

CHAPTER 10

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

10.1 SUMMARY AND CONCLUSIONS

The ongoing quest for a better understanding of adoption behaviour, and more specifically the search for relevant, and meaningful behaviour determinants that can be useful in the understanding, analysis and change of adoption behaviour, has prompted this study. Over the years much attention has been given to independent variables like socio-economic and environmental factors, but with limited success in view of their rather limited and often inconsistent influence. More recent claims that intervening variables like; needs, knowledge and perception, have a potentially better prediction value, gave direction to the objective of this study namely to compare independent and intervening variables with regard to their influence on the adoption behaviour of recommended maize production practices by maize growers in the Njombe district.

A structured questionnaire was used to collect data from 113 farmers randomly selected to represent five percent samples of four villages selected to represent the biggest variation in terms of climatic conditions within the Njombe district of Tanzania. The data collected were analyzed using the statistical package for social sciences (SPSS). Correlations, chi-square, and regressions were used to determine the relationship between the independent and the dependent variables

The following hypotheses guided the study and provide an appropriate framework for a brief overview regarding the main findings and conclusions:

Hypothesis 1: The production efficiency is influenced by the adoption of recommended maize production practices

The results show that most of the farmers' (97.3 percent) production efficiency falls well below the optimum maize yield of about 40 bags per acre. The overall low level of adoption of the recommended and investigated practices as well as their highly significant correlation with yield goes a long way in explaining the low production efficiency. However, the total contribution of all included practices toward the explanation of yield variation is only about 55 percent. It is meaningful that the mere inclusion of weed infestation as an independent variable increases the regression (R^2) or explanation of variation from 55 to 72 percent and contributes more than any of the practices studied.

The fact that weed control, measured as weeding frequency, did not significantly contribute towards the regression, clearly shows that the measure used is inappropriate and that much work needs to be done in order to come up with appropriate and practical measures for assessing the level of weed control for baseline or for extension output purposes. The same applies, albeit to a lesser degree, to other recommended practices and it would appear that this is an area frequently overlooked by research, thereby largely failing in its knowledge support function.

Hypothesis 2: The adoption of recommended maize production practices is influenced by the independent variables like farmer's age, sex, formal education and farm size

As far as age is concerned large majority of the respondents (80 percent) are under 56 years of age and therefore can be expected to still perform all farming activities. The mean age is 45.4 but there are big variations, the youngest respondent being 20 years and the oldest 80 years old. It had been expected that the adoption of recommended maize production practices is higher among young **farmers** than among older ones, but the findings were rather inconsistent. Younger farmers appear to be more efficient than older ones regarding phosphate, nitrogen and total fertilizer package application. However, significant relationships are not found between age and the adoption of maize varieties, time of nitrogen fertilization and seed spacing.

The majority of the respondents (61.9 percent) were males but, in contradiction with many other studies, there is insufficient evidence to support this assumption in most of the investigated practices. Only seed spacing adoption seems to suggest that males are more efficient than female farmers in adopting this practice.

Amongst the independent variables education appeared to be one of the most influential. The correlation analysis revealed a significant positive correlation between formal education and adoption implying that the higher the formal education is, the higher the adoption of practices. However, formal education seems to have no relationship with some of the practices like time of nitrogen fertilization and seed spacing. This again shows the inconsequence of influence, even amongst the most influential independent variables, and questions their usefulness in behaviour prediction.

The influences of farm size and area under maize are very similar, and must be attributed to the close relationship between the two independent variables ($r = 0.471$, $p = 0.000$) In both cases there are significant correlations with the majority of practices, with the exception of seed spacing and maize varieties in the case of farm size and nitrogen application in the case of area under maize. The reasonably strong influence of these variables relative to other research findings (Bwana, 1996; Temu, 1996) can be attributed to the range of farm sizes found in the Njombe District (typical of many parts of Africa), which somewhere between the range of one and six acres can be more critical than is the case where farms are much bigger or well above the threshold of what can be regarded as economical units.

Hypothesis 3: The adoption of recommended maize production practices is influenced by the intervening variables like need related aspects, knowledge and perception

When investigating the role of intervening variables, they were all found to be very influential as determinants of adoption behaviour.

Efficiency misperception or the tendency to overrate one's own efficiency was a common phenomenon. For example in the case of nitrogen fertilization, 74.3 percent of the respondents overrated their efficiency while 58.4 percent and 55.7 percent overrated the efficiency of their maize varieties and total fertilization respectively. This perception was, according to the findings, very significantly related to the adoption of all the practices, implying that the more the own efficiency is overrated, the lower the level of adoption can be expected to be.

The need tension, which refers to the difference between the perceived current and desired level of adoption or production efficiency, was also found to be a very important behaviour determinant. The findings reveal a highly significant positive relationship between need tension and adoption behaviour. In respect of all the practices investigated, it was found that the higher the need tension, the higher the level or degree to which the practices are adopted.

When discerning about the role of the perceived need compatibility, its critical role becomes very obvious and was very clearly supported by the findings. This leads to the conclusion that the higher the perceived need compatibility, that is the degree to which the recommended practices are perceived to contribute towards the accomplishment of the individual's needs, the higher the level of adoption. The relatively low adoption of recommended maize varieties and fertilizer package, can largely be attributed to the fact that they are not perceived as very appropriate means in helping the respondents achieve their goals or satisfying their needs.

In general most farmers are not aware of what the optimum recommended level is regarding the adoption of the various practices in the study area. This perception or lack thereof was also found to be correlated with the degree of adoption. The perceived awareness of the solution or the optimum level has a direct bearing on the total need tension and can be regarded as a precondition, but not necessarily as a guarantee of adoption and as such can be one of a series of factors or forces preventing change.

Another intervening variable found to be related to adoption behaviour is the perceived degree of prominence of the recommended practice. The more prominent, or the more advantageous a recommended practice is perceived relative to other alternatives (especially the own) the more likely it is to be adopted. For example in the case of nitrogen fertilization, 60 percent of the respondents assessed it as having a low prominence and were correspondingly poor adopters.

The most important advantages of recommended maize varieties mentioned are high yield, early maturity, good taste and good grain quality; while poor grounding quality of grain, low storability, high implementation costs and poor resistance to draught were mentioned as the disadvantages. As far as the fertilization package is concerned the following advantages were mentioned: high yield, growth facilitation, good grain quality and high yield of maize plant residues. The disadvantages of the fertilization package identified include poor grounding quality of grains, high labour requirement, pests attach and wastage of money.

The study revealed that the number of perceived advantages of recommended maize production practices is positive and highly significantly related to adoption behaviour. This means that adopters are more aware of advantages than non-or poor adopters. However, as far as the number of perceived disadvantages of recommended maize production practices is concerned, there is no clear relationship with adoption behaviour. This could be attributed to the fact that adopters are as aware of the disadvantages as the non-adopters, but having gone through the adoption process, many of the disadvantages may have been overcome by them and no longer present negative forces preventing change.

A further analysis focused on the strength rather than the number of forces (advantages and disadvantages) revealed similar results, namely strong relationships between the total positive forces and imbalance of positive over negative forces with adoption behaviour.

The negative correlation regarding the total negative forces and adoption behaviour confirm the above suspicion that disadvantages can be mere disadvantages without representing negative forces acting as restraining forces to change. The challenge, from a behaviour analysis point of view, lies in differentiating between what are mere cognitions or disadvantages and what are actual negative forces

In general the intervening variables show very strong relationships with adoption behaviour and, unlike what is a common phenomenon among independent variables, these relationship show great consistency, which is in support of the research hypothesis.

Hypothesis 3: The influence of intervening variables on adoption behaviour is bigger than that of independent variables

A regression analysis, of which the results are summarized in Table 10.1, shows the much bigger influence of intervening variables compared to independent variables.

Table 10.1: Comparative role of total independent and intervening variables in explaining the percentage variation in adoption behaviour

Recommended practices	Independent variables (%)	Intervening variables (%)
Maize varieties	18.7	86.7
Phosphate fertilization	24.8	73.2
Nitrogen fertilization	29.5	74.8
Total fertilizer package application	32.9	82.0
Seed spacing	6	93.6

In regard to all practices investigated, the influence of intervening variables very clearly overshadows that of independent variables. The tremendous difference emphasizes the importance of the former variables.

The logical explanation for this highly significant difference is that the intervening variables are probably the immediate and direct determinants of adoption behaviour and that the influence of independent variables only becomes manifested in adoption behaviour *via* the intervening variables. This means that the obvious variables on which attention need to be focused in behaviour analysis are the intervening variables; like needs, perceptions and knowledge.

According to the findings of this study, focus of extension can be narrowed down to that of the intervening variables, which are relatively low in number and very relevant as opposed to independent variables that involve collection of bulk data from the great number of variables that are not always consistent in behaviour determination. Concentration in intervening variables will also assist in saving time, energy and financial resources.

10.2 RECOMMENDATIONS

Based on the findings of the study the following recommendations emerge:

1. Refinement of adoption criteria and scales.

Extension often lacks appropriate criteria, scales and absolute standards of adoption behaviour analysis. This problem manifests itself in the poor contribution of the various maize production practices on production efficiency. This leads to the conclusion that extension and research haven't got all the answers, either in terms of the nature and completeness of recommended practices or in terms of the appropriate criteria for their measurement. This calls for closer collaboration between extension and research in the area of message development, refinement and outcome evaluation.

2. Focusing on intervening variables

In all the practices investigated the contributions of intervening variables on the adoption behaviour far outweigh those of independent variables (Table 10.1). Since the results provide sufficient evidence in supporting the relevance of intervening variables in adoption behaviour, the study recommends that emphasis be put on these variables in extension programs.

More specifically, the focus in all strategies should be focused on

- adding or strengthening the positive or driving forces,
- elimination or reduction of negative or restraining forces, and
- changing the direction of negative to positive forces.

Strictly speaking, it is very important to concentrate more on removing the constraining forces that hinder the adoption behaviour to take place. If the existing situation for example efficiency of practice adoption is overrated due to misperception the solution from an extension point of view is to establish a form of tactful disillusionment i.e avoiding public exposure. In the case of need incompatibility the innovation or practice should, if possible, be compatible with or lead to a solution of the perceived major needs or problems. For example, if the problem is limited knowledge concerning the optimum that is achievable, it is important for the extension staffs to provide convincing evidence about the optimum and that its achievement is worthwhile.

3. Further research

Although the intervening variables seem to be critical and very crucial in behaviour determination, there are still some outstanding challenges. For example, in the case of disadvantages, the study model (Fig. 2.7) indicates that one cause of non - adoption is awareness of disadvantages but the findings show that both adopters and non-adopters are almost equally aware of these disadvantages. The challenge here lies in differentiating between what are mere disadvantages and what are actual negative forces.

It is also important to continue the search for possible other intervening variable and to try and merge the variables encompassed in the models of Ajzen and Düvel. Furthermore, studies should be replicated in different parts of the world and different cultures for the purpose of further verification and introduction of these variables to other people who are not yet familiar with them and Düvel's (1991) behaviour analysis model in general. It can form the basis for the development of an epistemology of extension for which there is still a dire need.