, Kottamum	137	Prasad, K.V. Kozhikkal, Malayattoor
118	Shaju, C.R. Njaliyil, Kottamum	138	P.P. Venu, Punnilathil, Malayattoor
119	Thomas, P.O. Puthussery, Kottamum	139	Avirachan M.P. Manickathan, Kottamum
120	Baby, P.J. Parattil, Kottamum	140	Augustine, K.D., Kandathil, Malayattoor
121	Mr. Devassykutty Madassery, Kottamum	141	Shajan Chakola, Madasseril, Kuttamum
122	G.D. Varghese Njalivel, Kottamum	42	M.A.Poulose, Manickathan, Neeleeswaram
123	Jose. P.V. Padayatti, Malayattoor	43	Sebastian K.K, Kandathil, Malayattoor
124	M.V. Antony Manickathan, Naduvattam	44	M.P. Raphel Madaseeri, Neeleeswaram
125	Joy Thomas Madassery, Neeleeswaram	45	M.P. Antony Nirappu, Malayattoor
126	Thomas, K.V. Kannothan, Malayattoor	46	Baby M.V. Manickathan. Neeleeswaram
127	T.C. Chacko Thuppathil, Kottamum, Malayattoor	47	Krishnan, Koshnai, Malayattoor
128	Devassykutty Kannath, Malayattoor	48	K.P. Joseph, Kodapparampil, Malayattoor
129	Varghese, M.P. Manickathan, Naduvattam	49	N.P. Thomas Nirappel, Malayattoor
130	T.D. Jose Thekkanathu, Malayattoor	50	Muraly Koshanai, Neeleeswaram.
131	Mary varghese, Madassery, Kottamum		
132	T.C. Chacko, Thuppathil, Kottamum		
133	K.P. Shouru, Kodapparamban, Malayattoor		
134	Devassy Papachan, Menachery, Malayattoor		

ADAPTATION BEHAVIOUR OF VEGETABLE GROWERS IN CRISIS SITUATIONS

By

BOBAN PAUL

ABSTRACT OF THE THESIS

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ABSTRACT

Kerala, the green stretch, in the south west cost of India, is delineated from other states by Western Ghats stretching around six hundred kilometers of its Eastern boundary. These hill ranges creates an exclusive climatic conditions in this land. The soil and whether factors have lead to diversity of plant population and also the crops cultivated here. Like other states of India, the crop loss and consequent economic crises occur in Kerala farming also. However the root causes of the crises are different here compared to other states. There it happens as a results of flood, droughts and storms where in Kerala the economic loss results mainly from pest and disease incidence, land slides etc. Kerala is well known for the production of spices and plantation crops. In last two or three decades the commercial cultivation of vegetables also was started in the state. Still a major portion of state's requirement of vegetables are met by products from neighbouring states. The government through its Department of Agriculture and the Vegetable and Fruits Promotion Council of Kerala are trying to increase vegetable production in the state. It was in this context, the present study was undertaken with the objectives such as identifying the different crisis situations encountered by commercial vegetable growers, identifying the methods of adaptation in these crisis situations, rationality behind those methods of adaptation and finally the perception of commercial vegetable growers about the external intervention of developmental agencies in crisis situation.

The study was conducted in Ernakulam district which was a traditional vegetable growing area. More over the activities of Department of Agriculture and vegetable and fruits promotion council of Kerala was in progress for the promotion of vegetable production. A two stage sampling technique was used to select three panchayats for the selection of respondents. From the selected panchayat fifty vegetable growers each were randomly identified and they formed the respondents.

Data were collected with the help of a pretested and well structured interview schedule.

The crops selected were Bitter gourd (*Momordica*), Snake gourd (*Trichosanthus anguina*), Oriental pickling melon (*Cucumis melo*), Ash gourd (*Benincasa hespida*), Cowpea (*Vigna anguiculata* var. *sesquipedalis*). Data was collected classifying crop wise and season wise. The data regarding methods of adaptation were delineated as anticipatory measures, measures for mitigation and contingent measures. The rationality of the methods of adaptation was studied by the rating from three groups of respondents which included scientist, extension personnel and progressive farmers. An index was developed for measuring the level of adaptation.

The salient findings are as follows:

The commonly adopted anticipatory measures by farmers to insulate themselves from the impact of a possible economic loss were mixed cropping in vegetables, crop diversification with perennial crops, crop rotation with seasonal crops, crop diversification in annual crops, vocational diversification by other enterprises, vocational diversification by other jobs, adjusting planting time to get yield during high demand season and minimising hired labour by employing maximum family labour.

The measures taken by the majority of farmers for mitigating the impact of an already occurred economic loss in a crisis were compensating for the loss with the profit from other crops, loan renewal, obtaining new loans on land and gold mortgage and government subsidies. The unexpected price fall was tackled by the contingent measure of pooling the produce from neighbouring farmers and transporting to distant markets. Majority of the respondents reported that VFPCCK was intervening in the crisis situations. Only a minor section of respondents reported that Department of agriculture was making interventions. With regard to effectiveness of interventions majority were of the opinion that both the agencies

mentioned above were effective in making interventions. With regard to the level of adaptation, majority of the respondent belonged to the category of medium level of adaptation.