TOWARDS A MORE SITUATION APPROPRIATE AND RESPONSIVE EXTENSION APPROACH FOR ETHIOPIA

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ABSTRACT

This paper investigates the influence of some selected personal, environmental and intervening factors on the adoption behaviour of dairy producers with the object of identifying the most important causes of behaviour and thus finding a more purposeful and effective way of changing the adoption behaviour.

200 farmers were randomly drawn form a total of about 430 standing members of Ada Liben Woreda Dairy And Dairy Products Marketing Association (ALWDADPMA) in Debrezeit, Ethiopia. In the analysis of data the ordinary least squares (OLS) regression methods were employed to identify the most important determinants associated with behavioural change

The results indicate that, in general, the intervening variables tend to have the highest prediction value. They were found to explain 68.3 percent and 80.9 percent of the variance of behaviour associated with the practice adoption and production efficiency, while the independent variables explained only 17.8 percent and 19.3 percent of the variation, respectively. The contribution of independent variables appears substantial only when their indirect effect (effect through intervening variables) is considered.

1. INTRODUCTION

The conviction that the promotion of individual technologies is ineffective, led to the development of the Participatory Demonstration and Training extension System (PADETES), which has been primarily designed to promote technology packages. Systematic in-depth studies of the effects of these packages have, however, not been conducted. The few studies (e.g., Howard, *et al*, 1999 and Zegeye & Tesfaye, 2001) were mainly focused on an analysis of the effects of some socio-economic and environmental factors, ignoring the possible influence of the intervening human causes, which Düvel (1998:31)

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maintains, are the immediate precursors of behaviour and through which the independent variables become manifested in decision making and behaviour.

The objective of this study, therefore, is to identify and compare the different categories of variables in regard to their influence on the adoption behaviour as it pertains to dairy producers in the Debrezeit located some 45 kms South East of Addis Ababa.

2. THEORETICAL RATIONALE

Most models or approaches of behaviour change are based on a process or on behaviour determinants or a combination of both. Amongst the processes the classical 5-stage adoption process (North Central Rural Sociology Committee, 1961), the Campbell Model (1966) and the innovation-decision model of Rogers (1983) are the best known and had the biggest impact. In a way the problem-solving approach is also a process, but emphasizes perhaps more than the others that the content is more important. The search for behaviour determinants has been going on for decades with changes in focus, which are aptly summarised by Albrecht (1969). The more recent KIS (Knowledge Information System) is another variation, which appreciates the system or a bigger totality and dynamic interdependency of cognitive issues. This brings it in line with Lewin's field theory (1951), which emphasizes perhaps more than any other theory the situation-specificity and uniqueness of human behaviour.

With the increasing number of factors or variables having been related with behaviour, the challenge to distinguish between the more and less important determinants has increased, and is of particular interest for the practitioner faced with the task of behaviour analysis, intervention and evaluation.

The contribution of Tolman (1967), who distinguishes between independent and intervening variables, creates the possibility of distinguishing the more indirect from the more direct behaviour determinants, particularly if it is assumed that the indirect causes (independent variables) become manifested in decision making or adoption behaviour via the intervening variables.

3. HYPOTHESIS

Based on the above, the following hypothesis are formulated:

Adoption behaviour and production efficiency are determined by independent[3] and intervening variables[4] of which the influence of the former is indirect and only becomes manifested in the adoption behaviour and the resulting production efficiency via intervening variables, which are the direct and most important predictors, and taken together, will account for a significantly greater proportion of the variance of adoption and production efficiency

4. RESEARCH VARIABLES AND STATISTICAL METHODS

In the past it has been believed that human behaviour, particularly the adoption behaviour of farm operators is largely determined or influenced by socio-economic and personal factors (independent variables). This has led to a research tradition in the area of behavioural sciences, which is largely dominated by an investigation of the relationships between these variables and behaviour. However, the findings are inconclusive and usually contradictory. Roger's (1983) generalizations, based on the findings of more than 200 studies regarding the factors responsible for behaviour change of a farm operator, are, for example, reflecting the importance of these variables without taking account of the more direct intervening variables, which, according to Düvel (1989, 1991 & 1998) are the immediate precursors of behaviour.

With the objective of assessing the relative importance and obtaining a better perspective of influence relationships, an attempt was made to evaluate the influence of the independent and intervening variables on the adoption of a package of dairy practices by 200 dairy farmers of ALWDADPMA, Ethiopia. Following the identification of the explanatory variables significantly associated with the two criterion variables, a more rigorous analysis was made by employing the OLS method to determine the contributions of these factors to the variance in package adoption behaviour and production efficiency of respondent dairy farmers.

A concise overview of the large diversity of independent variables and their association with adoption behaviour has been provided by Rogers' (1983) summary of research findings. Table 1, which provides an overview of the independent variables selected for this study, makes use of the same categorisation.

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[3] *Education, farm size, farming experience, gender, change agent contact, media contact, organizational participation, attitudinal modernity, age.*

[4] *Perceived current efficiency, Need tension, need compatibility, Perceived total attribute.*

Table 1: An overview of the selected independent variables and description of their measures or scales

Variable name	Measurement and description
1. Socio economic variables:	
Age	Number of years of respondent
Gender	Dummy: Male headed household = 1
Literacy	Ability to read few lines prepared to test literacy skill
Education	Number of years of schooling (formal schools)
Farm size	Annual average fortnightly milk production
Farming experience	Number of years spent on farming
Organizational participation	Dummy: membership and more positions = 1
2. Communication variables	
Extension contact	Dummy: contact at critical periods and more frequent = 1
Media exposure	Dummy: exposure of one or more contacts per month = 1
3. Personality variables:	
Modernity	33 item attitudinal scale1

1 Scale developed by Smith and Inkeles, 1966 in Saeed 1989

The concept of intervening variables, which is borrowed from Tolman (1967), does not necessarily refer to only hypothetical constructs or abstract variables, but rather to variables that are the immediate precursors of behaviour and thus also the variables through which the more independent variables become manifested in behaviour. These are the variables which, with reference to Lewin's (1951) field theory, can be associated with the field forces, but not to the factors influencing these field forces. Düvel (1975 & 1991) has identified needs, perceptions and knowledge under this category of variables. Some aspects of knowledge, especially knowledge of advantages and disadvantages, are assumed to be largely included in or provided for by perception. Intervening variables considered in this study are, therefore, either need related (perceived current efficiency [PCE], need tension [NT], and need compatibility [NC]) or perception-related (perceptions of technology attributes [PTA]). These variables do not exist as such, but are related to and have to be assessed in association with the specific activities, technologies or practices under investigation. In view of this, the intervening variables considered for further analysis in this study include the PCE and NT of respondents regarding the overall milk production and the recommended

dairy production technology practices such as housing, medical feed, and breeding practices, and the NC, and PTA of respondents regarding these four recommended practices.

Extension interventions are normally focused on the adoption behaviour regarding recommended practices for optimising sustainable production and thus the resulting outcome in terms of physical (e.g. yield) and economical (e.g. profit) success.

Pearson's correlation and standard multiple regression analyses were used to assess the relationships between variables.

Preliminary analyses were also made to check if the assumptions of normality, outliers, homoscedasticity and linearity are met. The Analysis showed no serious violation of these assumptions

5. FINDINGS AND DISCUSSIONS

The relationships between the independent variables and adoption behaviour and production efficiency are summarised in Table 2.

Table 2: Correlations between independent variables and adoption and efficiency behaviour of dairy producers Debrezeit, 2002

Independent variables	Adoption	Efficiency
Age	-0.036	0.158*
Education	0.281**	0.265**
Farm size	0.257**	0.324**
Farming experience	0.008	0.042
Dummy: gender	0.001	-0.032
Dummy: Media	0.310**	0.023
Dummy: Organization	0.089	0.077
Modernity	0.086	0.177*

*Significant: $p < 0.05$, ** Highly significant: $p < 0.01$*

About 50 percent of the selected variables (Table 2) are significantly related to both the adoption of practices (measured as a total score) and the production efficiency. Gender, experience, organizational participation and to a lesser degree media contact and attitudinal modernity do not have a significant relationship. Age shows a negative correlation with adoption though the relationship is not significant. A more likely reason, for the above exceptions

is that some dichotomous scales were used which somewhat restricts the validity of the correlations.

The relationships of some of the intervening variables (Table 3) are characterised by extremely high correlations. This applies in particular to need compatibility.

Table 3: Interrelationship between intervening variables and adoption and efficiency behaviour of dairy producers, Debrezeit, 2002

Variable	Adoption		Efficiency	
	r	p	r	p
PCE(1 regarding overall milk production	0.011	0.872	-0.430	0.000
PCE regarding breeding practices	0.088	0.215	0.017	0.809
PCE regarding housing practices	-0.442	0.000	-0.019	0.794
PCE regarding medical practices	-0.178	0.012	-0.058	0.382
PCE regarding feeds	-0.337	0.000	0.047	0.508
NT(2 regarding overall milk production	0.074	0.295	-0.234	0.001
NT regarding breeding practices	-0.234	0.001	-0.182	0.010
NT regarding housing practices	-0.272	0.000	0.103	0.145
NT regarding medical practices	-0.506	0.000	-0.051	0.472
NT regarding feeding practices	-0.106	0.136	-0.030	0.673
NC(3 regarding breeding practices	-0.144	0.043	0.791	0.000
NC regarding housing practices	0.075	0.291	0.500	0.000
NC regarding medical practices	0.181	0.010	0.532	0.000
NC regarding feeding practices	0.258	0.000	0.479	0.000
PTA(4 regarding breeding practices	0.048	0.500	0.070	0.325
PTA regarding housing practices	-0.010	0.893	0.143	0.044
PTA regarding medical practices	0.113	0.111	-0.131	0.065
PTA regarding feeding practices	0.106	0.136	0.030	0.673

(1 = Perceived current efficiency; (2 = Need tension; (3 = Need compatibility; (4 = Perception of total technology attributes

Negative correlations in the case of several variables related with the perceived problem discrepancy (need tension) between the current and desired situation can be attributed to especially the less effective respondents over-rating their own efficiency and/or need satisfaction, i.e., the changed behaviour due to adoption of the recommended practices resulted in a change of need tension.

The regression analysis in Table 4 confirms the rather limited contribution of independent variables on adoption and production efficiency.

Table 4: Multiple regression estimates of the effects of independent variables on adoption and efficiency behaviour of dairy producers Debrezeit, 2002

Variable	R^2 = 0.193 (Efficiency), 0.178 (adoption)					
	Efficiency			Adoption		
	Beta	t	p	Beta	t	p
Constant	-	3.217	0.002	-	18.584	0.000
Age	0.173	2.569	0.001	-	-	-
Farming experience	-	-	-	0.001	0.015	0.988
Education	0.243	3.146	0.002	0.160	2.208	0.028
Farm size	0.275	4.183	0.000	0.229	3.467	0.001
Media contact	-	-	-	0.251	3.546	0.000
Modernity	0.069	0.902	0.326	-	-	-

Farm size and education have a significant influence on both the adoption behaviour and the production efficiency of dairy farmers. Media contact and age have a significant influence on adoption and production efficiency, respectively. In accordance with these limited contributions, the total variation explained by independent variables is a mere 17.8 percent (R^2 = 0.178) in the case of adoption and 19.3 percent (R^2 = 0.193) in the case of production efficiency.

Table 5 summarises the findings in regard to the contribution of intervening variables to variation in adoption behaviour and production efficiency

Table 5: Multiple regression estimates of the effects of intervening variables on adoption behaviour and production efficiency of dairy producers Debrezeit, 2002

Variable	Efficiency			Adoption		
	Beta	t	p	Beta	t	p
PCE[1] regarding breeding practices	-	6.59	0.000	-	33.35	0.000
PCE regarding housing practices	-	-	-	-0.43	-10.1	0.00
PCE regarding medical practices	-	-	-	-0.21	-4.69	0.000
PCE regarding feeding practices	-	-	-	-0.21	-4.68	0.000
NT[2] regarding breeding practices	-0.08	-2.54	0.012	-0.06	-1.49	0.138
NT regarding housing practices	-	-	-	-0.35	-8.09	0.00

Variable	Efficiency			Adoption		
	Beta	t	p	Beta	t	p
NT regarding medical practices	-	-	-	-0.41	-9.21	0.000
NC(3 regarding breeding practices	0.564	13.97	0.000	-0.05	-1.13	0.26
NC regarding medical practices	0.221	5.681	0.000	0.039	0.848	0.390
NC regarding feeding practices	0.190	5.160	0.000	0.197	4.173	0.000
NC regarding housing practices	0.114	3.036	0.003	-	-	-
PCE regarding overall milk production	-0.13	-3.30	0.001	-	-	-
NT regarding overall milk production	-0.12	-3.22	0.001	-	-	-
PTA regarding housing practices	-0.00	-0.02	0.984	-	-	-
R^2 =	0.809			0.683		

(1 = Perceived current efficiency; (2 = Need tension; (3 = Need compatibility; (4 = Perception of total technology attributes

These contributions are significantly higher. They contribute in total 68.3 percent (R^2 = 0.683) and 80.9 percent (R^2 = 0.809) of the variation in the adoption behaviour and production efficiency of dairy farmers, respectively.
On the other hand, the contribution of independent variables to the variance of adoption and production efficiency is not only direct. There is also an indirect influence (via the intervening variables), which can increase their total impact. To elaborate the direct and indirect relationships between these variables a path analysis was employed taking the relationships between the stimulus variables and production efficiency as an example (Fig. 1).

The net effect of intervening variables on production efficiency when the effect from the independent variables is controlled (R^2 change) is the difference between III and I i.e. 81.9 - 19.3 = 62.6. The indirect effect of independent variables on the production efficiency of dairy farmers (their effect manifested through the intervening variables) is the effect of intervening variables on the dependent variable before the possible effect of independent variables is controlled, less the effect of intervening variables after the influence of independent variables is controlled (80.9 percent - 62.6 percent), which equals 18.3 percent. The aggregate effect of independent variables is the sum total of their indirect and direct effects (viz.18.3 percent + 19.3 percent), which equals 37.6 percent. This figure is still less compared against the net effect of intervening variables obtained after the possible effect of independent variables is controlled (62.6 percent). However, the path analysis (Fig. 1) shows that the effect of independent variables becomes sizeable (increased to 37.6 percent) only when their indirect effect is considered. The same procedure was applied to assess the direct and indirect influences of these variables on the adoption behaviour of dairy farmers and

found that the total effect of independent variables is increased to 30.2 percent when their indirect effect (12.4 percent) is added.

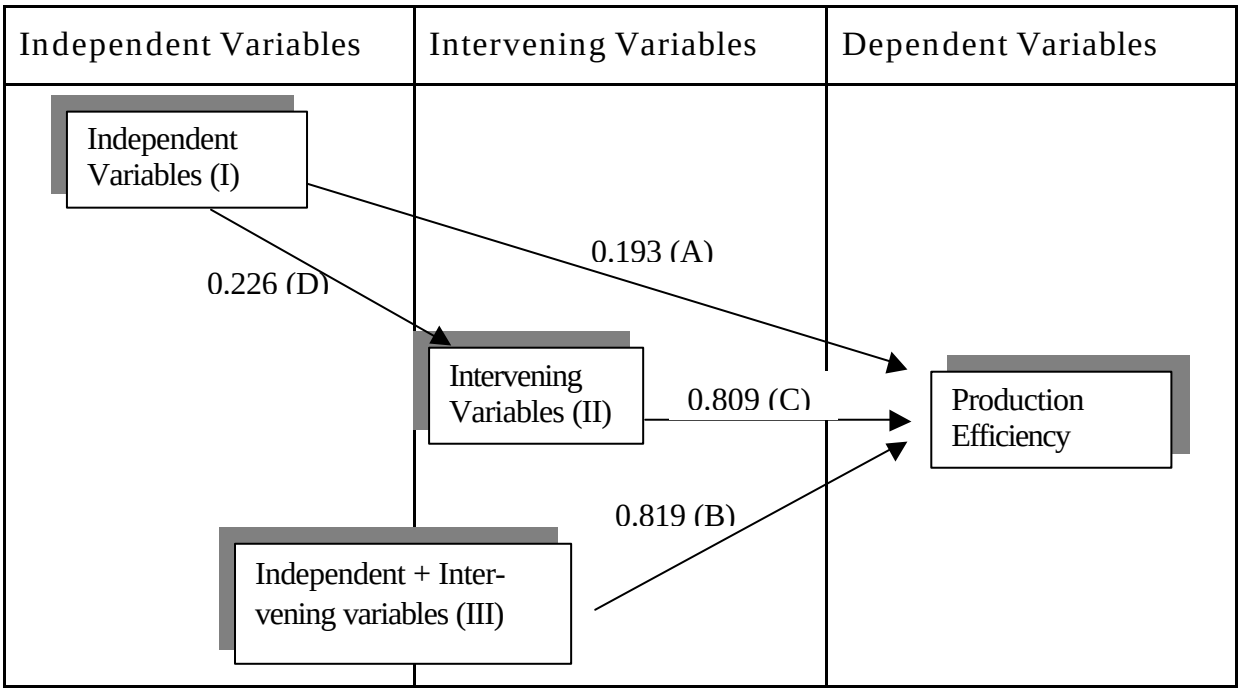

Figure 1: Path diagram showing the relationship between independent, intervening variables and production efficiency of dairy farmers[5]

These, together with the highly significant contribution of intervening variables on the adoption behaviour and production efficiency of dairy farmers, provide strong evidence in support of the hypothesis of intervening variables being the likely precursor of adoption behaviour and production efficiency and through which the influences of independent variables become manifested.

The importance of the intervening variables is also reflected in the very high contribution of individual variables. Top of the list is need compatibility, which, from a theoretical point of view and the understood role of needs, is almost a precondition for change, since it is difficult to visualise an action or behaviour that is in contradiction with his/her needs. In fact, it does appear as if the issue is not that the hypothesis regarding the intervening variables is invalid, but rather that the difficulty lies in their accurate measurement. An example is that of need tension, which represents the perceived potential need tension or difference between the current and the aspired or optimum

[5] *The values, 'A', 'B' & 'C' are obtained by regression analysis. 'D' is calculated from these results, i.e. D= 0.183/0.809=0.226.*

situations. Its contribution is, according to Table 5, very significant, but should, according to theoretical considerations, have been significantly more. Its measurement as reflection of need is distorted for several reasons

There is a clear tendency for the current level (of practice adoption or production efficiency) to be increasingly over-estimated the poorer the adoption or efficiency of the client. This tendency tends to cancel out or undermine the need tension. The fact that this is more likely to be the case with production efficiency than with practice adoption is the possible reason why need tension contributed less in the case of production efficiency where needs are more conscious and focused.

Behaviour aimed at realising the need will change the need tension. Therefore unless need assessments would have all been done immediately prior to behaviour change in the case of all respondents, it is near impossible to accurately measure or assess the important role of these needs.

The need tension reflected in the difference between the current and aspired levels is but one criteria or indicator of need scope or intensity. Equally important in reflecting the scope of the need is the current level that is where it is relative to the maximum or optimum. For example, the need to maintain a current near maximum level of production is higher and reflects more "will of attainment" than the need to increase the level from very low to mediocre.

A noteworthy finding is that perception does not seem to be as important as needs. This may be attributable to the fact that perception, as understood in this paper. is very closely related to knowledge. For example the knowledge or perception of the advantages and disadvantages is hardly distinguishable. This finding could imply that knowledge, in terms of its influence, is a less important intervening variable and may offer an explanation as to why the mere dissemination of knowledge is seldom effective or why it is often maintained that "knowledge does not sell itself". There is also a suspicion regarding the effectiveness of the 5-point scale measurement instrument employed in this study in the sense that it is probably not sensitive enough to accurately measure the strength of the various valences or forces.

6. IMPLICATIONS FOR EXTENSION

Further verification studies: The very convincing findings provide strong evidence for cross-cultural validity of the behaviour analysis and intervention model employed in this study. However, since the study is the first of its kind to test and verify Düvel's (1991) model in a completely different social

environment, more verification is necessary under still more varying conditions to further test the model and increase its value.

The study has indicated that the intervening variables are the most important predictors of behaviour change and can thus be associated with Lewin's (1951) forces of change. This, together with the mere fact that the intervening variables, as opposed to the more stable and unchangeable independent variables, can be changed through extension, make them the logical focus of extension. The shift in focus to these variables makes extension more situation appropriate and thus more sensitive to changes in the needs and perceptions of the clients it intends to serve. A further major advantage is that this new focus allows for much more accurate and realistic monitoring and evaluation.

Current measurement instruments are not yet capable to effectively distinguish between the strength of forces or between mere awareness and a real force with behaviour implications. For example, the fact that even the adopters of the various technologies are as conscious of the disadvantages or negative forces as the non-adopters (and is the reason for the absent correlation between perception and adoption behaviour) seems to indicate that in the case of adopters, the so-called constraints or disadvantages have been largely overcome, and probably represent mere disadvantages rather than active negative forces. This is indicative of a shortcoming in the accurate measurement of the strength of forces, and should receive attention by researchers.

In general the search for further potentially important intervening variables needs to continue. Other challenges relate to the clearer distinctions between the inter-related concepts of perception, needs and knowledge and, above all, a refinement of measurement techniques and scales.

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