

CHAPTER 2

REVIEW OF LITEARTURE

2.1 INTRODUCTION

The literature review is interested in two major areas. In section one, a short summary of the various development theories is made with a view to identify the most important variables associated with change and development. Section two proceeds with the investigation of the various behavior change models with the aim of identifying the conceptual model or approach appropriate for behavior analysis for the study. Section three reviews empirical studies conducted in the area of behavior change (adoption), which finally led to the formulation of the research hypotheses.

2.2 THEORIES OF DEVELOPMENT AS VIEWED FROM THE PERSPECTIVE OF AGRICULTURE

The ultimate objective or motivation of any behavior change model or construct is to provide the framework of how social change takes place both at the micro and macro (individual and society) level. Behavior change at the individual farm operator level is believed to bring changes at the society level (development). It may be argued here that the origin of behavior change models is partly associated with our present understanding and concept of development. The origins of the classical five-stage adoption process (1961), the Campbell model (1966), and the innovation decision-making process model of Rogers's and Shoemaker (1971), for example, is the well-known modernization theory of development whereas recent behavior change models such as AKIS (agricultural knowledge and information system) are more associated with current theories like growth with equity and human resource development.

The concept of other behavior change models, such as the Tolman model (1951), and Lewin's psychological field theory, on the other hand, is purely associated with psychological constructs or the cognitive map of the individual at that given period and do not have to do much with development theories. A brief overview of the various development theories is made here inter alia show the relations between development and behavior change and the major changes that occurred over time so as to be in a position to identify the more appropriate behavior change model to guide the study and identify the respective key variables.

2.2.1 Historical overview

Melkote (1991:13-14) has divided the history of world development into three major epochs namely:

- (1) The period of great development (350BC-1700AD). Mention is given to ancient civilization of Mesopotamia, Egypt, Indus valley, Shang, Han, Ming, Axum, Ghana, Mali, Songhai, Zimbabwe, Mayan, Aztec and Inca in order of chronology,
- (2) Period of colonization; emergence of the Third World (16th-20th century). A period of change from a state of development to underdevelopment where slave trade, protectionism, mercantilism, and imperialism were the major phenomena of the day,
- (3) Period of decolonization (late 19th century).

The period from the emancipation of underdeveloped nations (decolonization) up to our present day is characterized by:

- (1) Genesis of organized development assistance involving the birth of multi-lateral development assistance (1945) and the emergence of bilateral development assistance (1949),
- (2) Development of emerging Third World (1950s) involving fostering self-help by capital infusion and diffusion of modern innovations from the west and

industrialization, urbanization, westernization, considered critical for development,

- (3) First decade development: - Period of great optimism (1960s). The dominance of modernization paradigm of development characterized by industrialization, urbanization, capital-intensive technology, centralized economic planning, etc.
- (4) Second decade of development: - Period of pessimism (1970s). Top down flow of message and decisions, authority driven models, widening socioeconomic gaps were scrutinized as features of the dominant paradigm which ultimately led to its down fall,
- (5) Alternative conceptions of development (1970s). Growth with equity models, self determination and self reliance of local communities, freedom from external dependency and integrated rural development considered critical,
- (6) Third development decade (1980s). Participatory decision making, knowledge sharing on a co-equal basis, use of pluralistic culture sensitive models of development were considered to be important to bring about the desired change in development (ibid. 15-18).

Perret *et al*, (2003:19), however, summarize this period into three major development eras; the fifties and sixties that was characterized by the belief in trickle down development and technology transfer, the seventies and early eighties by equity considerations and the latter eighties and nineties by participatory people driven development.

Agunga (1997:138) also abridges the history of development interventions of the 2nd half of the 20th Century into four major periods each characterized by its own distinguishing development theory namely:

- (1) The modernization theory of the late 1940s to mid 1960s,
- (2) The dependency theory of the late 1960s,
- (3) Growth with equity of the 1970s, and
- (4) The human development theory - an emergent theory since the mid 1980s.

The above stratifications on the episode of the various development strategies is somehow similar and consistent with other classifications and can serve as a base for our present objective of looking at the factors considered to be the key for development with changes in our thinking from time to time.

2.2.2 Modernization Theory (The Orthodox Approach)

Modernization is the process by which individuals change from a traditional way of life to a more complex, technologically advanced, and rapidly changing style of life (Rogers 1969:14). According to Little, quoted by Eicher & Staatz (1998:9), leading development economists of the 1950s knew little about the nature of tropical agriculture and rural life when they designed the so-called modernization theory of development. This theory saw development as an evolutionary, uni-linear and uni-directional path through which all nations must move (Agunga, 1997:140).

Modernization places the developed western values and culture in the center and puts that of the developing nations' in the periphery. Development was therefore thought to be brought about by the transfer of technology, expertise, and training from the center to the periphery, the same way that the economy of the war victim European countries was reconstructed through the Marshall Plan after the termination of the 2nd world war. But according to Perret *et al*, (2000:21), it was not possible and fair to compare the then Europe to the present developing countries, which lack the structural, institutional, and attitudinal conditions to efficiently use the new capital input. Rogers (1969:10) was also convinced in the claim and said that our error was one of equating redevelopment with development; the technical know how, and basic education for and the aspiration to higher levels of development which were lacking in the present developing countries were already present to bring the war-torn Europe back on its feet through the Marshall plan.

It was for this reason that agricultural development programs of the 1950s placed heavy emphasis on the American style of agricultural extension and the diffusion model of agricultural development which assumed that farmers could substantially increase their

agricultural productivity by allocating existing resources more efficiently and by adopting agricultural practices and technologies from the industrial countries (Eicher & Staatz, 1998:12).

For Alex Inkeles, as quoted by Melkote (1991:47), the transformation of individuals was both a means and an end in itself of the development process. Inkeles (1983:35) used nine attitudinal items to construct what he call the analytical standard scales of modernity, which he later used to identify the character of the modern person viz.:

- (1) Readiness for new experiences and the openness to innovation and change,
- (2) Growth of opinion, disposition to form and hold opinions and democratic orientation
- (3) Planning habits,
- (4) Belief in human and personal efficiency,
- (5) Belief that the world is calculable, trust, optimism
- (6) Awareness of, and respect for, personal and human dignity,
- (7) Educational and occupational aspirations and faith in science, technology and new learning,
- (8) Belief in technical skill and distributive justice against particularism
- (9) Time (orientation to the present or to the future rather than the past, punctuality, regularity and orderliness).

Other modernization theorists, Kahl (1968); Motoitwitz (1970); Schnaiberg (1970) and Porters (1974) are reported to have supported his idea and prepared an exhaustive list of the social psychological attributes of modernity, viz.:

- (1) Desire for geographical mobility,
- (2) High participation in organizations,
- (3) Secularism,
- (4) Appetite for national and international information,
- (5) Achievement motivation,
- (6) Desire for consumption of new goods and technology,

- (7) Preference for urban areas (cosmopolites)
- (8) New attitudes to wealth, work, savings, and possibility of change,
- (9) Socio economic and political discipline and deferral gratifications (Melkote 1991:47).

A leading exponent and modernization theorist, Everett M. Rogers (1969:23), asserts that for a country to develop or modernize it was necessary that the peasants were persuaded to change their traditional way of life (subculture) characterized by:

- (1) Mutual distrust, suspiciousness and evasiveness in interpersonal relations,
- (2) Perceived limited goods (the image of limited good) - a notion that all desirables in life (including land, wealth, health, love, power, and safety) exist in finite quantity, are always in short quantity and cannot be increased in quantity by any means within the peasant's power,
- (3) Dependence and hostility toward government authority (their interpersonal distrust carries over into their attitudes toward government leading to a relation of distance, reserve, resignation, and cheating). A long history of exploitation at the hands of outsiders has conditioned the villager to this hostile view. They also tend to regard most village improvements as the job of the government rather than their own,
- (4) Familism (the subordination of individual goals to those of the family caused by mutual distrust in interpersonal relations, which leads to greater dependence on one's own family to insure protection against aggression and humiliation),
- (5) Lack of innovativeness (the tendency for villagers to follow the prescribed ways of their ancestors attributable to lack or inappropriateness of knowledge about available alternatives or generations of negative cultural conditioning-an accumulation of which discourages adoption of innovations),
- (6) Fatalism (the degree to which an individual recognizes a lack of ability to control his future and ultimately leading to failure to see relationship between work and one's economic condition),

- (7) Limited aspirations (Low desired future states of being such as social status, education and occupation caused by perceptions of blocked opportunities), lack of achievement motivation and inconspicuous consumption,
- (8) Lack of differed gratification (postponement of immediate satisfaction in anticipation of future rewards),
- (9) Limited view of the world or localiteness caused by low geographical mobility and low mass media exposure,
- (10) Low empathy (the ability of an individual to project himself into the role of another person)

In general all the modernization theorists believe that factors associated with personal characteristics of the traditional man were the precondition for traditional societies to improve their situation. These factors include readiness for change, perceived limited good, belief in human and personal efficiency and distributive justice, time, planning habit, secularism, fatalism, deferral gratification, cosmopolitness, empathy and innovativeness. Smith & Inkeles (1966: 353-377) summarized and captured these factors in a 33-item attitudinal scale and formed a composite variable, attitudinal modernity. Organizational participation and mass media exposure were also included to this variable list. Rogers (1969:50) expanded the number of variables by adding literacy and extension contact as some of the antecedent variables, innovativeness being the consequent variable. Attitudinal modernity, literacy, organizational participation, media exposure and extension contact are, therefore, considered in this study as some of the key variables to be looked into.

Development strategies designed and based on theories of modernization paradigm, however, did not work and it became clear that the model had practically failed to replicate western style of development over the so-called third worlds when the expected trickle down effect of the diffusion of innovations did not occur. Experience of the comprehensive and minimum package projects, which were outmoded from 1968 to 1974 in Ethiopia, is a practical example. In fact, the disparity between the developed and the developing and the rich and the poor appeared to widen. Paul Streeten, as cited by

Agunga (1997:146), criticized modernization theory on what he called logical, moral, political, historical and economic grounds.

According to Dudley Seers, as quoted to by Melkote (1991:125), the neo-classical economic model started loosing its credibility in the seventies and gave way to its successor for the following major reasons, namely:

- (1) The social problems of developed nations were spreading concern about environmental costs of economic growth,
- (2) Despite substantial transfer of capital and technology from the developed nations to the third world, the gap in per capita income between the two blocks was growing,
- (3) Third world nations with impressive rates of growth did not achieve either political status or social equity expected of them,
- (4) Income inequality was increasing all over the third world countries,
- (5) Unemployment rates were refusing to go down in spite of impressive growth rates,
- (6) Power was being concentrated among the elite who benefited from the growth, who then used that power to preserve the inequality in their societies,

2.2.3 Dependency Theory (The Radical Approach)

The dependency paradigm of development places the cause of under development on institutional and structural barriers rather than on the individual peasant and advocates for undertaking political and economical reforms to break down the barriers.

Arguments of the radical scholars or promoters of the theory is that economic growth, the major element of modernization theory, was more than just a technocratic matter of determining how best to raise per capita GNP as was believed by modernization scholars. They rather believe that development involves the restructuring of institutional and political relationships (Staatz & Eicher, 1998:15). The Ujamaa villages in Tanzania, different forms of organizational societies (peasant associations, service co-operatives

and producers co-operatives) in Ethiopia, and several other forms of peasant institutions in many eastern European and developing countries were established for this purpose. These organizations were established with the aim of restructuring existing traditional rural institutions and enable the broad majority of peasant population to control their development endeavor and be in a position to administer land reform programs, which were critical under rural settings.

Agunga (1997:150) argues that, whilst modernization theorist's focus on the role of western educated elites in guiding their nations in the new era, Marxists (dependency theorists) give more attention to pressure from below - to the working class and peasant basis of revolutionary and nationalist movements and to the economic exploitation that causes such uprisings. However, dependency theory has also been criticized on three grounds, namely rigidity of its central planning principle, the suppression of individual liberties and its large government bureaucracy (Seitz, 1998:7-8). Staatz & Eicher (1998:15) further remark that the paradigm suffered form its

- (1) inadequate attention to the need for technical changes in agriculture,
- (2) lack of attention to the biological and location specific nature of agricultural production processes and
- (3) lack of a solid micro foundation based on empirical research at the farm and village level.

As properly put by Statz & Eacher above, the paradigm lacks a theoretical foundation and failed to formulate propositions about how human behavior changes in a way that generalizations and hypothesis testing are possible. Consequently, it was not possible to extract variables that could be considered for behavior analysis in this study.

2.2.4 Growth With Equity (GWE)

Since the development experience with modernization strategies of the 1960s showed that the gap between the rich and the poor countries was growing wider and that dependency theorists had no solutions to narrowing this gap, a new thinking was

required, which came in the form of “*growth-with-equity*” theory (Agunga, 1997:151). He listed the main distinguishing features of this theory to be the following:

- (1) its recognition that traditional reliance on growth of GNP will not benefit the poor in today’s less developed countries or won’t benefit them, at least not over the short term,
- (2) its recognition that social revolution is not possible or even advisable in many countries,
- (3) its assumption that peasants in developing countries are not lazy, they simply lack economic opportunities and incentives and finally,
- (4) GWE theorists noted that both modernization and dependency theorists tend to treat the third world as a homogeneous group of countries rather than as a conglomeration of heterogeneous states with different needs and priorities.

Melkote (1991:194) summarized the main elements and philosophy of this theory of development in what he calls alternative pluralistic conceptions of development namely:

- (1) Equity in distribution of information and other benefits of development,
- (2) Active participation of people at the grass roots,
- (3) Independence of local communities (or nations) to tailor development projects to their own objectives,
- (4) Integration of the old and new ideas, the traditional and modern systems, and the endogenous and exogenous elements to constitute a unique blend suited to the needs of a particular community,

Due to its pluralistic (blend of the old and new concepts) nature, this model of development was engaged in running combined intervention strategies in agriculture including:

- (1) Expansion of extension services, provision of credit, agrochemical and high vigor cultivators to small-scale farmers,

- (2) Capacity building like the provision of market centers, feeder roads, drinking water, and organization of the peasant community for the promotion of popular participation in decision-making and planning,
- (3) Promotion of social, economic, political and human development aspects in integrated way,
- (4) Acceleration of land and tenancy reform,
- (5) Decentralization of authority to rural communities,

However, although this approach to development seems to be meaningful on several grounds, it couldn't escape criticisms and later rejection. According to Lele, quoted by Staatz & Eicher (1998:17), many integrated rural development projects expanded social services faster than the economic base needed to support them, and the projects often proved to be extra-ordinarily complex and difficult to implement and replicate over broader areas.

Binswanger, as cited by Staatz & Eicher (1998:17), has also assessed that the rise and decline of integrated rural development approach of the GWE theory was very similar to that of the community development approach of the 1950s. Still another criticism of GWE theory is that it failed to teach people how to do things for themselves. Instead, it continued with the top-down approach like in the case of the modernization paradigm whereby foreigners assumed direct control of development and decision-making. Donor agencies continued to preach local participation, but firmly held control of projects, never delegating these to third world development ministries (Agunga, 1997:154).

Like in the case of its preceding development theory, GWE is also lacking the theoretical foundation and the conceptual framework and not formulated in a way that cause and effects can be statistically tested. It would be difficult to postulate any proposition or deduce any conclusion in the absence of such conditions, which forms the pillar of any scientific enquiry. Some factors associated with development that can be used for behavior analysis can, however, be summarized as access to credit and markets, extension contact, organizational participation, and provision of agricultural technologies. Some of these factors like access toward credit and markets are addressed in the 33-item

attitudinal modernity scale as mentioned previously while extension contact, organizational or social participation and provision of agricultural technologies stand on their own and are included in the variable list of this study.

2.2.5 Human Development Theory

Over time there has been an increased realization that development is about people and that, they, the beneficiaries are the principal actors. Agunga (1997:158) reported “As disappointment with development aid mounted in the late 1970s and early 1980s, many writers, analysts, thinkers, and policy makers began to accept the reality that development is not something that can be forced on people by outsiders, particularly foreign experts. In the final analysis, development is about people”. He further argues that economic pressures, national and international, have led to the neglect of the human dimension in development and unless remedied, the neglect could lead to the destruction of billions of poor people.

The human development theory implies that any development program aimed at human development must be based on the perceived needs and problems of the people themselves. Servaes, Mowlama and Wilson as cited by Melkote (1991:234) also pointed out that in this paradigm, priorities are more contextual to the needs and problems of individual countries (or communities) than the universal applicability of earlier paradigms. According to Perret, *et al*, (2003:38), two fundamental principles of participatory development, which is the main aspect of human development theory, are:

- Communities are knowledgeable, possessing indigenous technical knowledge (ITK). Interventions should not be planned on the basis of exogenous analysis, which may be unrelated to the local situation,
- The participants in rural development and technical change in agriculture are the farmers themselves, and the communities to which they belong. These farmers are rational decision makers, in the context of their constraints and opportunities. They have good reasons for doing what they do. Their practices reflect the information available to them, the resources they can mobilize, their technical

skills, and their physical and institutional environment. To express a value judgment on these practices according to some “external expertise” or “standard criteria” is incorrect, although it may be easier than to figure out the context of these practices.

The dimensions and intervention strategies of human development theory (Agunga, 1997:165) include:

- (1) Sustainability – natural resource oriented,
- (2) Capacity building – training oriented,
- (3) Emancipation – education and organization oriented and
- (4) Development support communication making people at the center of development.

Some of the factors considered critical for development like capacity building in the form of training and extension, emancipation such as literacy and education, organization and communication are well provided for in the former growth-with-equity theory and are included as behavior determinants in this present study. But the other factors that are emphasized in human resource development theory such as participation, sustainability etc. were not found to be easily quantified. According to Oakley (1990:32), evaluation of the social aspects of development, such as the above, requires different indicators and methods. Suggested methods, like participant observation, and in-depth study demand a fairly longer period of time of more than one season. This is beyond the scope of this present study, thesis research, and might be areas of future investigation.

2.2.6 Conclusion

Where considering the various theories and approaches and how they have evolved over time the following shifts in tendency become evident.

- (1) Single factor determinism which focuses either to economical, social or communication causes to contextual perspectives,

- (2) External and intervention orientation to endogenous and sustainable strategies,
- (3) Economic and material (NI, GDP) to social development indicators (income, education, literacy),
- (4) Dependence on external expertise to management of programs by local people, and,
- (5) Agendas as defined by outside experts to needs and problems, as perceived by the actors themselves,
- (6) Individual blame for lack of change in behavior and growth to system blame.

Several factors such as backward tradition or lack of attitudinal modernity, lack of expertise and capital, lack of organizational participation, lack of access to technology, lack of education and training and access to information (Lack of access to extension and media) etc. appear to be important causes of behavior and justify further investigation. There are also new concepts (participation, emancipation, liberation, conscientization, sustainability, empowerment, etc.) that are considered to be legitimate causal factors. However, there is a lack of theoretical foundation, objectivity, and operational and scientifically acceptable method of enquiry. Proposed methods, also demand conducting continuous monitoring (data collection, and interpretation) over a longer period of time (Oakley, 1990: 32-35). Their main intent is to understand processes and not to measure outcomes, which is neither the objective nor the capacity of this study i.e. it is beyond the scope of the present study, which had to be completed in a given and limited time period.

2.3 MODELS OF BEHAVIOR CHANGE

Edward Tolman, quoted by Lee (1977:168), held that all behavior was intentional and governed by experience about the environment. It's intentional nature makes human behavior situation specific and therefore less predictable. The complexity is the fact that the same person at different situation may make different decisions and can therefore behave in different ways (Düvel, 1987:3). In connection to this, Albert Einstein is quoted by Jacobsen to have said, "it is hard to understand the behavior of human beings than to understand atoms" (Düvel, 1991:77).

Despite the dynamic nature of human behavior however, social scientists have managed to formulate conceptual constructs or behavior change models, which make provision as to how behavior can be acquired, modified or changed with the introduction of a new stimulus or experience. Düvel (1991:74-77) and Botha (1986:25), distinguished the following behavior or adoption models namely,

- (1) The traditional approaches,
- (2) The classical 5-stage adoption process,
- (3) The Campbell model,
- (4) The innovation decision-making process of Rogers and Shoemaker,
- (5) The psychological field theory of Lewin,
- (6) The Tolman model and
- (7) Düvel's behavior analysis model, however, the more recent KIS (knowledge and information system) and Ajzan & Fishbein's attitudinal factors determining the individual's behavior can be regarded as another variations.

Most models or approaches of behavior change are based on processes or behavior determinants or a combination of the two (Habtemariam & Düvel, 1993:87-98). According to them, the classical 5-stage adoption process (North Central Rural Sociology Committee, 1961), the Campbell Model (1966), and the Innovation-decision model (1971) are typical processes. KIS can also be included under this category as it deals with system processes. The problem solving or behavior determinant approach is in a way also a process, but emphasizes perhaps more than others that the content is more important.

The following is a critical overview the different models and approaches for the purpose of assessing them regarding their usefulness as models of behavior analysis and intervention.

2.3.1 The Traditional Approaches

Albrecht (1969) quoted by Düvel (1991:74) enumerated the teaching method, the socio cultural, the atomic communication, the socio structural communication and situational-communication approaches in this category. Düvel (1991:74) has also emphasized the adequacy and contribution of the situational-functional approach (Albrecht, 1969) for its ability to address the problem of behavior from varied perspectives of situational factors as opposed to the other four which label either the teaching method, cultural ties, communication or any other single factor to be the cause of behavior.

2.3.2 The Classical 5-stage Adoption Process (NSRC, 1961)

According to Brown (1958:146) adoption of a farm practice is a bundle of related events emerging through time, not an instantaneous metamorphosis. He said that from first awareness to regular use, there must be a transformation in the orientations and behavior of the farm operator. Against this background, the North Central Rural Sociology Committee (1961) developed what is known as the classical adoption process model Campbell (1966:459). It assumes that the adoption of an innovation often is not an instantaneous act; rather, it is a process that develops over a period of time and is influenced by a sequence of actions. These actions consists of five- stages, namely:

- (1) Awareness: The farm operator hears of the practice,
- (2) Interest: The farm operator feels the practice is a workable solution for an existing problem,
- (3) Evaluation: The farm operator carefully considers it together with alternatives and their consequences,
- (4) Experimentation: The farm operator tries the practice on his farm and,
- (5) Adoption: The farm operator uses the practice.

The assumption is that the process begins with awareness of an innovation, but, according to Campbell (1966:460), it may also start with a problem perception. He argues that many adoption sequences are problem oriented, whereby the individual becomes

aware of a problem and then seeks out ideas or solutions and consequently becoming aware. The model is also criticized for disregarding non-rational decision-making. He argues that diffusion researchers have implied a reflective, carefully thought out decision of a rational nature (adoption follows careful evaluation), but it is a truism that not all decisions are rational

2.3.3 The Campbell Model

The individual adoption process model (NSRC, 1961) is a simplified heuristic device for describing a varied complex process and questioned for its adequacy to delineate the adoption process as it occurs in all of its variations (Campbell 1966: 459). Having scrutinized the weaknesses of the classical five-stages adoption model, Campbell (1966:465) came up with an alternative approach, which he claims, expands instead of refutes the predecessor. For Campbell, the individual decision- maker may take any of the proposed four types or paths of adoption namely:

- (1) Rational-Problem Oriented. “Stages” (problem-awareness-evaluation-rejection or trial-adoption or rejection),
- (2) Rational-Innovation Oriented. “Stages” (awareness-interest-evaluation, rejection or trial-adoption or rejection),
- (3) Non-Rational-Problem Oriented. “Stages” (problem-awareness-adoption or rejection-resolution [including information seeking]),
- (4) Non-Rational Innovation Oriented. “Stages” (awareness-adoption or rejection –resolution [including information seeking]) (Fig. 2.1).

“Rational” is defined here as a process in which the possible alternatives and consequences of the decision are considered before any action is taken, whereas, “non-rational” is any process that occurs without consideration of the alternatives or consequences including impulsive decisions (Campbell, 1966:461). He states that the majority of decisions undoubtedly fall between the two extremes, since they have elements of both rationality and non-rationality in them. Example was the reasons for the purchase of new automobile, where the purchase could be rational such as

dependability, prestige, or achievement; and that it may also be non-rational such as the “desire” or “yearning” to have a new automobile and the impulse to buy one new without carefully assessing its social and economic desirability and comparing it against other priority needs and aspirations.

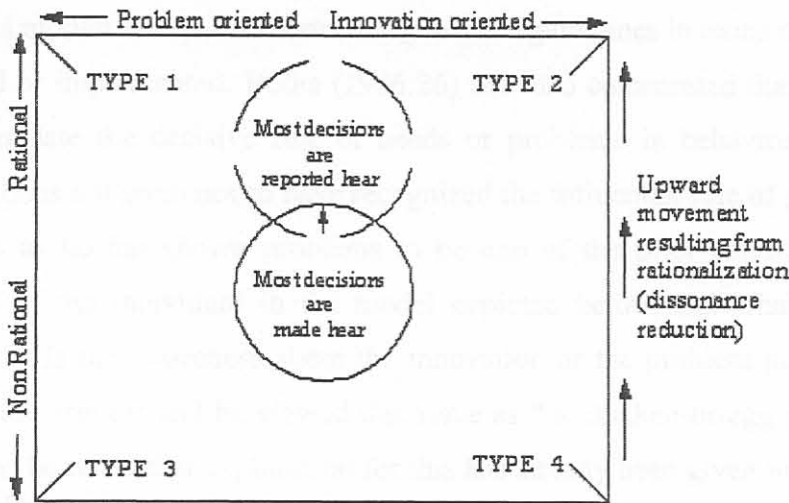


Fig. 2.1 A paradigm of individual decision making and adoption (Campbell, 1966: 465)

The model appears to offer an inclusive record of the possible pathways, which a farm operator may follow in the process of adopting new ideas. However, in common to the other process models, it focuses on explaining change and does not account on how change can be brought about.

2.3.4 The Innovation Decision-Making Process

At about 1968, when the generation of diffusion of knowledge that have reached to a watershed in the late 1960’s, started to decline, Rogers and Shoemaker (1971) merged findings from several of the social sciences in both the United States and abroad into a single, integrated body of concepts and generalizations, which is called the classical diffusion model (Goss, 1979: 744).

According to the classical diffusion model (Fig. 2.2), the innovation decision process is the process through which an individual or other decision making unit, extension

organization, for example, passes from first knowledge of an innovation, to forming an attitude toward the innovation, to a decision to adopt or reject, to implementation of the new idea, and to confirmation of the decision (Rogers, 1983: 163).

Düvel (1991: 74) asserts that the model has successfully overcome the weakness of previous models except its shortcoming to offer guidelines in terms of how change can be directed or implemented. Botha (1986:26) has also commented that the model does not accommodate the decisive role of needs or problems in behavior analysis. However, Rogers does not seem not to have recognized the influential role of problems in behavior analysis as he has shown problems to be one of the prior conditions in the decision process of the individual in the model depicted below, but what he did question is whether it is the awareness about the innovation or the problem perception, that comes first in the process and he viewed this issue as “ a chicken-or-egg problem”. It should, however, be noted that explanation for this has already been given in the Campbell model of the individual adoption process. He gave the possibilities of both the rational (problem oriented) or non-rational (innovation oriented) processes depending on the type of the decision, the individual decision maker and the time. According to Campbell, an individual can make rational decisions at one time and can make non-rational decisions at another.

According to Singh (1997:19), although the model is not sufficient to explain the complete behavior of farmers and has been criticized severely, there has not been a better model, which has been developed by extension scientists and this has resulted into a theoretical vacuum in extension. Since traditional models are all heavily dependent on Roger's model, extension is faced with the paradigmatic crisis and extension researchers are still using the Roger's model as their bible though Roger himself has rejected his model and lamented that ‘the child was thrown away with the bathwater’ (Singh, 1997).

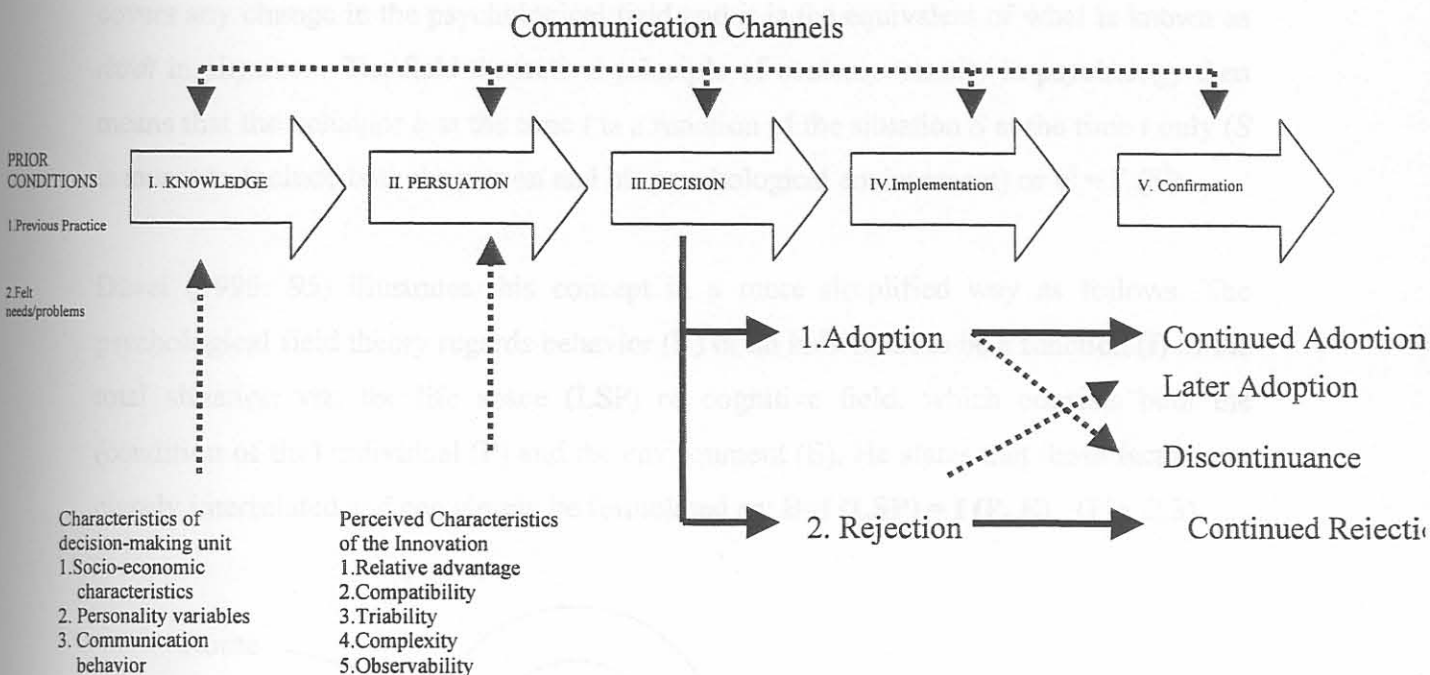


Fig. 2.2 A model of stages in the innovation decision process (Rogers, 1983:165)

2.3.6 The Psychological Field Theory of Lewin

The central element of Lewin's model, according to Neel (1977: 337), is a life space or psychological field in which the person moves. He states that this space is psychological, not physical (geographical concept), or it is not merely a spatial relationship but a hypothetical construct, an interface about what went on inside the human being or animal.

For Lewin (1951:299), the psychological field or the life space is synonymous to the physical space in physics, within which physical objects are moving. One of the basic principles of psychological field theory is the principle of contemporaneity, which states that any behavior or any other change in a psychological field depends only on the psychological field at that time (Lewin, 1951: 301). He elaborated this concept in saying that a change at the point x in the physical world is customarily characterized as dx/dt ; that is to say, as a differential changes in the position of x during a differential time-period dt . Field theory states that the change dx/dt at the time of t depends only on the situation S^t at the time t ($dx/dt = F(S^t)$). He further went on saying that the term behavior

covers any change in the psychological field and it is the equivalent of what is known as dx/dt in physics. The field theoretical principle of contemporaneity in psychology then means that the behavior b at the time t is a function of the situation S at the time t only (S is meant to include both the person and his psychological environment) or $b^t = F(S^t)$.

Düvel (1995: 95) illustrates this concept in a more simplified way as follows. The psychological field theory regards behavior (B) of an individual to be a function (f) of the total situation viz. the life space (LSP) or cognitive field, which consists both the (condition of the) individual (P) and the environment (E). He states that these factors are closely interrelated and can simply be formulated as: $B=f(LSP) = f(P, E)$ (Fig. 2.3).

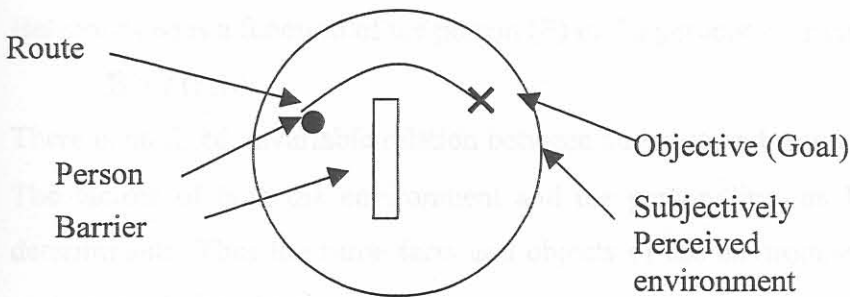


Fig. 2.3 Model of the psychological field (Payer & Sulzer quoted in Düvel, 1987:3)

The basic objective behind any psychological theory of behavior is to make provision for its accurate measurement and analysis. According to Lewin (1951: 301), field theory is best characterized by a method of analyzing causal relations and building scientific constructs. In the formula, $B = F(P, E)$, B is the dependent variable while the “P” and “E” are the causal variables, which according to Lewin (1951:25) are interdependent.

Hruschka, quoted in Düvel (1991:75), states that the most relevant and important features of this theory making it useful as a conceptual framework for understanding behavior change are the following:

- The basic motivation of every organism is to maintain equilibrium.

- A disturbed equilibrium is experienced as a need tension, i.e. a felt need to reduce the tension. In this state the person tends to mobilize forces or energy to reduce the tension and re-establish a new equilibrium under the given conditions.
- The re-establishment of equilibrium takes the form of movement (locomotion), physical, or psychological, which continues until the equilibrium has been re-established. The effects of a felt tension on perception, cognition, and action are therefore such as to change the field in order to restore the tension-reduced situation.
- Anything in a situation that is perceived by the person as a goal, or as a path or barrier to a goal is understood as a force operating on the person's behavior. This force can be positive or negative.
- Behavior (B) is a function of the person (P) in the perceived environment (E)

$$B = f(P.E)$$

There is no fixed, invariable relation between stimulus and response.

- The factors of both the environment and the personality can become behavior determinants. Thus the same facts and objects of the environment or personality may cause different actions.
- The co-existing forces are dynamically interdependent constituting the so-called 'force field', which is subjective, time-specific and determines behavior.
- Change, or the lack thereof, is, in principle, explainable by the same concept: namely the constellation of interacting forces. Change can be brought about by changing the force field, i.e. by adding or strengthening "driving forces" (positive) forces and/or eliminating or weakening "restraining forces" (negative forces).

According to field theory, a person who finds himself in a relatively stable situation may assume a new behavior if and only if this seemingly stable situation (equilibrium) is disturbed and a need tension (dissonance situation) is created. In an attempt to eliminate or reduce the need tension and reestablish a new equilibrium, as the model in Fig. 2.4 below illustrates, the person starts locomotion from phase 1 where the pressure of positive forces (driving forces) outweigh the opposite pressure from restraining forces (barriers or negative forces). The movement continues to a level or until a new equilibrium is formed

According to Düvel (1975:10) imbalance of positive and negative forces can be achieved in either one or combination of the following alternatives viz.:

- (1) Addition or strengthening of positive or driving forces,
- (2) Elimination or reduction of negative or restraining forces or
- (3) Changing the direction of negative forces to positive.

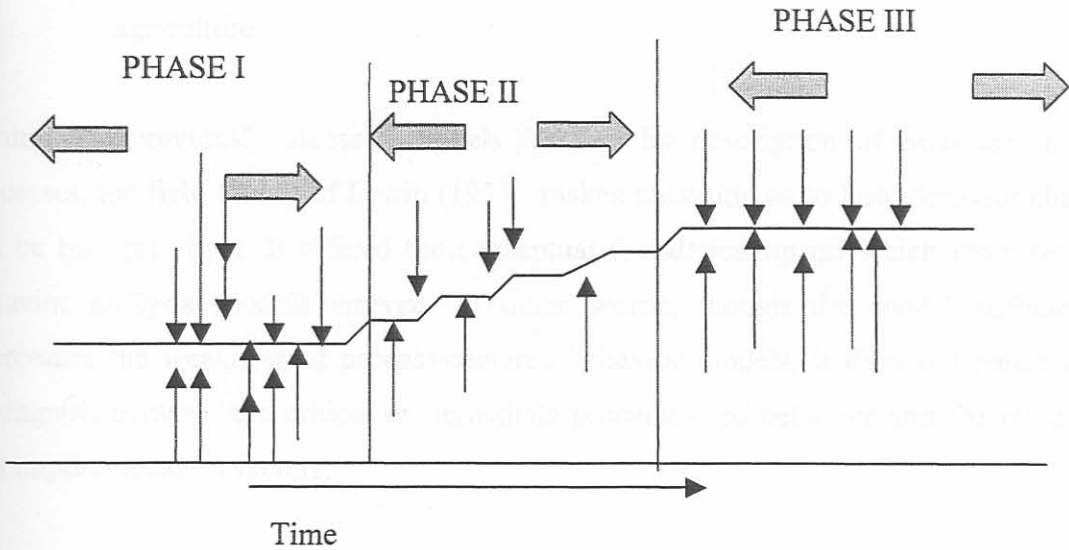


Fig. 2.4 Behavior change model (Lewin, 1951, quoted in Düvel, 1987:3)

As quoted by Düvel (1991:75) the field theory has originally been identified by Hruschaka (1969) and is regarded as the most appropriate for behavior analysis especially from extension point of view. According to Düvel (1991:75) the practical advantages of the model are,

- (1) It provides a concept in terms of which the complexity of any real life situation, in respect of behavior relevant factors, can be analyzed,
- (2) The theory is not limited to change but also explains non-change. It provides guidelines not only for situation analysis explaining behavior but also for planning change and for evaluation,
- (3) It is also useful for the analysis of greater social units as groups of clients, organizations, and also for planning change with them,

- (4) With the exception of its mathematical descriptions and quantifications it is easy to understand, mainly because of familiar principles or concepts relevant in other disciplines (e.g., the field concept of Einstein or the valence concept of chemistry),
- (5) Regarded as an interdisciplinary theory that is not confined to any of the disciplines of the social sciences, which is inconsistent with the multidisciplinary nature of extension hence allowing it address all aspects in agriculture.

Contrary to previously assessed models featured by description of behavior change processes, the field theory of Lewin (1951), makes provision as to how behavior change can be brought about. It offered the conceptual foundation upon which more refined behavior analysis models emerge. In other words, though the model sufficiently overcomes the weakness of process-centered behavior models, it does not particularly distinguish between the critical or immediate precursors of behavior and the relatively less important causal factors.

2.3.6 The Tolman Model

Edward Tolman, according to Düvel (1995:46), is the one who introduced the concept of intervening variables. He is quoted by Düvel (1991:76) to have been differentiated three sets of variables, namely the independent, the dependent and the intervening variables (Fig. 2.5).

Fig. 2.5 The Tolman Model (Tolman: 1951: 256)

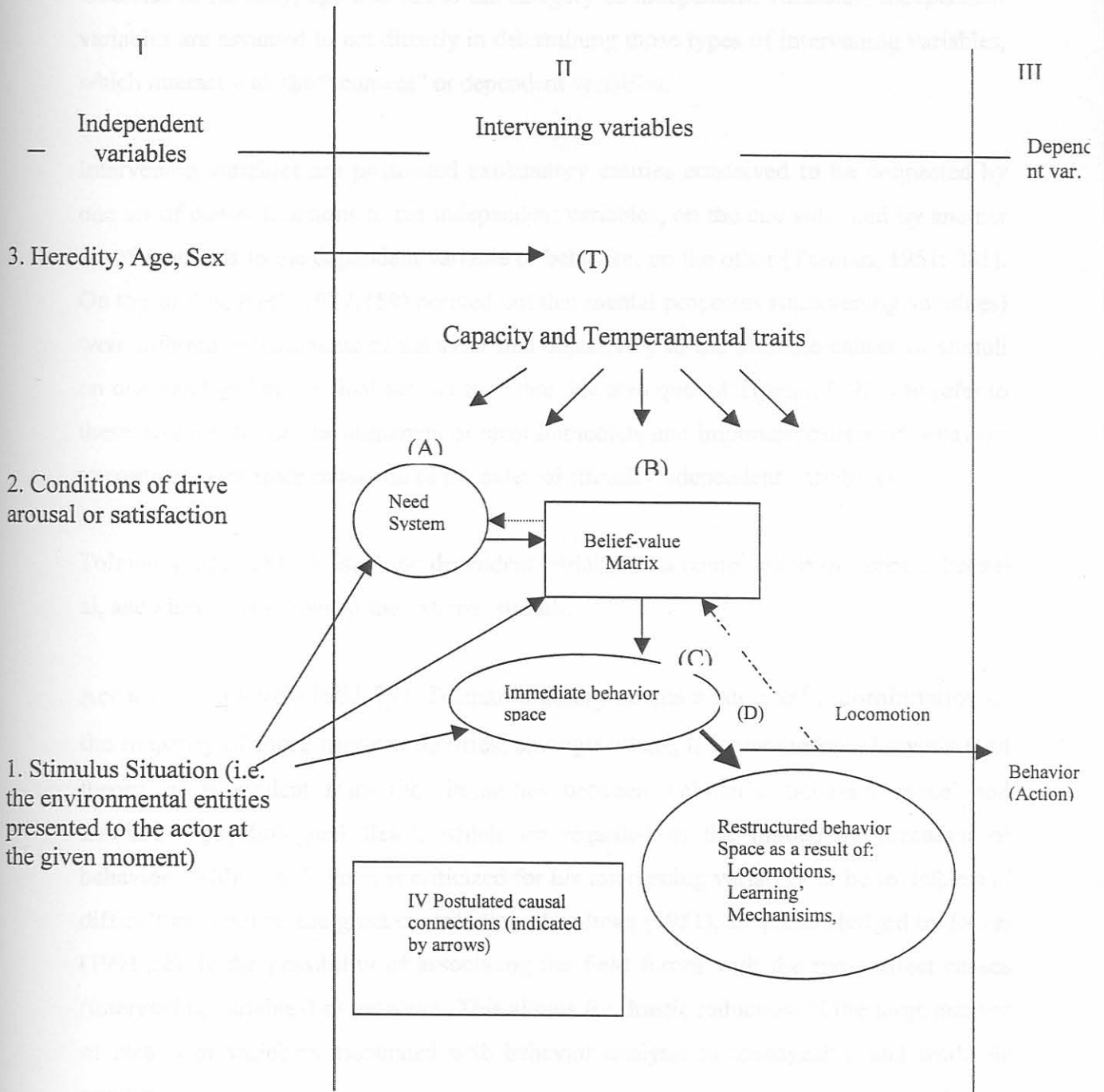


Fig. 2.5 The Tolman Model (Tolman, 1951: 286)

According to Tolman (1951:279), the independent variables are the initiating causes of the individual's action consisting of the environmental entities presented to the individual actor at the given moment (physical, social, and cultural objects and processes). He also

enumerated conditions of drive arousal and such individual-difference-producing variables as heredity, age and sex to the category of independent variables. Independent variables are assumed to act directly in determining those types of intervening variables, which interact with the “content” or dependent variables.

Intervening variables are postulated explanatory entities conceived to be connected by one set of causal functions to the independent variables, on the one side, and by another set of functions to the dependent variable of behavior, on the other (Tolman, 1951: 281). On top of this, Neel (1977:159) pointed out that mental processes (intervening variables) were inferred determinants of behavior tied objectively to the ultimate causes or stimuli on one hand and to the final act, on the other. He also quoted Tolman (1951) to refer to these neural activities as immanent or most immediate and important causes of behavior, in contrast to ultimate causation of the external stimuli (independent variables).

Tolman, (1951: 281) defined the dependent variable as a combination of verbal, skeletal al, and visceral reactions to the external stimuli.

According to Düvel (1991:77), Tolman’s theory seems a successful combination of the majority of more modern theories; amongst others, it accommodates Lewin’s field theory, as is evident from the similarities between Tolman’s ‘behavior space’ and Lewin’s ‘psychological field’, which are regarded as the immediate precursor of behavior. Although Tolman is criticized for his intervening variables to be invisible and difficult to measure, the great contribution of Tolman (1951), as acknowledged by Düvel (1991:22), is the possibility of associating the field forces with the most direct causes (intervening variables) of behavior. This allows for drastic reduction of the large number of factors or variables associated with behavior analysis to manageable and workable number.

2.3.7 Fishbein & Ajzen's attitudinal determinants of behavior

Attitudes are viewed as complex systems comprising person's beliefs about an object, his feelings toward the object, and his action tendencies with respect to the object (Fishbein & Ajzen, 1975: 340). They elaborated that attitude is a learned predisposition to respond to an object in a consistently favorable or unfavorable manner and indicated the strong link that exists between attitude and behavior. They classified attitude into affective (e.g., I feel a strong liking for the church), cognitive (e.g., I believe that the church has extremely desirable qualities), and conative (e.g., I act supportive to the church).

According to Ajzen (1988:113) the important point about willful behaviors such as voting behavior, watching evening news over the Television, blood donation, etc. is that their occurrence is a direct result of deliberate attempts made by an individual i.e. people can easily perform these behaviors if they are so inclined, or refrain from performing them if they decide against it. This inclination or abstinence is termed as intention. Intentions are assumed to capture the motivational factors that have an impact on behavior. He argues that when dealing with volitional behavior, people can be expected to do when they intend to do. Expressions of behavioral intention should thus permit a highly accurate prediction of volitional action.

With an ultimate goal of understanding, predicting and explaining an individual's behavior, Ajzen & Fishbein (1980:8) tried to integrate diverse theories and lines of research in the attitude arena and came up with a complete list of behavior determinants (Fig. 2.6). Their theory is based on the assumption that human beings are usually quite rational (reasoned action) and they consider the implication of their action before deciding to engage or not to engage in a given behavior (Ajzen & Fishbein, 1980: 5). They assume that a person's intention to perform (or not to perform) a behavior is the immediate determinant of action. According to their theory of reasoned action, a person's intention is a function of two basic determinants, one personal in nature (the individual's positive or negative evaluation of performing the behavior), which they call 'attitude toward the behavior' and the other reflecting social influence, which is called subjective norm.

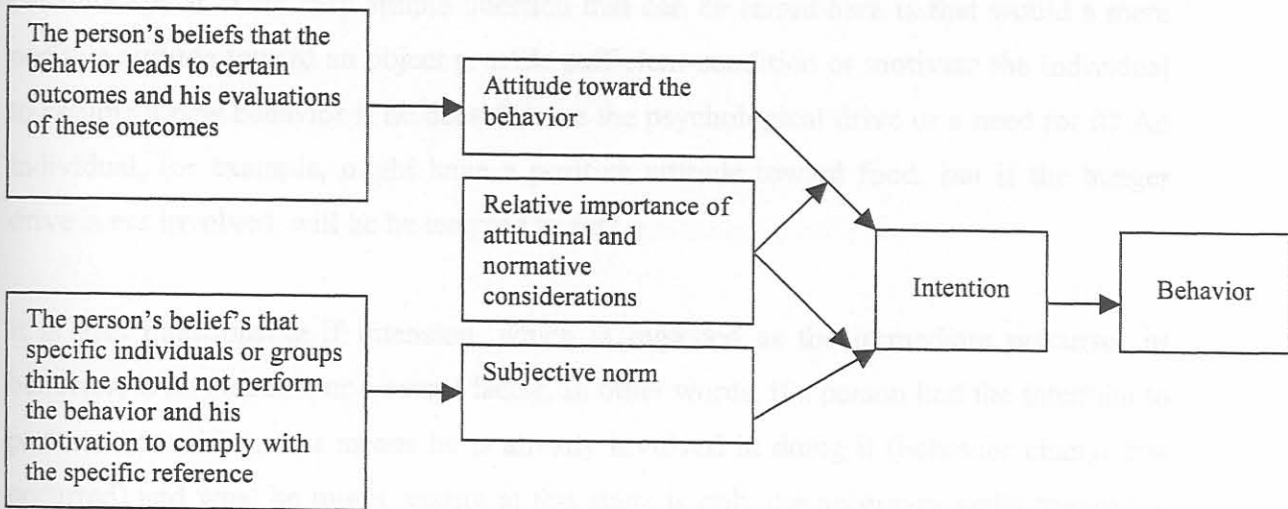


Fig. 2.6 Factors determining a person's behavior (Ajzen & Fishbein 1980:8)

One very important issue that can be noted here is that their analysis does not make reference to the various independent and intervening variables invoked to explain behavior by other behavior analysts. This is not, however, unintentional. They recognize that some of these factors such as personality characteristics (authoritarianism, achievement motivation), personal variables (age, sex, social class), status, kinship pattern, etc. may influence behavior but they classified them as 'external variables', whose influence is only indirect (Ajzen & Fishbein, 1980:82). They argue that external variables will have an effect on behavior only to the extent that it influences the determinants of that behavior and not directly the behavior itself.

Their association of independent variables to only an indirect influence is quite similar to that of Tolman's (1951) view. However, the fact that no mention is made neither to some of the salient features of Tolman's (1951) and Lewin's (1951) behavior space, nor to Düvel's (1975,1991) intervening variables (needs, perceptions and knowledge), which are assumed to be a direct precursor of behavior is not very clear. Of course, they assumed that there are different causes for different behaviors (Ajzen & Fishbein, 1980:4). Nonetheless it does not seem to be a sufficient explanation. It is difficult to expect changes in behavior without the presence of sufficient conditions for change like the creation of needs and favorable perceptions, which form the psychological field or

behavior space. One very simple question that can be raised here is that would a mere positive attitude toward an object provide sufficient condition or motivate the individual to assume a new behavior if he doesn't have the psychological drive or a need for it? An individual, for example, might have a positive attitude toward food, but if the hunger drive is not involved, will he be tempted to eat?

It is also questionable if intension, which is regarded as the immediate precursor of behavior, is an outcome or a causal factor. In other words, if a person had the intention to perform something, that means he is already involved in doing it (behavior change has occurred) and what he might require at this stage is only the necessary skills training to implement the new behavior.

2.3.8 Agricultural Knowledge and Information System (AKIS)

The assumption and approach of AKIS is somewhat different from the other behavior analysis models. According to Blum (1997:2), the "classical" Transfer of Technology (ToT) models, that is to say NSRC, the Campbell model, Roger's and Shoemaker model, etc. assume that knowledge and technology are generated (only) through research and technological development, and these are then "transferred" (mainly) by an extension service to the knowledge and technology users, the farmers. He argues that the ToT models neglect the influence of policy decisions, the place of education, the media and farmers' role as knowledge providers and the potentials of indigenous knowledge, which should form part of the technology generation and utilization system. Singh (1997: 20) added that the study of consequences of innovations at the macro level was neglected and resulted in the shift of extension focus to systems perspectives. According to Rivera (1991:74), extension is afforded a quite broad purpose in AKIS, which goes beyond dissemination of agricultural information and technology to include education along with provision of information and innovations.

In the literature, Agricultural Knowledge System (AKS) and Agricultural Information System (AIS) and Agricultural Knowledge and Information System (AKIS) are interchangeably used. According to Rölting (1988:33), AIS is a system in which

agricultural information is generated, transformed, transferred, consolidated, received, and fed back in such a manner that these processes function synergistically to underpin knowledge utilization by agricultural producers. He defined AKS as a system of beliefs, cognitions, models, theories, concepts, and other products of the mind in which the (vicarious) experiences of a person or group with respect to agricultural production is accumulated. According to Van Den Ban & Hawkins (1988: 32), the sources of information about agriculture (the research, extension and utilizer sub systems) collectively are called the agricultural knowledge system. In this study the term AKIS is used to denote the whole process involved in the generation and utilization process of agricultural technology with the purpose of avoiding such confusion.

Röling (1988:188) holds that development of new knowledge and its utilization is a key survival strategy of the human species; it is a normal aspect of coping with the environment and not a specified function of researchers. He went on saying that the search for knowledge is a survival mechanism, in addition humans acquire a collective store of knowledge, which could be improved on the basis of their experience and inherited through cultural transmission by other generations. His argument here is that research is only a formal procedure for what is a normal human behavior, which follows that for a research output to be useable and be adaptable to the local situations, the research subsystem should not be the sole generator. The utilizer sub system, the extension, and policy sub systems have a role to play in the whole process of technology development. AKIS appreciates the system or bigger totality and dynamic interdependency of its subsystems rather than focusing on sub systems.

Features of a system's approach, as identified by Hurtubise (1984) and quoted by Röling (1988:188) are the following:

- It centers on interaction between elements instead of on the elements,
- It emphasizes the effects of interactions instead of their nature.
- It is based on global view, instead of on precision of details,
- It seeks to modify groups of variables at a time instead of a single variable,

- It seeks to validate facts by comparing model with reality instead of by experimental proof,
- It uses models which might not be very rigorous but can be used for decision and implementation,
- It is multi-disciplinary,
- It focuses on exact knowledge of objectives, and imprecise knowledge of details, instead of vice versa.

Fig. 2.7 provides a model of AKIS. AKIS consists of the knowledge policy, generation, development, exchange and utilization subsystems, which are assumed to be interdependent and dynamically interacting.

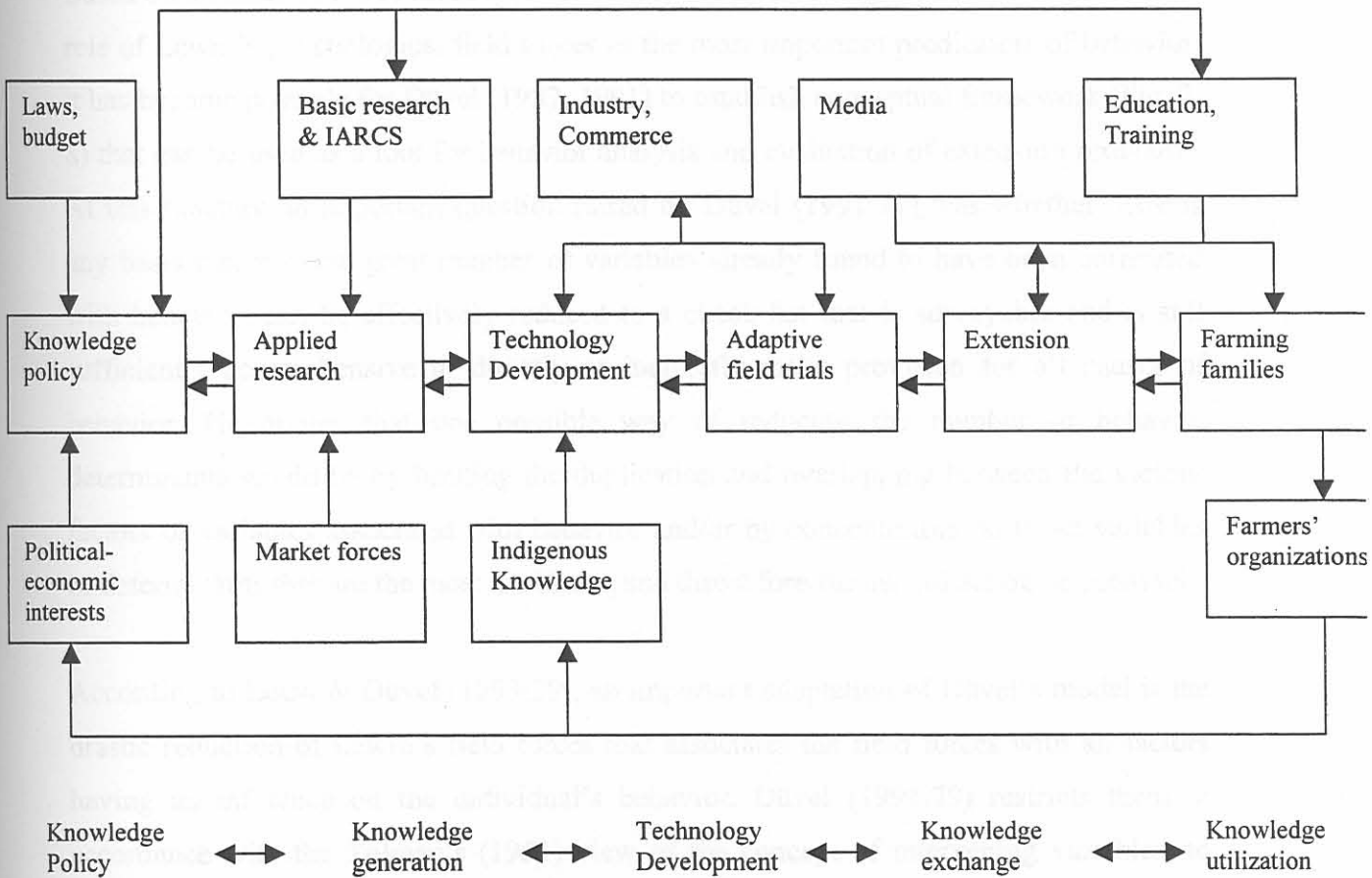


Fig. 2.7 Schematic illustration of the Agricultural Knowledge System (Blum, 1977:6)

According to Röling (1988:188), the word system is used for analytical, design, and simulation purposes but when used for analytical purpose, it seems difficult to analyze complex systems by conventional scientific analysis. It is also mentioned above that one of the features of the systems approach is that it seeks to validate facts by comparing model with reality instead of by experimental proof. In addition, systems approach is inappropriate for explaining individual behavior since the unit of decision-making is the individual and his perception of the system, which doesn't correspond with the objective system.

2.3.9 Düvel's Behavior Analysis Model

Based on Tolman's (1951) finding of the concept of intervening variables and the critical role of Lewin's psychological field forces as the most important predictors of behavior, it has become possible for Düvel (1987, 1991) to establish conceptual framework (Fig. 2.8) that can be used as a tool for behavior analysis and evaluation of extension programs. At this juncture an important question raised by Düvel (1991:77) was whether there is any basis whereby the great number of variables already found to have been correlated with behavior, can be effectively reduced to a check-list that is surveyable and is still sufficiently comprehensive to directly or indirectly make provision for all causes of behavior. He argues that one possible way of reducing the number of behavior determinants would be by limiting the duplication and overlapping between the various factors or variables associated with behavior and/or by concentrating on those variables or determinants that are the most immanent and direct fore-runners of action or behavior.

According to Louw & Düvel (1993:29), an important adaptation of Düvel's model is the drastic reduction of Lewin's field forces that associates the field forces with all factors having an influence on the individual's behavior. Düvel (1991:79) restricts them in accordance with the Tolman's (1951) view of the concept of intervening variables, to only those variables (mediating variables) through which most causes of behavior (independent variables) become manifested in behavior. Louw & Düvel (1993:29) reported that the mediating variables represent a further selection of Tolman's (1967) intervening variables (mostly defined as invisible or covert constructs) to include only

those that appear to be the immediate and direct precursor of decision-making or behavior, namely needs, perceptions and knowledge. This approach, namely the focus on the intervening variables has been implemented with success in numerous research projects as for example Düvel (1975), Louw and Düvel (1978), DeKlerk and Düvel (1982), Düvel and Scholtz (1986), Marincowitz and Düvel (1987), and Düvel and Botha (1990).

The salient features of Düvel's behavior analysis model (Figure 2.8) are needs, perceptions, and knowledge, with the former two being the more basic or immediate determinants. Needs are the most important of all, because only through them can the process of behavior change come about or be triggered off, perceptions being regarded as an excellent means of determining psychological field forces as it indirectly comprises most, if not all, the factors determining behavior (Düvel, 1987:5). The independent variables or situational factors (personal, physical, economical, social, cultural, or communication) are not regarded to be part of the model because they are claimed to have only an indirect influence and thus play a less important role in the behavior determination process. The model is illustrated in Fig. 2. 8.

The advantages of using the intervening variables, which are an important feature of the model, for behavior analysis and behavior intervention, according to Düvel (1998:32), are as follows:

- They are, as direct determinants of behavior, the logical focus of intervention, and consequently also the logical criteria of evaluation,
- They will, if monitored, reveal why (or why not) change has occurred. Similarly, it is through these variables that progress (or the lack of it) can be monitored and that the extensionist can get an indication concerning the adaptations that need to be made in terms of message, method or approach,
- They allow for a fair and just merit assessment or recognition of performance. It is not uncommon for an extensionist to either get undue credit for change that can only be partially accredited to him, or - perhaps even more frequently - not to get

credit for what he has accomplished, simply because the change is of a covert nature.

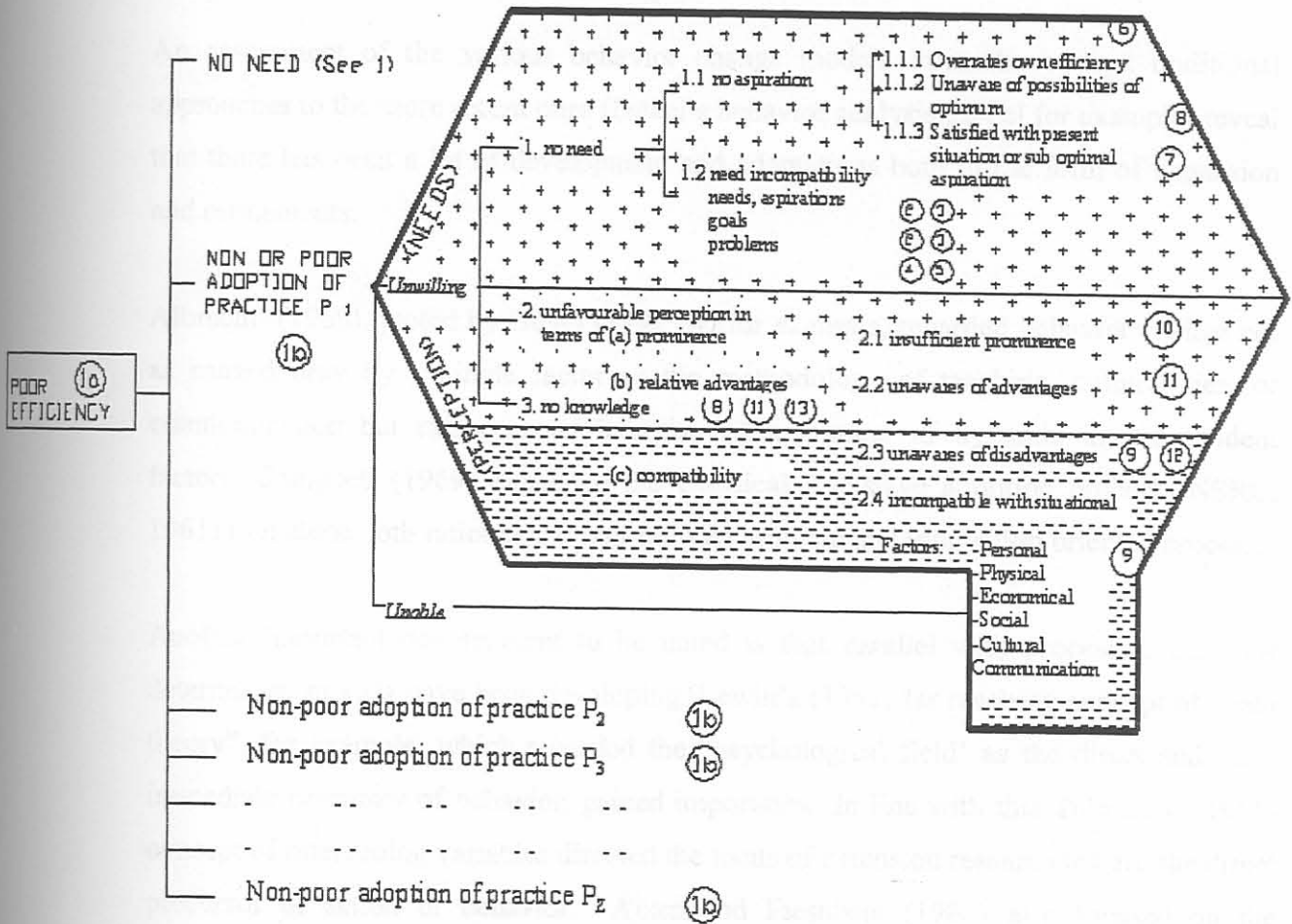


Fig. 2.8 Düvel's behavior analysis model

Furthermore it is difficult, if not impossible, to expect change by concentrating efforts on independent variables such as age, status, education, which, have attracted the attention of past extension research, but are usually a given and cannot be changed. The intervening variables such as needs, perceptions and knowledge are, on the other hand more dynamic and can easily be changed by extension efforts. Beal (1956: 249) is of the same opinion to this line of argument. He suggests for an alternative research focus on dynamic factors such as satisfaction, having a say in decision making, and feeling of responsibility than on the independent factors. According to him it is possible for group

members and leaders to easily change the former factors through group action than the latter, which are more static.

2.3.10 Conclusion

An assessment of the various behavior change models from the earliest traditional approaches to the more recent ones (Düvel's behavior analysis model for example) reveal that there has been a lot of development and adaptations both in the form of expansion and refinements.

Albrecht (1969) quoted by Düvel (1991:74) for example, regarded behavior change not as caused only by a single factor as the methodology of teaching, cultural ties, or communication but rather as an interplay of a number of dynamic inter-dependent factors. Campbell (1969) expanded the Classical five-stage adoption process (NSRC, 1961) to include both rational and non-rational problem and innovation oriented process.

Another important development to be noted is that parallel with processes, behavior determinant models have been developing. Lewin's (1951) far reaching concept of 'field theory', for example, which regarded the "psychological field" as the direct and most immediate precursor of behavior, gained importance. In line with this Tolman's (1951) concept of intervening variables directed the focus of extension research toward the direct precursor of action or behavior. Ajzen and Fishbein (1980) also focused on the immediate precursors of behavior like attitudinal factors and indicted that the influence of independent variables is only indirect.

Based on the concepts of Lewin's psychological field and Tolman's intervening variables, Düvel (1987 and 1991) came up with his own model, which successfully reduced and refined the great many number of variables assumed to have been correlated with action or behavior and at the same time, appears to be so comprehensive and made provision for all causes of adoption behavior. A not worthy development when studying various behavior change models is the change in focus to the more direct forerunners of

action or behavior (intervening variables) rather than the more independent (personal, physical, economical, social, cultural, or communication) factors.

2.4 Conceptual model of the study

Part one of the literature review showed that social development programs launched in the second half of the 20th century failed to change the traditional way of life of farmers. Factors or variables, that were considered most important or key for changes in behavior, were mainly associated with the personal characteristics (attitudinal modernity, literacy, organizational factors, communication, etc.). The individual peasant was, therefore, blamed for the lack in the change of behavior or lack of development. The most important development, however, was the recognition of the central role of people in the development process.

Part two of the review also concludes by underlining the decisive role of the intervening factors, (needs, perceptions, knowledge) in behavior determination. This change in focus of research and development tradition from the independent to more of the intervening variables is also an indication for the recognition of the important role of the people in development process. Moreover Düvel (1998:30) argues that if behavior evaluation has to produce meaningful results and answer the question “why change has/ has not occurred?” then it should not restrict itself with learning whether and to what extent the intended results have been achieved. Broadening the scope of the investigation from how (behavior processes) to why (behavior determinants) will enable evaluators to recognize alternative strategies in designing future programs. According to him, evidences to the why part of the question can be found only through an investigation of the influence of the intervening factors on behavior, which showed the focus of future extension research.

The compliance of the central ideas of part one and part two of the literature overview has motivated the researcher to focus on the investigation of the intervening factors in order to attain his objectives. It is noted that the main objective of the study is to determine the level of behavior change attained and the factors responsible for change in behavior of extension program participant farmers in Ethiopia.

Düvel's behavior analysis model is applied for the study. First proposed in 1975 and introduced in 1987, the model has, over the years, been refined, developed and tested for its workability in behavior analysis especially in the area of agricultural development. It clarifies the main concepts, defines the dimensions and limits of technical factors or variables to be investigated in association with behavior change, sets forth crucial assumptions, and states the theoretical propositions and their operational hypotheses to be tested. The model, as clearly revealed with the review, is also presented in a more concise and simplified manner and has been able to capture the important aspects of past behavior analysis models and assumed to be more appropriate to meet the objectives of this study i.e. it provides a frame of reference and directives for the collection and analysis of data to answer the research questions raised in this study.

Based on his general behavior analysis model, Düvel (1991: 77) showed the relationship between behavior determining variables in agricultural development (Fig. 2.9), which gave the guideline and conceptual framework for this study. As clearly illustrated, the three categories of variables associated with behavioral change in agricultural development are the independent, the intervening, and the dependent variables. Based on the literature review, factors such as personal (e.g., age, education, literacy, organization, attitudinal modernity), socio-economic (e.g., farm size, capital, expertise) and communication aspects (e.g., extension, media), which were assumed to be important across all development theories and behavior change models reviewed, are considered in this study. Needs, perceptions and knowledge are found in the refined list of intervening variables. Distinction has even been made within the mediating variables in the degree to which they are assumed to predict behavior on the cause/effect continuum (Fig. 2.9). The model shows that needs are more closely associated with behavior or action among the intervening variables.

The content variables to be predicted are adoption behavior and the ultimate production efficiency. Based on the conceptual framework provided above, a comparative analysis will be made between the influence of selected independent and intervening variables on the adoption behavior and production efficiency of maize and dairy farmers.

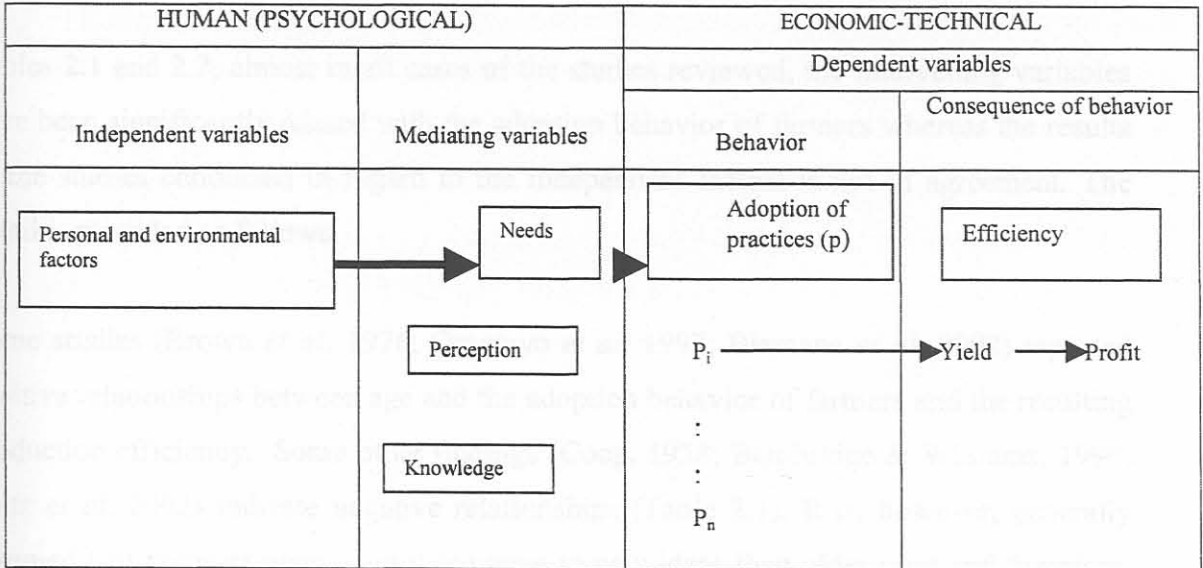


Fig. 2.9 The relationship between behavior-determining variables in agricultural development, (Düvel, 1991:77)

2.5 EMPIRICAL STUDIES ON THE EFFECT OF INDEPENDENT AND INTERVENING VARIABLES ON ADOPTION BEHAVIOR

A voluminous body of literature exists concerning the influence of situational factors on the adoption behavior of farm operators. The literature is too diversified to be reviewed here; therefore, only those studies that relate to the variables of this study will be reviewed. Relatively speaking only minorities of studies have been conducted on the influence of intervening variables. This could be attributed to the recentness of the models, which address the important role of intervening variables in behavior analysis. As a result studies conducted in this area are largely confined to Southern Africa and did not spread over a larger geographical area as yet (Table 2.1). This study, focusing on the investigation of these intervening human factors, is, therefore, believed to narrow this gap in the general body of knowledge.

In general, review of the literature indicates a greater degree of inconsistency of research results regarding the independent than the intervening variables. As clearly shown in

Tables 2.1 and 2.2, almost in all cases of the studies reviewed, the intervening variables have been significantly related with the adoption behavior of farmers whereas the results of the studies conducted in regard to the independent factors is not in agreement. The detail is provided as follows.

Some studies (Brown *et al*, 1976; Omotayo *et al*, 1997; Bizmana *et al*, 2002) reported positive relationships between age and the adoption behavior of farmers and the resulting production efficiency. Some other findings (Coop, 1958; Bembridge & Williams, 1990; Foltz *et al*, 2002) indicate negative relationships (Table 2.1). It is, however, generally assumed that younger people are more open to new ideas than older ones and therefore, are believed to be more likely to adopt agricultural technologies relatively earlier. In this context and based on the time dimension of Lewin's (1951) theory of life space, Neel (1977: 339) asserts that as a person become older, he is able to exist in a broader time perspective, which includes his past, present, and future, while the small child lives completely in the present and is determined in its behavior by it.

Agronomical speaking middle altitude agro ecological areas, where moisture supply is relatively better-off, yield better output than lower altitude areas where moisture supply is a major limiting factor for crop growth. According to Getahun *et al*, (2000), fertilizer use by farmers in the Southern Ethiopia showed positive response in the middle altitude zone than the lowland zone while significant difference was not observed in variety use.

The number of years the farm operator spent in farming will increase the experiential base and this should assist in making adoption decision (Abd-Ella, 1981:45). Such a consistent result is not, however, found in the review of the literature. Experience is found to have no relation with adoption behavior in some cases (Düvel & Botha, 1999; Zegeye *et al*, 2001; Zegeye & Tesfaye, 2001) while it has been positively (e.g., Omotayo *et al*, 1997) and negatively (e.g., Abd-Ella *et al*, 1981) related regarding the rest of the studies reviewed (Table 2.1).

According to Abd-Ella (1981:45), larger farm size means more resource and greater ability to take the risk involved in the adoption of recommended practices. Rogers

(1983:252) has also generalized that early adopters have a larger-sized units than later adopters. Review results are in agreement with this generalization, i.e. farm size is found to be positively related with adoption in twelve cases. (Opere, 1977; Omotayo *et al*, 1997; Elias, 1999; Alene *et al*, 2000; Zegeye *et al*, 2001; Getahun *et al*, 2002) can be cited as examples. Farm size does not show any relationship only in some cases (Getahun *et al*, 2000; Zegeye & Tesfaye, 2001) while it is negatively related in a single case.

Education is a human capital that is regarded as the best option of empowering farm operators. It is, therefore, expected that education increase the adoption level of farmers. Rogers (1983:251) has also reported that earlier adopters have more years of education than the later adopters have. The review indicates inconclusive findings. Although positive relationships are found in most cases (Bembridge & Williams, 1990; Mensah & Seepersad, 1992; Foltz *et al*, 2002), significantly large number of studies does not show any relationship between the educational level of the farm operator and his adoption behavior. Studies conducted by Düvel & Botha (1999), Elias (1999), and Getahun *et al*, (2000) are some examples. A negative relationship (Omotayo & Ogunwale, 1996) is also rarely reported.

Abd-Ella (1981:45) has reported that interaction with the environment (cooperative activity, communication behavior, and extension contact) is essential for the farm operator so that he can learn about the recommended practices. Rogers (1983:259) has also generalized that these variables, such as extension, media contact and organizational participation are positively related with adoption behavior. The review also shows that extension contact has been positively related with adoption behavior (Elias, 1999; Alene *et al*, 2000; Zegeye & Tesfaye, 2001) in more than 90 percent of the studies reviewed. Reports regarding the relationships between media exposure and adoption are highly inconsistent. Abd-Ella *et al*, (1981) found a negative relationship. Omotayo *et al*, (1997) reported no relationship whereas Bizmana *et al*, (2002) found negative relationship. Organization is found to be positively related (Elias, 1999; Getahun *et al*, 200) with adoption in more than fifty percent of the cases and does not show any relationship

(Omotayo *et al*, 1997; Getahun *et al*, 2000; Zegeye *et al*, 2001) regarding the rest of the studies reviewed.

Male-headed households are said to have better access to agricultural information than female-headed households, which is attributed to negative influence of cultural norms and traditions. A study conducted by Mensah & Seepersad (1992), found positive relationship between gender and the adoption behavior of cocoa farmers in Ghana i.e. Male farmers are more likely to adopt agricultural technologies than female farmers.

According to Rogers (1983:257) personality variables, like attitudinal modernity have not received much research attention, in part because of difficulties of measuring personality dimensions in field interviews. The same observation is made in this study. A study by Saeed (1989) that considered attitudinal modernity *per se* (as a composite variable) in its behavior analysis found positive relationship. Concerning the study of the influence of this variable on adoption behavior, many other studies focus their assessment only on specific issues or on elements like attitude toward science, attitude toward education, fatalism, etc, that form the composite variable attitudinal modernity rather than looking at its composite or holistic effect. Rogers (1983:258), for example, has made the generalizations that adoption behavior is positively related with favorable attitudes toward education, science, credit, change, etc.

Table 2.1 Summary of studies on independent variables-adoption behavior relationship

Variable	Researcher	Year	N	Place	Subjects	DV	r ^{*,**,***}	
Age	Alene et al,	2000	110	West Shoa (Ethiopia)	Maize men	Maize varieties	NS [*]	
	Elias	1999	150	West Ethiopia	Wheat men	Wheat practices	NS	
	Elias	1999	154	West Ethiopia	Teff men	Teff practices	NS	
	Zegeye & Tesfaye	2001	363	South Ethiopia	Maize men	Maize practices	NS	
	Zegeye et al,	2001	1460	Whole Ethiopia	Maize men	Maize practices	NS	
	Getahun et al,	2000	240	South Ethiopia	Maize men	Variety	NS	
	Getahun et al,	2000	240	South Ethiopia	Maize men	Fertilizer	NS	
	Bizmana et al,	2002	183	South Rwanda	Coffee men	Package	+, Sig.	
	Bembridge & Williams	1990	170	SW South Africa	Maize men	Package	-,Sig.	
	Opore	1977	1191	Ghana	Cocoa growers	Cocoa practices	NS	
	Omotayo et al,	1997	5000	Nigeria	Farmers	Package	+, Sig.	
	Omotayo et al,	1996	150	Nigeria	Farmers	Animal traction	+, Sig.	
	Mensah & Seepersad	1992	180	Ghana	Cocoa growers	Cocoa practices	NS	
	Düvel & Botha	1999	79	South Africa	Farmers	Conservation practices	NS	
	Foltz et al,	2002	245	Connecticut, USA	Dairy men	rbst	-,Sig.	
	Brown et al,	1976	202	Horby, US	Dairy men	Insimination service	NS	
	Copp	1958	157	Kansas-USA	Cattlemen	Beef practices	0.24**	
	Copp	1958	177	Wisconsin-	Dairy men	Dairy practices	-0.23**	
	Agro ecology	Getahun et al,	2000	240	South Ethiopia	Maize men	Variety	+, Sig.
	Farming experience	Getahun et al,	2000	240	South Ethiopia	Maize men	Fertilizer	NS
Zegeye & Tesfaye		2001	363	South Ethiopia	Maize men	Maize practices	NS	
Zegeye et al,		2001	1460	Whole Ethiopia	Maize men	Maize practices	NS	
Opore		1977	1191	Ghana	Cocoa growers	Cocoa practices	+, Sig.	
Omotayo et al,		1997	5000	Nigeria	Farmers	Package	+, Sig.	
Düvel & Botha		1999	79	South Africa	Farmers	Conservation practices	NS	
Abd-Ella et al,		1981	844	Low-USA	Family farm	Farming practices	-0.230**	
Farm size	Havens	1965	145	Ohio -USA	Dairy farmers	Bulk milk tanks	-0.089	
	Alene et al,	2000	110	West Shoa (Ethiopia)	Maize men	Maize varieties	+, Sig.	
	Elias	1999	150	West Shoa (Ethiopia)	Wheat men	Wheat practices	NS	
	Elias	1999	154	West Shoa (Ethiopia)	Teff men	Teff practices	+, Sig.	
	Zegeye & Tesfaye	2001	363	South Ethiopia	Maize men	Maize practices	NS	
	Zegeye et al,	2001	1460	Whole Ethiopia	Maize men	Maize practices	+, Sig.	
	Getahun et al,	2000	240	South Ethiopia	Maize men	Variety	NS	
	Getahun et al,	2000	240	South Ethiopia	Maize men	Fertilizer	NS	
	Bizmana et al,	2002	183	South Rwanda	Coffee men	Package	+, Sig.	
	Opore	1977	1191	Ghana	Cocoa growers	Cocoa practices	+, Sig.	
	Omotayo et al,	1997	5000	Nigeria	Farmers	Package	+, Sig.	
	Omotayo et al,	1996	150	Nigeria	Farmers	Animal traction	+, Sig.	
	Mensah & Seepersad	1992	180	Ghana	Cocoa growers	Cocoa practices	-, Sig.	
	Düvel & Botha	1999	79	South Africa	Farmers	Conservation practices	+, Sig.	
	Foltz et al,	2002	245	Connecticut, USA	Dairy men	rbst ^{****}	+, Sig.	
	Havens	1965	145	Ohio-USA	Dairy farmers	Bulk milk tanks	0.267**	
	Copp	1958	157	Kansas-USA	Cattle men	Beef practices	0.52***	
	Copp	1958	177	Wisconsin-	Dairy men	Dairy practices	0.43***	
	Abd-Ella et al,	1981	844	Low-USA	Family farm	Farming practices	0.155**	
	Brown et al,	1976	202	Horby, US	Dairy men	Insimination service	NS	

^{*,**,***} Significant at 10 percent, 5 percent, 1 percent level

^{*} Not significant

^{****} Recombinant bovine somatotropin

Table 2.1 Continued...

Variable	Researcher	Year	N	Place	Subjects	DV	r ^{*,**,* **}	
Education	Alene et al,	2000	110	West Shoa (Ethiopia)	Maize men	Maize varieties	+, Sig.	
	Elias	1999	150	West Shoa (Ethiopia)	Wheat men	Wheat practices	NS	
	Elias	1999	154	West Shoa (Ethiopia)	Teff men	Teff practices	NS	
	Zegeye and Tesfaye	2001	363	South Ethiopia	Maize men	Maize practices	NS	
	Zegeye et al,	2001	1460	Whole Ethiopia	Maize men	Maize practices	+, Sig.	
	Getahun et al,	2000	240	South Ethiopia	Maize men	Variety	NS	
	Getahun et al,	2000	240	South Ethiopia	Maize men	Fertilizer	NS	
	Bizmana et al,	2002	183	South Rwanda	Coffee men	Package	+, Sig.	
	Bembridge & Williams	1990	170	SW South Africa	Maize men	Package	+, Sig.	
	Omotayo et al,	1996	150	Nigeria	Farmers	Animal traction	-, Sig.	
	Mensah & Seepersad	1992	180	Ghana	Cocoa growers	Cocoa practices	+, Sig.	
	Duvel & Botha	1999	79	South Africa	Farmers	Conservation practices	NS	
	Foltz et al,	2002	245	Connecticut, USA	Dairy men	rbst	+, Sig.	
	Abd-Ella et al,	1981	844	Iowa-USA	Family farm	Farming practices	0.214**	
	Havens	1965	145	Ohio-USA	Dairy farmers	Bulk milk tanks	0.094	
	Copp	1958	157	Kansas-USA	Cattle men	Beef practices	0.34***	
	Copp	1958	177	Wisconsin-	Dairy men	Dairy practices	0.19**	
	Organization	Elias	1999	150	West Shoa, Ethiopia	Wheat men	Wheat practices	+, Sig.
		Elias	1999	154	West Shoa, Ethiopia	Teff men	Teff practices	NS
		Zegeye et al,	2001	1460	Whole Ethiopia	Maize men	Maize practices	NS
Getahun et al,		2000	240	South Ethiopia	Maize men	Variety	+, Sig.	
Getahun et al,		2000	240	South Ethiopia	Maize men	Fertilizer	NS	
Omotayo et al,		1997	5000	Nigeria	Farmers	Package	NS	
Copp		1958	157	Kansas-USA	Cattle men	Beef practices	0.48***	
Copp		1958	177	Wisconsin-	Dairy men	Dairy practices	0.58***	
Abd-Ella et al,		1981	844	Iowa-USA	Family farm	Farming practices	0.015**	
Extension		Alene et al,	2000	110	West Shoa (Ethiopia)	Maize men	Maize varieties	+, Sig.
	Elias	1999	150	West Shoa, Ethiopia	Wheat men	Wheat practices	+, Sig.	
	Elias	1999	154	West Shoa, Ethiopia	Teff men	Teff practices	NS	
	Zegeye and Tesfaye	2001	363	South Ethiopia	Maize men	Maize practices	+, Sig.	
	Zegeye et al,	2001	1460	Whole Ethiopia	Maize men	Maize practices	+, Sig.	
	Getahun et al,	2000	240	South Ethiopia	Maize men	Variety	+, Sig.	
	Getahun et al,	2000	240	South Ethiopia	Maize men	Fertilizer	NS	
	Bizmana et al,	2002	183	South Rwanda	Coffee men	Package	+, Sig.	
	Bembridge & Williams	1990	170	SW South Africa	Maize men	Package	+, Sig.	
	Omotayo et al,	1997	5000	Nigeria	Farmers	Package	-, Sig.	
	Omotayo et al,	1996	150	Nigeria	Farmers	Animal traction	+, Sig.	
	Mensah & Seepersad	1992	180	Ghana	Cocoa growers	Cocoa practices	+, Sig.	
	Abd-Ella et al,	1981	844	Iowa-USA	Family farm	Farming practices	0.219**	
	Elias	1999	150	West Shoa, Ethiopia	Wheat men	Wheat practices	+, Sig.	
	Elias	1999	154	West Shoa, Ethiopia	Teff men	Teff practices	+, Sig.	
	Zegeye and Tesfaye	2001	363	South Ethiopia	Maize men	Maize practices	NS	
	Zegeye et al,	2001	1460	Whole Ethiopia	Maize men	Maize practices	+, Sig.	
	Omotayo et al,	1997	5000	Nigeria	Farmers	Package	+, Sig.	
	Media	Abd-Ella et al,	1981	844	Iowa-USA	Family farm	Farming practices	0.269**
		Bizmana et al,	2002	183	South Rwanda	Coffee men	Package	-, Sig.
	Omotayo et al,	1997	5000	Nigeria	Farmers	Package	NS	
Gender	Mensah & Seepersad	1992	180	Ghana	Cocoa growers	Cocoa practices	+, Sig.	
Modernity	Saced	1989	216	White Nile, Sudan	Farmers	Practices	+, Sig.	

* , ** , *** Significant at 10 percent, 5 percent, 1 percent level

The intervening variables considered in this study are need and perception related. As indicated before, results of previous studies in these areas are consistent with expectations except in one case (Table 2.2). Düvel & Scholtz (1986) found that perception of controlled selective grazing (CSG) has not been related with adoption of recommended veld management practices. Association of need related variables (need compatibility, need tension) and adoption behavior has been positive and significant. Studies by (Koch, 1986; Koch, 1987; Louw & Düvel, 1993; Düvel & Botha, 1999) for example, found positive and significant relationships. Koch (1986) found negative relationship between perceived current efficiency and adoption. This means that adoption of agricultural practices is inhibited by problem misperception or by a lack of clear perception.

Perception of technology attributes is positively related with adoption behavior regarding most of the studies reviewed (Botha, 1986; Louw & Düvel, 1993; Düvel & Botha, 1999) are some examples.

Table 2.2
Summary of studies on intervening variables-adoption behavior relationship

Variable	Researcher	Year	N	Place	Subjects	Dependent variable	Association
NC** - atriplex nummularia	Louw & Düvel	1993	46	NW South Africa	Farmers	Attriplex nummularia	+, Significant
NC-Conservation practices	Düvel & Botha	1999	79	South Africa (SA)	Farmers	Conservation practices	+, Significant
NT***-income	Koch	1985	100	Orange free state, SA	Commercial farmers	Package	+, Significant
NT-CSG	Düvel & Scholtz	1986	77	Volksrust, SA	Farmers	CSG	+, Significant
NT-package	Koch	1987	100	Orange free state, SA	Commercial farmers	Package	+, Significant
PCE****-package	Koch	1987	100	Orange free state, SA	Commercial farmers	Package	-, Significant
PTA*****-atriplex nummularia	Louw & Düvel	1993	46	NW SA	Farmers	Attriplex nummularia	+, Significant
PTA-conservation farming	Botha	1986	52	SW Africa	Beef farmers	Beef practices	+, Significant
PTA-pasture management	Botha	1986	52	SW Africa	Beef farmers	Beef practices	+, Significant
PTA-production systems	Botha	1986	52	SW Africa	Beef farmers	Beef practices	+, Significant
PTA-fodder banking	Botha	1986	52	SW Africa	Beef farmers	Beef practices	+, Significant
PTA-fodder cropping	Botha	1986	52	SW Africa	Beef farmers	Beef practices	+, Significant
PTA-package	Koch	1985	100	Orange free state, SA	Commercial farmers	Package	+, Significant
PTA-package	Koch	1986	100	Orange free state, SA	Commercial farmers	Package	+, Significant
PTA- CSG	Düvel & Scholtz	1986	77	Volksrust, SA	Farmers	CSG*	NS
PTA-c-conservation practices	Düvel & Botha	1999	79	South Africa	Farmers	Conservation practices	+, Significant

** Need compatibility

*** Need tension

**** Perceived current efficiency

***** Perception of total attributes

* Controlled selective grazing

2.6 Towards a formulation of hypotheses

Against the theoretical background of this chapter, presenting the literature review and an assessment of different models, the following research hypotheses emerge:

Hypothesis 1:

The adoption of recommended technologies or production practices¹ contribute significantly to production efficiency²

Hypothesis 2:

Production efficiency is determined by independent³ and intervening variables⁴, of which the influence of the former is indirect and only becomes manifested in production efficiency via intervening variables, which are the direct and immediate precursors of production efficiency.

Support for the above hypothesis can be found in evidence indicating that

- 2.1 There is a significant relationship between independent personal and environmental factors³ and production efficiency²
- 2.2 There is a significant relationship between intervening factors⁴ and production efficiency²
- 2.3 Intervening variables⁴ are the most important predictors, and taken together, will account for a significantly greater proportion of the variance of production efficiency²

¹ = Improved seeds, fertilizer, line planting, spot application, breed, housing, feed, and medical practices

² = Maize and dairy farmers

³ = Agro ecology, education, farm size, farming experience, gender, change agent contact, media exposure, organizational participation, attitudinal modernity, and age

⁴ = Perceived current efficiency, need tension, need compatibility, perceived total attribute

Hypothesis 3:

Adoption behavior² is determined by independent³ and intervening variables⁴, of which the influence of the former is indirect and only becomes manifested in behavior via intervening variables, which are the direct and immediate precursors of decision making and adoption behavior.

Support for the above hypothesis can be found in evidence indicating that

- 3.1 There is a significant relationship between independent personal and environmental factors³ and adoption behavior²
- 3.2 There is a significant relationship between intervening variables⁴ and adoption behavior²
- 3.3 Intervening variables⁴ are the most important predictors, and taken together, will account for a significantly greater proportion of adoption behavior²